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PREFATORY ESSAY.

A GENERAL SURVEY OF RECENT POLITICAL PROGRESS.

By Edward Dicey, C.B.

TO find any single phrase which could adequately describe the tendencies of human thought, policy, and statecraft during the last quarter of the 19th century is an obvious impossibility. But the nearest approximation to such a phrase would probably be to employ the phrase "Conservative reaction" as characterizing the period in question. This phrase, if used not in the way the expression is commonly employed, as referring to party politics, but in a wider sense, expresses a general phase of mind in most, if not all, the self-governing countries of the world, which, for good or bad, has of late years influenced their State policy in a uniform direction. To put the same idea in another, and perhaps simpler, manner, it may be said that the spirit of the times was progressive during the first three quarters of the 19th century, and unprogressive, if not reactionary, during the last quarter. The course of human affairs is not regulated by fixed laws, such as those which govern the rise and fall of the tides. It is therefore idle to discuss the exact date at which the movement in favour of progress reached its apogee, or the date at which reaction set in. But men whose memories extend over half a century will probably agree in saying that in Great Britain, as in all other countries where the conditions of public life are at all similar, the ideas which commended themselves to public approval in the first-named of these periods lost their sway during the years that have come and gone since the ninth edition of the *Encyclopædia Britannica* first saw the light of day. The International Exhibition of 1851 formed the high-water mark of the progressive movement, though at the time it was commonly regarded as the commencement of a new and better era, in which wars were to cease, the progress of science was to ameliorate the fundamental conditions of human existence, and free democratic institutions were to unite the nations of the world in bonds of amity and goodwill. During the quarter of a century which followed the World's Fair in Hyde Park, the belief in the progress of humanity retained its ground. Up to 1870, or even later, the creed of Liberalism was held, or at any rate professed, by the great majority of thinking men in all countries, and in consequence its prestige continued long after the fervour of belief had passed away. The course of events had for many previous years been gradually undermining popular faith in the efficacy of democratic institutions, or of the discoveries of science to modify materially the lot of mankind upon the earth. Then, again, the doctrines on which the system of Free Trade was based had not succeeded in commanding general assent; or, to speak more correctly, the results which its adoption was regarded as certain to produce had not been realized. Moreover, the working classes throughout the Old World and the New had had their faith in parliamentary institutions severely shaken by the fact that the general organization of society, in so far as labourers and artisans were concerned, remained much the same under democratic institutions as they had been under aristocratic or oligarchical rule.

In consequence, the hewers of wood and drawers of water had begun to lose their enthusiasm for political reform as a means of ameliorating their own condition, and to base their hopes on Socialistic schemes for the regeneration of society, schemes which, whether sound or unsound, were diametrically opposed to the cardinal dogmas of old-fashioned Liberalism—that State intervention was an evil in itself; that Capital and Labour would each thrive best by being at liberty to fight their own battles; and that any effort on the part of the State to interfere with absolute freedom of contract, and to regulate the profits of Capital on the one hand, or the wages, hours, and conditions of Labour on the other, was foredoomed to failure. The growth of Socialist ideas amidst the working class had tended to dissolve the political alliance which had existed for so many years between the operative class and the lower middle class. Shopkeepers, clerks, small employers, and the less prosperous of the rate-paying classes had become alarmed at the Socialist schemes which had found favour with workmen and labourers; while they also resented the growing authority of Trades Unions. In consequence, the vast class which lies between the poor and the wealthy had gradually gravitated towards Conservatism as distinguished from Liberalism. Moreover, it cannot be doubted that the tone of modern thought and the consequent decay of dogmatic religious belief to some extent modified the aspirations and ideals of civilized mankind. Doubts as to the merits of unrestricted competition as a system capable of universal application; a tendency to look to State action, rather than to individual effort, as the best remedy for social evils; a fear of the supremacy of the masses by the property-owning part of the community; and a widespread desire for the reorganization of the world on the basis of social, as distinguished from political, reform, are some of the chief factors which influenced the policy of all progressive States during the last five-and-twenty years of the 19th century, and led to various changes in their internal fabric, and, in some instances, in their external relations with one another.

Wars.

The shadow of the great Franco-German war of 1870–71 has lain over the years which have come and gone since the German armies entered Paris as conquerors. The direct results of the campaign are obvious enough. Germany became the leading State in continental Europe, while France was relegated to the second, if not to the third, place amidst the Great Powers of the mainland. Her loss of territory is insignificant as compared with her loss of authority; and the authority she still exerts is mainly due to her grand traditions and to the alliance contracted with Russia. The indirect effects of the war of 1870–71, though less obvious, are certainly not less important. The outcome of the German victories throughout the length and breadth of France was to deal a death-blow to the common belief that the era of wars of aggression and conquest had come to an end, and that under free governments, in which the influence of the democracy was supreme, international issues would be settled by arbitration instead of by the brute force of arms. This belief, it may be urged, ought to have been already dispelled by the series of wars which had agitated the world for many years previous to 1870. But each one of these wars might be ascribed, not altogether without justice, to other causes than to the greed of conquest, the dynastic ambitions, or the lust of power, which, according to the leading popular teachers of the day, were solely responsible for the wars of a bygone period. The Franco-Italian war of 1859 was justified by the desire of France to assist Italy in recovering her national independence. The civil war in North America was regarded as a struggle for the abolition of slavery. The invasion of Denmark by Prussia and Austria was excused on the plea that it was waged to uphold the principle of nationality, outraged, or alleged to be outraged, by the rule of the Danes in Schleswig-Holstein. The Seven Days' campaign, which ended at Sadowa, was supposed to have been due to the paramount necessity of creating a united Fatherland. Popular delusions die hard; and all these indications that, now as heretofore, might is the supreme arbiter upon earth failed to shake the idea, embodied in the Exhibition of 1851, that the days of aggressive warfare had passed away never to return. But no faith, however robust, in the permanence of peace under democratic rule could withstand the shock given to this faith by the war between Germany and France. At the period of its outbreak the passions of onlookers were keenly enlisted on one side or the other, and partisans of either combatant contended that the responsibility for the war rested exclusively on the rulers of the State to which their own sympathies were opposed. But the more the inner history of the war became known, the clearer it became that its *causa*

causans was the jealousy between the German and French nations, or, to speak more accurately, their desire of attaining respectively certain objects, to whose attainment the subjugation of the other was an essential preliminary. Of course the personalities of Prince Bismarck, of Napoleon III., and of others played a large part in the actual conditions of the war. But when France had set her heart on remaining the dominant military power in Europe, and when Germany had made up her mind to convert a confederation of sovereign states into a united empire, an armed conflict between the two countries had become inevitable at no distant date. The outbreak of such a war as this—due to no serious provocation on either side, possessing far less obvious justification than any of the dynastic wars of the 17th and 18th centuries, and hailed with enthusiasm by the voice of the two nations about to engage in mortal combat—was utterly irreconcilable with the theory that modern civilization, the advance of science, and the progress of humanity, had rendered an aggressive war a practical impossibility. If wars were to be waged in the future, as they had been in the past, whenever any State had an interest in aggrandizing its power or extending its territories at the expense of its neighbours, and saw a favourable opportunity for so doing, certain conclusions followed logically, whose weight no prudent nation could afford to overlook. The first of these conclusions was that any Power which was anxious to hold its own position and retain its own independence must be prepared to defend herself against any other Power, or combination of Powers, by whom she was likely to be attacked. The second conclusion was that if the leading States of the civilized world were to act upon the principle of extending their dominions or consolidating their power whenever they could do so with fair chance of success, any State which did not avail itself of every opportunity presented for aggrandizement without incurring serious danger of reprisals must of necessity fall behind in the struggle for life. It will be found, on examination, that both these convictions, in some instances consciously and, in many more, unconsciously, have influenced the course of events during the period under review. With respect to the first conviction, as to the necessity for increasing their military forces, there has been a marvellous accord on the part of all the leading Powers of the world. It is not an exaggeration to say that the chief occupation of the last twenty-five years of the 19th century, in as far as Governments were concerned, consisted in preparing for the possible eventuality of war. Reference to any record of national statistics will confirm this statement. For our present purpose it is sufficient to say that, in well-nigh every civilized country, the army and navy have been placed, in times of peace, on what at the commencement of the period in question would have been regarded as on the footing of war. All countries are burdened well-nigh to the full extent of their numerical and financial resources. Various minor States, such as Bulgaria and Servia, have been brought to the verge of bankruptcy by their military expenditure; and it is open to question how long even powerful countries such as Italy, Russia, and Austria can continue to support the constant drain on their resources caused by the necessity, whether real or imaginary, of making themselves ready for war in times of peace.

In the majority of instances these military preparations were honestly made for defence, not for defiance. But it is only in accordance with human nature that the possession of power should engender a desire for its exercise. The period of increased armaments has therefore coincided with a period of annexation on the part of all the powerful States of the world. To cite only the main instances, Great Britain has acquired a virtual protectorate over Egypt, and holds joint dominion with Egypt over the Sudan; has annexed Burma, the Transvaal, and the Orange Free State; and has secured a leasehold of Cyprus, tantamount to a freehold. France has taken possession of Tunis, and has assumed the administration of Indo-China—comprising the formerly independent States of Annam, Cochin-China, Cambodia, and Tongking. Russia has annexed Bessarabia and the northern provinces of Armenia. Germany has planted her flag on the mainland of Zanzibar in Africa and at Kiao-chow in China. Austria has possessed herself of Bosnia and Herzegovina. Italy has assumed the ownership of Massawa, and was only hindered from securing a protectorate over Abyssinia by the disastrous campaign which ended in the defeat of Adowa. Belgium, in fact if not in name, has added the Congo Free State to her European dominions. The passion for territorial aggrandizement has not been confined to Europe. In the East, Japan has obtained a footing in Korea, and would have extended her territory into China

proper after her victories in the war with the Celestial Empire had she not been baffled by the intervention of Russia, France, and Germany. In the West, the United States, as the reward of their war with Spain, hold Cuba within their grasp, and have actually annexed Porto Rico and the Philippines. We might cite any number of smaller acquisitions of territory—chiefly, no doubt, on the part of Russia and Great Britain—in barbarous or semi-barbarous countries; but it is unnecessary to do more than allude to the partition of Africa, one of the most striking illustrations of the earth-hunger which has had so great an influence on the course of events within the last few years, and which is likely to have far greater influence in the years to come. The Dark Continent, to whose existence, after the suppression of the slave trade, Europe had remained persistently indifferent, has since 1880 been partitioned out into so-called spheres of influence, over which various European States claim a right of predominance.

The earth-hunger.

It may be contended with some plausibility that this earth-hunger is due solely, or at any rate mainly, to increased armaments, and to the bellicose frame of mind which these armaments have necessarily engendered amongst all progressive countries. This explanation, however, is inadequate. Even the most ardent opponents of militarism would hardly dispute the assertion that, as a body, the civilized nations of the world have increased their armies and their navies on the principle, *Si vis pacem para bellum*. The possession of augmented military power may have facilitated the subsequent annexations of territory. But the chief object for which the nations have submitted willingly to the burdens inseparable from so-called "bloated armaments" has assuredly not been solely an ambition of seizing on the waste places of the world. The truth is that the outburst of militarism has coincided fortuitously with what we may call the contraction of the earth. It need hardly be said that this contraction is moral, not material, and is due to the rapid increase of the world's population, owing partly to improved sanitary and social conditions, but mainly to the discoveries of science. If by some convulsion of nature the various inhabited portions of the globe could have been brought into close proximity to each other, the result of such a convulsion would hardly have differed materially from that produced by the agency of railways, steamships, and, above all, of electricity. Even as late as 1875 the system of world telegraphy was in its infancy as compared with its present development; and it seems well-nigh certain that the 20th century will witness such an extension of the means of international locomotion and communication as to induce succeeding generations to regard themselves, with far more justice than we can do to-day, as the heirs of all the ages. It is not to be wondered at if this contraction of the earth should have increased the desire of all leading nations to increase their area of available territory while there was yet time and opportunity. When the owner of a large and prosperous estate finds building going on all around him, in such a manner as to threaten "the amenities" of his property, he has only one course open to him if he is anxious to maintain his position. That course is to obtain possession of all adjacent land which is available for appropriation. The same instinct which leads the landowner to provide against the danger of being crowded out, has led the master nations of the day to appropriate, in as far as they can, all the unoccupied portions of the habitable globe. It is a significant fact that the two countries in which this land-greed has been most powerful should be Great Britain and Germany, which both have very dense and very rapidly increasing populations, and which are both to a considerable degree dependent upon foreign enterprise for the food of their people. In France, on the other hand, where the population barely holds its own in numbers, and where the produce of the soil is more than sufficient for native wants, the land-greed has taken but small hold on popular imagination. This statement may seem hard to reconcile with the vigorous though spasmodic efforts made by France since the Franco-German war to extend her spheres of influence in various parts of the globe. A very slight acquaintance, however, with the French people is sufficient to convince any observant person that Frenchmen know little and care less about colonial possessions in themselves, and only value them, if at all, from a sort of unreasoning impression that Great Britain owes her greatness to her colonies, and that if France had colonies of her own, she might become more powerful than Great Britain, or at any rate might cause that country trouble and annoyance.

Something may well be said here of the violent outburst of anti-British feeling which has manifested itself throughout Europe, and especially in France, and which forms one of the most noteworthy, though

least pleasing, incidents of the period under consideration. Be the rights or wrongs of the war between Great Britain and the Transvaal what they may, it is idle to imagine that the well-nigh universal condemnation passed upon the former abroad was due to any genuine sympathy for the Boers or to any other sentiment than jealousy. The head and front of British offending lies in the fact of the extraordinary success and unparalleled prosperity of the British people, and the same is to a great extent true of the Continental jealousy towards the United States of America. It is difficult for Britons who have not lived in foreign lands to appreciate the irritation caused by the mere existence of their empire. That the small islands forming the United Kingdom should be the centre of a world-wide dominion, that the British flag should float in every quarter of the globe, that the English language should be spoken, as the master tongue, in so many parts of the world, that the trade of the universe should be mainly in British hands, and that the wealth of Great Britain should so greatly surpass that of other nations, seems to the non-British mind a violation of the laws of nature, an outrage upon the principles of eternal right. The explanation that this success and prosperity are due to certain superior qualities of the British race is one which foreigners can hardly be expected to accept. A more simple and a far more pleasing explanation is afforded by the theory that British greatness is due either to sheer accident, or to a mixture in the British character of extreme selfishness and almost sublime duplicity. The world, for the most part, is convinced that Great Britain's proud position is a bubble, needing only to be pricked to disappear into thin air. The unexpected reverses of her troops at the outset of the war with the Transvaal seemed to foretell the probability of her collapse, and on that account the Boers commanded general sympathy. Of course there were exceptions. A few countries, and a minority of thinking men in every country, declined to admit that the Boers must be right because they were opposed to Great Britain. But if the questions at issue between the British Government and the Boer Republics could have been submitted to an international Court of Arbitration, or to a plebiscite of all Continental countries, no matter what might have been the intrinsic strength of the British case, the passing of an award in favour of the Boers would probably have been a foregone conclusion. If our explanation of the causes which practically ranged the nations of the European mainland on the side of the Boers, as the enemies of the British Empire, be admitted, it follows that whenever Great Britain is placed in a position of difficulty, she may count upon the sympathies of the vast majority of her neighbours being enlisted on the side adverse to British interests.

Continental jealousy of England.

The recognition of this plain truth, unwelcome as it may be, has strengthened the growth of the Imperialist movement, which, in England at any rate, has been the most remarkable feature of the fourth quarter of the 19th century. There is no need to have reached an advanced age in order to remember the time when the formation of a Federated British Empire was regarded as an idle dream of Utopia. Till the days of the fourth Lord Carnarvon, no statesman had ever come forward as the champion of Imperial Federation; and even the Minister under whose auspices the Dominion of Canada became an accomplished fact was looked upon by his contemporaries as an amateur politician. The idea that the union of the scattered colonies of Great Britain beyond the seas could ever come within the domain of practical politics had hitherto met with no support from the leading statesmen of the Victorian era, whether Liberal or Conservative. Federation never formed part of the programme of either party—of the Liberals even less, if possible, than of the Conservatives. Why this should have been the case is obvious enough. In former days the first practical step towards the creation of an Imperial Federation was deemed to be the establishment of a Customs Union, under which all parts of the British dominions, wherever situated, or whatever might be the nationality of their inhabitants, should not only enjoy free trade with one another, but should be advantaged, as against foreign nations, by being subject to lower duties than those imposed on foreign traders. To take such a step, to however small an extent, was deemed an infraction of Free Trade principles; and up to a very recent period the theory that Free Trade was a system advantageous everywhere, at all times, and in all circumstances, was a cardinal tenet not only of the Manchester school, but of the whole Liberal party. Amongst the causes to which the progress of the Federation movement is due, the decline of popular faith in the universal application of Free Trade principles cannot fairly be overlooked. The chief cause, however, is beyond

Imperialism.

doubt the advance in the use of telegraphic communication. Any system of common government between the mother country and the British colonies, other than that of a vague dynastic union, was manifestly impossible so long as communication between the parent State and her offspring was a matter of weeks or months. Of course, notwithstanding all the improvements in railway and steamship communication, the mileage distance between the mother country and her colonies forms a grave difficulty in the way of any possible Federation; but this difficulty nowadays is insignificant compared with what it was in 1875. Thanks to submarine telegraphy, any event of public interest which occurs in Great Britain is known at once in every important colony. In the same way, the main incidents of colonial life are read and commented on at home almost simultaneously with their occurrence. The variations of public opinion in Great Britain and in all the self-governing colonies of Greater Britain are discussed simultaneously in every part of the British Empire. Joint administration conducted by telegraphy cannot, for various reasons, be ever as satisfactory as joint administration by oral methods and personal intercourse. Still, the former system of administration is conceivably possible, while the latter is at present manifestly impossible. What, however, is even more important than the increased facility of communication between all parts of the British Empire is the extent to which this facility of communication has tended to weld Great Britain and Greater Britain into one people, with common thoughts, common interests, and common ideas. All families which have relatives settled in the colonies must be aware that, though mutual affections might remain undiminished, the interest in each other's fortunes felt by the members of a family, residing some at home, some in the colonies, tended formerly to decrease with the lapse of years. But when the papers report every morning to every British town of importance in each quarter of the globe the news of what has passed on the preceding day, whether in the mother country or in her dominions beyond the four seas, the common interest in each other's doings and sayings, which binds together men of the same race and country, is far less liable than it was heretofore to diminish in strength. To a great extent the British race, whether at home or abroad, has, owing to the advance in telegraphy, become again one community, united by other ties besides those of a common language and a common ancestry. We have seen how this rapidity of communication works in practice by the experience of the South African War. It needs no saying that the war would not have excited the intense sympathy displayed by the Colonies if the defeats, victories, sufferings, and triumphs, not only of the British army, but of the Colonial contingents, had not been made known to them day by day in the order of their occurrence. We must not seem to undervalue the military assistance afforded by these contingents, if we regard as a yet more important result the way in which this assistance has tended to strengthen the influences which work for Imperial Federation. There are grave practical difficulties which attend the formation of any working scheme for carrying out the idea of the Federation of the British Empire. But it is a striking fact that, for the first time in British annals, this idea has commended itself to popular favour both at home and in the colonies.

It has always seemed to the present writer that the political economists who contend that self-interest is the factor which determines national policy are equally in the wrong with the school who contend that sentiment—using the word in no offensive sense—is the mainspring of human action. It would be more correct to say that the world is governed by a combination of self-interest and sentiment, the relative power of each factor being subject to certain variations, but always tending to revert after each variation to a status of equality. Hostile critics would urge that the sentiment which supports Federation cannot last, as it is based on no foundation of self-interest. In our view this assertion is erroneous. The British colonies have manifestly an interest in Federation, on the assumption that it is essential to colonial independence and is calculated to facilitate a Customs Union. The working-classes in the United Kingdom have at the first sight no interest in a Customs Union, which they have been led to believe would not only violate the principles of Free Trade, but would raise the price of the articles they mainly consume. Of late, however, there have been indications that this belief is no longer so widely or so enthusiastically entertained as it used to be by the electorate of the mother country. The British working-man would be far more blind to his own interest than he is commonly supposed to be if he had failed to note the fact, that under unrestricted competition a number of British industries

have been shrivelling away, if they have not become absolutely moribund, which under a protective policy have gained ground in every leading foreign country. Market after market has been closed to British trade by the imposition of prohibitive duties abroad; and though the rate of wages has kept up, the fear that any falling-off in British industry may possibly lead to a general lowering of wages has for some time haunted the minds of labourers, mill-hands, artisans, and miners. This fear has afforded an opening of which the partisans of Imperialism have not been slow to avail themselves. They advocated the necessity of providing fresh markets for British industry, by fostering colonial development, by "pegging-out" new claims, by subsidizing enterprises calculated to bring the colonies into closer communication with the mother country, and by adopting the policy of Federation, of which Mr Chamberlain has been the most prominent advocate. If once the British working-classes get it into their heads, with or without reason, that a British Zollverein—the probable result of Imperial Federation—would conduce to the augmentation of their wages, or at any rate to the maintenance of the present rates of payment for labour, they would be led by self-interest to espouse the cause of Federation. The influence of self-interest would be augmented by the force of sentiment—of patriotism, Jingoism, or whatever one may choose to call it,—which is certainly not less powerful in the lower classes of British society than in the upper. It is significant that the most important legislative act of the last year of the 19th century should have been the passing of the Act authorizing the Australian Colonies to form themselves into an Australasian Commonwealth. Whatever may have been the case in Australia, this measure was deemed in the old country to owe its chief importance to the fact that it was regarded as an initial step towards the ultimate formation of an Imperial Federation embracing all parts of the British Empire.

The note of Imperialism was first heard in British politics at the commencement of the period with which we are dealing. It was in the last days of 1875 that Disraeli purchased for Great Britain the Khedive Ismail Pasha's interest in the Suez Canal, and thereby committed her to an intervention in the affairs of Egypt, which gradually eventuated, as all intervention is apt to eventuate, in the establishment of a virtual protectorate over the country in whose affairs the intervention was employed. A year later Queen Victoria, by Disraeli's advice, added to her titles that of Empress of India. In pursuance of the policy indicated by this change of appellation, the then Premier brought Indian troops to Europe in order to garrison Malta during the period when a war between Great Britain and Russia seemed to be on the cards in consequence of the invasion of Bulgaria by the armies of the Tsar. A further step towards the development of British Imperialism was taken in the attitude which Lord Beaconsfield adopted at the Berlin Conference, and by the convention he formed with Turkey, in virtue of which Great Britain obtained practical possession of Cyprus, and pledged herself to defend Asia Minor in the event of this portion of the Ottoman dominions being invaded by Russia. There can be no doubt that the acquisition of Cyprus was intended by its author to enable Great Britain to make Cyprus a *place d'armes*, and thereby to forestall any possible despatch of French troops to Egypt, and to protect the port of Alexandretta, which was to have been the terminus of the projected Euphrates Valley Railway to the Persian Gulf. Lord Beaconsfield's Imperialist policy laboured under two fatal defects; first, that owing to advancing years he was not prepared to carry it through, in the face of the active antagonism of his opponents and the lukewarm sympathy of his supporters; and, secondly, that the ideas which lay at the bottom of his policy had not yet appealed to public opinion at home. Indeed, popular sentiment, excited by the Bulgarian atrocities, had turned against any alliance with Turkey; and the result of Mr Gladstone's Midlothian campaign was the decisive defeat of the Conservatives at the General Election of 1880, and the return to power of the Liberal party under Mr Gladstone. For a time Imperialism was at a discount; indeed, it may fairly be said that to the end of his career the ideas which underlie Imperialism were distasteful to the great Liberal leader. But the force of events soon compelled a Liberal Government to resume the system of active intervention in foreign affairs, against which they had protested so warmly in the days of their predecessors. Two years after his accession to office Mr Gladstone had to send troops to Egypt in order to suppress the Arabi insurrection, to occupy Cairo, to abolish the Franco-British dual control, and to undertake the provisional administration of the country. We entertain no doubt as to the perfect good faith with which Mr Gladstone protested that the British

occupation of Egypt was not intended to be, and would not be, of a permanent character. It was not his fault if the logic of facts proved stronger than he had anticipated, and if the provisional domination of Great Britain in Egypt assumed, year after year, a character of greater permanence. The insurrection in the Sudan, the victories of the Mahdi over the Egyptian forces, the evacuation of the Sudan, to which Egypt was compelled to accede at the command of the British Government, the despatch of General Gordon to the Sudan to arrange for the withdrawal of the Egyptian garrison, and the subsequent investment of Khartum, compelled the British Government, sorely against their will, to send a British army to the Sudan in order, if possible, to effect the release of their envoy. Popular sentiment forced the hands of the Ministry, and resented the withdrawal of the Wolseley expedition, then almost within sight of Khartum, on learning that Gordon had already succumbed to fate. The force of this sentiment made itself manifest at the elections of 1885. Of all the baseless calumnies which have been brought against Great Britain abroad, the most baseless is the charge that her action in Egypt was dictated by a deliberate desire and purpose to establish British supremacy in the valley of the Nile. Having been conversant with Egyptian affairs for many years, and having been personally, and in many cases intimately, acquainted with the leading personages, native as well as foreign, in Egyptian public life from the date of the opening of the Suez Canal, the present writer can declare with confidence that until a very recent period British policy in Egypt was based on a genuine and honest, though, as he holds, a mistaken desire to quit Egypt and to get rid as soon as possible of the liabilities inseparable from military occupation. This desire was not a matter of party feeling. It was shared alike by Liberals and Conservatives; and if the British are still in Egypt, this is only in obedience to that manifest destiny which shapes the history of nations, and which in the case of Great Britain compels her to pursue her Imperial mission. In a similar way the Jameson Raid, which was undertaken without the knowledge, and most assuredly against the wishes, of either the Government or the people of Great Britain, placed that country in a position which forced her most reluctantly to go to war in order to protect her Imperial interests. Everybody who has studied the history of Great Britain is aware that wars of conquest have been of very rare occurrence in her annals. The story of almost all her acquisitions of territory has been substantially the same. The instincts of their race have led British subjects to settle in far-away lands, from desire of trade or adventure. The settlers have acquired interests in the countries where they have taken up their abodes, and these interests have been assailed either by the natives or by foreigners. Great Britain, as a trading nation, has had no choice except to protect the interests of her traders abroad. Wars have ensued; territories have been annexed for the protection of trade; and, finally, the mother country has had to step in and place the territories in question under her rule and sway. In other words, the British Empire has been welded together, not in virtue of any distinct policy, but in obedience to the exigencies of its position as the chief trading nation of the world. It has grown unconsciously, not been created consciously. If this fact gives greater promise of permanence, it also renders the limitation of the British Empire a matter of extreme difficulty. The founders of empires created by conquest can in most cases say, "Thus far and no farther." But so long as the causes which have brought the British Empire into existence continue in full force of action, Great Britain has not the power, if she has the will, of altering her policy. We have dwelt at length on the development of British Imperialism because we regard it as the most important incident of recent years not only in regard to Great Britain, but in regard to the world at large; but the same note of Imperialism has influenced the policy of all the leading civilized nations of the world throughout the period under review.

Legislation.

The Latin proverb *Inter arma silent leges* applies with especial force, though not perhaps in its literal sense, to this period of militant Imperialism. There has been a lull in the department of constitutional legislation. In Great Britain the only measure of grave constitutional importance was the passing in 1885 of the Bill establishing Household and Lodger Suffrage in the counties. The measure in question was the logical corollary of the "leap in the dark" taken under Lord Derby's premiership in 1868, by which a system approximating very closely to adult manhood suffrage was established in the boroughs. The Liberals, by all the traditions of British party warfare, were bound, in

sporting phrase, "to go one better" than the Conservatives; and the responsibility for the reforms under which, for the first time in British history, supreme electoral power was entrusted to the hands of the most numerous, the poorest, and the least educated classes of the community, rests, for evil or for good, on the shoulders of both parties alike. So far the new agricultural franchise has told in favour of the Conservative party. In 1886, in 1895, and again in 1900, the constituencies returned large Conservative majorities. As long as the attention of the country is occupied with foreign or Imperial questions, or with issues not bearing, except indirectly, on labour and its relations to capital, the voice of the working-class electorate is likely, in normal circumstances, to be in favour of the Conservative party. Equal confidence is not possible as to what may be the result when foreign or Imperial questions may be in abeyance, and when party questions are raised on one side or the other involving the acceptance or rejection of legislation calculated, in the opinion of the working-class electorate, to affect the real or supposed interests of Labour as opposed to Capital.

The British Parliament, for the last quarter of the 19th century, has been mainly occupied with the irrepressible Irish question. In its vicissitudes were included the commencement of the Fenian outrages, the Prevention of Crimes Act, the Irish Land League, the assassination of Lord Frederick Cavendish in the Phœnix Park, the formation of a united Irish parliamentary party under Mr Parnell, the attempt to obstruct all legislation at Westminster by an abuse of the rules of the House, the enactment of the closure, the coalition between the Liberals and the Irish Nationalists, the introduction by Mr Gladstone of a Bill for the Repeal of the Union, its rejection owing to the secession of the Liberal Unionists, the Pigott trial, the downfall of Mr Parnell, the disruption of the National party, and the rejection of Mr Gladstone's second Home Rule Bill by the House of Lords, followed by his final retirement from public life. Great as was the interest caused by these events at the time of their occurrence, it may be doubted whether they modified materially the relations between Great Britain and Ireland. Their chief result was to show that the proposal to confer legislative independence upon Ireland excited little sympathy, and still less enthusiasm, among the British working class, and tended, in so far as they had any effect at all, to range them on the side of the Unionist party. The statement made by Lord Rosebery on his accession to the Premiership in 1894, to the effect that Home Rule could never be carried till the measure had commended itself to the opinion of the "predominant partner" in the Union, though it was afterwards explained away by its author, was approved by the good sense of the British public, and there seems as yet no prospect of any change of popular sentiment in England or Scotland with reference to the inexpediency of any repeal of the Union, under which the United Kingdom has grown in strength and prosperity. In other respects the political machinery of the United Kingdom underwent but slight change during the last quarter of the 19th century. But the reaction against "democratic" Liberalism has been conspicuously shown by the popular acquiescence in the apparent decline of the power of the House of Commons as such, and the concomitant increase in the power of the Cabinet. Very much the same significance must be attached to the fact that, in spite of the extension of the suffrage, and the multiplication of elections for local government, the main feature of the elections has always been the prevailing apathy of those entrusted with the privilege, or duty, of voting, and the comparatively small proportion of the electorate which is sufficiently interested to go to the poll.

In France, where constitutional changes are matters of far more common occurrence, the position remains much the same as it was on the downfall of the Second Empire after the surrender of Sedan. The Third Republic has remained in power for a longer period than any *régime* which held sway in France during the 19th century. The great majority of the present generation of Frenchmen have been brought up under Republican institutions, and it is only a comparatively small and rapidly diminishing minority which can have any personal recollection of either Empire or Monarchy. Moreover, the deaths of the Comte de Chambord, the Comte de Paris, and the Prince Imperial removed the only representatives of the deposed dynasties who appeared likely to have any hold on French popular sympathies. In these circumstances, it would seem antecedently probable that the Republic should have taken firm foot in French soil. So far, however, this anticipation has not been realized. The French Republic, as it has existed since 1870, is a parliamentary government; and this form of

European developments.

government, though in accordance with the political ideas and aspirations of Anglo-Saxon races, is, as the present writer ventures to think, incompatible with the opinions and ambitions of nations of Latin race. Be this as it may, the Third Republic has excited little or no enthusiasm in France. It is tolerated in default of any more congenial form of government, but it does not command the confidence or respect of its citizens. The absence of any statesmen of high eminence since the decease of Thiers and Gambetta, the Panama scandals, the hostility between the Church and the civil power, the Anti-Semitic agitation, the dread of Communism by the *bourgeoisie*, and the animosity against the employers of labour, which prevails so widely amongst the operatives and artisans, may all be cited as causes why the parliamentary rule of the Republic has not commanded popularity. That the Republic is still on its trial is patent from the fact that its safety was seriously imperilled by the appearance on the stage of politics of such a feeble antagonist as General Boulanger. It is commonly acknowledged in France that any general who might lead a French army to victory in a European war would be master of the situation in France. It is on this account that the civilian Ministers of the Republic, no matter to what party they belonged, have been unanimous in deprecating any external war. It is on this account, too, that of late the French Ministry have made various overtures to the Socialist party, and have even admitted into their ranks colleagues who are associated with the traditions of the Commune. Moreover, the Franco-Russian alliance, however little practical benefit it has as yet conferred upon France, has undoubtedly gratified French national pride, while the fear of shipwrecking the fortunes of the Exhibition of 1900 paralysed all revolutionary agitation for the last two years of the century. Nevertheless, the position of the French Republic remains, as in 1875, one of unstable equilibrium.

In Germany, politically speaking, things have undergone but little external change. The first emperor of a united Fatherland was succeeded, after the brief reign of his son, Frederick III., by his grandson William II. Prince Bismarck was dismissed and died; but the constitution of the empire remains substantially unaltered, and may perhaps best be described as a parliamentary government under which the Sovereign is his own Prime Minister, and is still the supreme authority in the State, not only in name but in fact. How far this state of things is likely to be permanent is an open question. As things are, the high character and ability of the Kaiser, the prestige of the Hohenzollern dynasty, the traditions of German history, the power of the military element, and the popular distrust of France, confer upon the head of the State an influence far beyond that possessed by the Parliament; and so long as this influence is exerted firmly and wisely, as it has been in the main under the reigning emperor, it is not likely to be materially diminished. At present the German Parliament exercises a sort of general control, of which even an autocrat has got to take account; and there are not wanting indications that parliamentary government in Germany may be more of a reality in the near future than it has been in the past. But so long as Germany, in the opinion of the German people, is threatened by the possibility of a hostile coalition between France on the west and Russia on the east, the conflict between the supremacy of the Parliament and the Crown is not likely to assume an active character. The great material progress made by Germany under the Empire has turned the thoughts of her citizens rather to industrial enterprise than to political reform. The trade interests of Germany, combined with her national pride, have led her to support a policy of colonial extension and, as a necessary corollary, the formation of a powerful navy; while the disputes between the Agrarian and the Free Trade parties on the one hand, and between the ecclesiastical and civil authorities on the other, have excited little beyond local and sectarian interest.

In Austria the Triple Alliance has secured many years of peace, and has afforded an opportunity for the consolidation of her heterogeneous provinces. The opportunity, however, has not been improved, as there seemed reason to expect, by the extension of parliamentary institutions. Ever since the premature collapse of Count Rechberg's scheme for the creation of a national Parliament, in which every province under the rule of the House of Hapsburg was to be represented on equal terms, and whose authority was to be supreme throughout the empire, the process of internal disruption has made rapid progress. This process commenced when Hungary, on the recovery of her independence after Sadowa, declined to entertain any proposal for fusion with the other provinces of the empire, and insisted on the possession of a separate legislation, a separate Ministry, and a separate Executive. The example thus set was soon followed by the

various nationalities of the Empire of other than Teutonic race. The Czechs, the Croats, and the Italian population of the Adriatic littoral have all set up claims to legislative independence. The Germans of Austria proper, who form the backbone of the empire, have resented these claims as an infraction of their supremacy. If Hungary had been represented in a common Parliament at Vienna, the Hungarians and Germans could have formed a majority strong enough to overrule the representatives of the Slav and Latin nationalities. As it is, no Austrian Ministry since 1880 has succeeded in commanding the support of the Parliament except by concessions to one race or another, which tided over a temporary difficulty, but left the problem of Austrian reorganization more complicated than it was before. The system of wanton obstruction adopted alike by Czechs and Germans, the coalitions between the Anti-Semite Liberals and the Clerical Conservatives, the virulence of the personal attacks made indiscriminately by every party in the Reichsrath, the constant fluctuations in ministerial policy, and the rapid succession of one Ministry after another—have all combined to discredit the system of parliamentary institutions in Austria, until the very existence of constitutional government in the Austrian half of the dual Monarchy is at stake. The personal esteem and affection entertained towards the Emperor Francis Joseph by all his subjects have given him an authority which no successor is likely to inherit, but no observer is able to contemplate without apprehension what may happen when his guiding hand is taken away.

In Italy, though from different causes, parliamentary government can hardly be said to have proved a success. The generation of statesmen of eminence possessed by Italy during the period of her unification has passed away and left but few successors. Owing to the influence of the Vatican, the wealthy classes have, as a body, abstained from public life; and political power has fallen, in consequence, to the lower class of professional men, who look to a seat in the Chambers as a means of livelihood. The amalgamation, however, of the various provinces of the peninsula into one united kingdom has proved a less difficult task than was anticipated at the outset. The composition of the Italian Chambers has without doubt contributed largely to the mal-administration of public affairs, which within the last few years brought Italy to the verge of bankruptcy. But it may be doubted whether a differently constituted Parliament could have enabled Italy to bring her expenditure within her income. The Triple Alliance was joined by Italy in order to procure protection against intervention in Italian affairs on the part of the French Republic, an intervention which in 1887 was regarded as imminent, and which is still looked upon by Italians as likely to occur whenever France has a free hand. Adhesion to the Kaiser-Bund necessarily involved the keeping on foot of a standing army large enough to render the military assistance of Italy useful to Germany and Austria in case of need; and the maintenance of such an army could only be met either by extravagant borrowing or by exorbitant taxation. The tendency to reckless expenditure was increased by the demand for railways and other public works, deemed necessary for the development of the great resources of the kingdom, and also by the natural desire of the Italians to assert their position as a great Power, a desire which gave rise to the disastrous war with Abyssinia. When the borrowing powers of the country were exhausted, the deficit caused by the service of the public debt and the extravagant cost of the administration had to be provided for by an increase of taxation, which told heavily on a population already overburdened in comparison with its resources. The result has been to strengthen the Republican party in the Peninsula, a party which, being closely connected with the French Socialists, entertains the belief that under a Republic Italy would have no cause to fear any interference with her independence on the part of France. The Church in Italy has done all in her power to throw discredit upon the system of representative government, which in her opinion presents an insuperable obstacle to any restoration of the temporal power of the Papacy. The net outcome of this state of things is that though the Italians are as determined as ever to uphold their national unity, they are not as convinced as their forefathers were that this unity can only be secured by parliamentary rule. With a young and inexperienced sovereign upon the throne the general outlook for Italy was not, at the opening of the new century, as encouraging as her friends could desire.

In Russia the autocratic system of government remains unaltered. The agitation on behalf of parliamentary institutions has made little apparent progress. The parliamentary idea has never as yet taken hold on the *Moujiks*, who, in so far as they give any attention to politics, seem to prefer the

autocratic rule of the Tsars to any other form of government; while the middle classes, who at one time favoured the constitutional agitation, have been alienated by the excesses of the Nihilists. Meanwhile, whether under Alexander II., Alexander III., or Nicholas II., the policy of the Russian Government has been directed almost exclusively to the consolidation and extension of the Empire. The first object has been advanced by the incorporation of the Baltic provinces; by the suppression of the independence guaranteed to Finland on her annexation just a century ago; by the wholesale persecution of the Russian Jews, due not so much to religious prejudices, as to a conviction that any separate racial nationalism impairs the homogeneity which Russia thinks is expedient should prevail throughout the length and breadth of the Tsar's dominions; and by the gradual destruction of every element in Poland which stands in the way of her permanent Russification. The second object has been pursued by the wars waged on behalf of Servia and Bulgaria,—which, whatever else they have achieved or failed to achieve, have resulted in largely increasing Russian authority throughout the Balkan Peninsula,—by the campaign against the independent Khanates in Eastern Asia, and by the construction of railroads which have practically made Russia the ruler of all the vast Northern area extending from the Baltic to the Pacific. A policy of this kind is only possible under an absolute autocracy. The experience of history teaches us that in empires, as in oceans, the tide must turn sooner or later, but during the period of which we write the tide of Muscovite aggrandizement has been flowing steadily in the same direction, and as yet there seems no sign of its receding.

In the United States of America a tendency towards what, for lack of a better word, we have called, in Europe, Conservative reaction has influenced the legislation of the years between 1875 and 1902.

United States.

It was in the first named of the above years that the popular outcry against Chinese immigration into the Western States assumed an active form. The resolution to prohibit the entry of Chinese labourers into the Union, which was formally embodied in a Bill passed by Congress in 1888 under Mr Cleveland's presidency, may have been justified by local considerations. But it was a distinct violation of the fundamental principle, that the territory of the Great Republic was open "to the meanest of Adam's kin." In like manner, popular jealousy of foreign competition may have had no small share in securing the enactment, two years later, of the highly protective duties on foreign imports recommended by Mr McKinley. From the earliest days of the Republic it had always been accepted as an axiom of State policy, that the United States were not to intervene in any way in affairs lying outside the American continent, and as a necessary corollary of this axiom, it was also held that the possession of colonies or foreign dependencies that would not ultimately become states in the Union was prohibited by the spirit, if not by the letter, of the Constitution. In foreign affairs up to a recent period non-intervention was the dominant principle of the administration, no matter which party might be in power. But during the last few years this principle has been openly disregarded. Whatever view may be taken of the war with Spain, there is no disputing the fact that its outcome, as seen in the acquisition of foreign territory, especially in another hemisphere, was inconsistent with the theory of the Constitution held by the founders of the Republic. A series of decisions of the United States Supreme Court in 1901, delivered in cases that had originated in the collection of customs by the revenue officers upon imports from the Philippines, Porto Rico, and Hawaii, gave legal form and substance to the colonial idea. These decisions, which (it should in fairness be stated) were made by a bare majority of the Court, held that the new possessions were not within the clause of the Constitution which provides that "all duties, imports, and excises shall be uniform throughout the United States," the Court holding that, as here, "territory belonging to the United States" is not necessarily a part of the United States, and entitled to the same rights and privileges as the territory of the individual States composing the Union. In other words, a place is definitely made for colonies under the Constitution where many had thought no such place existed, and their government and treatment are thus entrusted solely to the legislation of Congress, under the clause of the Constitution which provides that "the Congress shall have power to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States." Thus public sentiment and judicial interpretation alike have accepted the new state of affairs which has made America a colonial power.

Japan.

The political transformation of Japan is of too recent a date for any trustworthy judgment to be formed as to its character, and still less as to its permanency. At the outset the revolution replaced the titular sovereign upon the throne, and was followed by the destruction of the feudal system under which the Tycoons had for nearly eight centuries governed Japan as a sort of Eastern "Mayors of the Palace." The restoration, therefore, of the spiritual emperor seemed calculated to bring about the revival of the old autocratic system of rule. As a matter of fact the revolution has turned out to be only the prelude to the creation of a Constitutional Monarchy, formed after the fashion of the Western world. Within the course of the years which have elapsed since the deposition of the Tycoon, Japan has been converted into a civilized, progressive, self-governing commonwealth of the European type. During this period post-offices, railways, telegraphs, ironclads, weapons of precision, things hitherto unknown, have been introduced into the Japanese Empire. Primary schools, compulsory education, the use of the European alphabet and of Roman characters, freedom of the press, religious toleration, vote by ballot, party government, and well-nigh all the mechanism of European administration have been adopted by the subjects of the Mikado, who is still supposed to rule in virtue of his spiritual supremacy. The original Assembly, nominated in 1875 by the Mikado, has now been changed into a popular Parliament freely elected by the people. It is difficult to avoid a doubt how far the Japanese have imbibed the spirit, as well as adopted the forms, of constitutional government. Still, it must be said that in the course of a period so brief as scarcely to count in the history of a nation, they have not only made immense material progress, but have developed a spirit of individual nationality which augurs well for their future. Japanese youths have been sent to all parts of the civilized world, to study the languages, the armies, and the industries of every important nation. Foreign instructors have been brought into Japan; but their services have as a rule been dispensed with as soon as their pupils had acquired sufficient knowledge to impart it as teachers to their fellow-countrymen. The motto of Japan might well be that of Italy in the Garibaldian era, *fará da se*. The progress of Japan has already induced the European Powers to forgo the right, guaranteed by the capitulation treaties, of having their subjects placed under consular jurisdiction. Finally, Japan's recent participation in the expedition of the Allied Powers for the rescue of the Ministers besieged in Pekin has raised the island empire of the East to the level of a Power of which account has to be taken in all international questions; and this position was finally confirmed by the alliance between Japan and Great Britain at the opening of 1902.

The labouring classes.

It is sometimes said that all these questions of what—for lack of any exactly equivalent English term—may be best called *la haute politique*, do not interest the labouring classes, who under the general democratic tendencies of our time are gradually acquiring more and more political influence, and who in England, the United States, and the British self-governing colonies are practically supreme whenever they choose to exert their power. But this, though true in regard to a bygone time, is at the best only a half-truth nowadays. The spread of education, the wider, even if superficial, acquaintance with foreign affairs created by the cheap press, the abolition of caste privileges, and the tone of modern thought, have all tended to render the civilized and self-governing nations of the world more homogeneous than they were wont to be. The sentiment of national pride is far more widely diffused, if not absolutely keener, nowadays than it was in bygone times. In consequence, popular opinion, whether intelligent or otherwise, plays a far larger part in public affairs than it did formerly. The result of this changed state of things must be to render the ideas which underlie Imperialism more intelligible and acceptable to the classes who live by manual labour than they were when the 19th century came into existence. Moreover, these classes are beginning to realize that their personal interests as wage-earners may be indirectly affected by questions of foreign or Imperial policy. Still, it may be fully admitted that, as a rule, questions which directly affect the sons of toil are those most calculated to enlist their sympathies. The so-called governing classes have already begun to take this fact into account, and to modify their tactics accordingly. During the discussions on parliamentary reform Lord Palmerston is reported to have replied to a friend, who remarked that in the reformed Parliament Ministers and members were much of the same class as they had been in the

pre-Reform era: "Yes, the actors will be the same: the only difference will be, that they will play to the gallery instead of to the stalls." Careful students of politics will probably agree that the legislation of the last twenty-five years has been largely influenced by what may fairly be described as "playing to the gallery." This tendency has been most marked in Great Britain, owing to the simple fact that the working-man's vote is, electorally speaking, more powerful there than it is elsewhere. The remedial legislation of Mr Gladstone with regard to Ireland, whether sound or unsound, was a distinct violation of the rights of property and of freedom of contract. The system of County Councils, by which local authority was transferred from the hands of the landed gentry to Boards elected in the main by artisans and labourers; the appointment of a Government Commission authorized to determine the rent payable on any Irish estate by an arbitrary process, instead of by open competition; the substitution of State administration in domains hitherto left open to private enterprise; the preference shown in all fiscal arrangements for direct, as opposed to indirect, taxation; the interference with the liquor trade; the agitation against ground rents and in favour of the principle of betterment; the obligation placed upon railway companies to provide working-men's trains at arbitrarily fixed rates; the measures adopted to provide improved dwellings for the working classes at rentals lower than could be obtained by leaving the construction of such dwellings to be regulated by the laws of supply and demand; the attempt to suppress usury by regulating the rate of interest the lender might be entitled to charge and the borrower might be bound to pay—may be cited as a few of the measures which would never have been adopted if the working-class vote had not become of paramount importance. We express no opinion as to the wisdom or unwisdom, the justice or injustice, of these measures. Both parties, Liberals and Conservatives alike, are responsible for the principle that legislation must henceforward be in favour of the masses rather than of the classes. It is only fair to acknowledge that, so far, the working classes have exercised their power with moderation. On the other hand, strikes have increased in number and in effectiveness. These disputes, almost without exception, have been initiated by the workmen, either to demand an increase of wages or to protest against a proposed diminution of wages. If the aggregate loss occasioned by these interruptions of labour could be ascertained, it would be found to exceed by far any gains that individual trades may have derived from successful strikes. A demonstration, however, that the blank tickets in a lottery far exceed in value the winning prizes has never stopped the public from investing in lotteries; and the fact that in the long run strikes are a losing business for the workmen will never deter Trades Unions from resorting to industrial warfare. The modifications of the Anti-Combination laws have facilitated the promotion of Trades Unions, and the material condition of the working classes has beyond doubt improved in all trades which have been able to form powerful labour organizations. It may be questioned whether wages would not have risen without Trades Unions, or whether the purchasing value of wages to-day corresponds with their nominal rise. Still, the broad fact remains that under Trades Unions British workmen earn a larger wage than they did in an older and freer era; and the probability seems to be that these trade organizations will in coming years become even more truly representative of the body of working men than they are at present. The doctrine of a "living wage," which has gained much ground during the period under consideration, is manifestly unsound in the form it has taken, as it is obvious that no business can be carried on permanently at a loss occasioned by an excessive cost of labour, while it is by no means equally obvious that labour would not be forthcoming for a lower remuneration than that actually demanded on the score of the real or supposed necessities of the labourers. The idea so prevalent in the days of the Christian Socialist school, that all labour difficulties could be solved by a system of co-operation, has been dispelled by the discovery that co-operation, as between capital and labour, means, when tested by experience, that the latter has the right to share in the profits when trade is good, but is unable to contribute towards the losses when trade is bad. The craze for compulsory arbitration in all labour disputes is equally fallacious, owing to the circumstance that no court of arbitration, however constituted, can compel capitalists to carry on mills, mines, or factories at a price they do not deem remunerative, or can coerce workmen into working for a wage they hold to be insufficient for their needs. In the future, as in the past, all trade disputes must be ultimately settled on the "pull devil, pull baker" principle, by strikes on the part of the men

and lock-outs on the part of the masters. We may reasonably hope that the folly of unnecessary conflicts between labour and capital will commend itself more strongly to all classes of the community, but the *ultima ratio* in industrial, as in all other disputes, must consist in an appeal to the relative strength of the two contending parties. Apart from the agitation for an eight hours' day of labour, there is no evidence of any decided Socialist tendency on the part of the working classes in Great Britain. This may be attributed to certain very obvious causes. The first is, that under British laws and ideas the artisan enjoys an amount of independence and freedom without a parallel in other European countries, and in many respects in excess of that possessed by his class in the great Republic of the West. The second is, the extraordinary strength of the social organization in England, which almost precludes any revolutionary action on the part of the labouring classes, except at periods of intense popular excitement. The third and the most potent is, the strong desire of the individual in English society, no matter what his position in life may be, to rise into a class superior to his own. The attainment of this desire is facilitated by the fact that any man of intelligence and energy can force his way from a humble origin to a comparatively exalted position. In consequence, the very men who otherwise, by virtue of their strength of will and character, would become class leaders, end as champions of the established social order. No other explanation accounts for the almost complete absence in recent times of any English leader of the proletariat who has risen to high note even amongst his own class. A similar remark applies, though with less force, to the working classes in all other communities of English race and origin.

On the other hand, the growth of the Socialist party in almost all continental countries cannot but be regarded as a marked feature in the period to which the foregoing remarks have reference. In Germany, in spite of—possibly in consequence of—repeated legislative attempts to suppress Socialism by force, the idea of founding a new social system on the negation of the right of the individual to hold private property has made rapid progress. The Socialists have now become a powerful party in the Reichsrath, and at each election have been returned in increasing numbers by Berlin and the other large industrial centres of Germany. In Austria the Socialist-Anti-Semite coalition has reduced parliamentary government to a nullity. In France the Socialists have compelled the Government to carry out legislation based on communist ideas, especially with regard to labour disputes between employers and workmen. In Italy the Socialist movement has assumed proportions which seem to threaten the permanence of a monarchical form of Government, while in Russia they appear to have become the mainspring of all the Anti-Autocratic movements. In fact Anarchism and Nihilism owe their origin to Russia, and date their active existence from little more than a quarter of a century ago, when the Nihilist creed was propounded by Bakounine. Nihilism, in so far as any distinct opinion as to so nebulous a creed can be formed, is a repetition of Hamlet's saying, "The time is out of joint," supplemented by the corollary that the only way "to set it right" is to destroy all existing institutions—social, legal, or political. Logic would lead the holders of this creed to the conclusion that if the Creation has proved a hopeless failure, mankind would do wisely to terminate by universal self-immolation an experiment which has failed. Human nature, however, even amidst Nihilists, is never rigidly logical, and the adherents of this faith of despair are still sufficiently human to cherish the idea that if they could only get rid of the present social organizations they could call into being a new earth, if not a new heaven. The way by which this transformation is to be effected is by a series of outrages so appalling as to shake society to its very centre. The present writer's own observation of Russia, before even the name of Nihilism had become familiar to Western ears, led him to the conclusion that the colossal Empire of the North was an ideal soil for the growth of all insane revolutionary passions. In no part of the world is the contrast between the gorgeous luxury of the rich and the sordid, squalid misery of the poor so flagrant. Nowhere else are the material conditions of existence so hard for the masses; nowhere is the line of cleavage between wealth and poverty cut so sharply. In Russia there may be said, in comparison with the size of the population, to be no middle educated class; and in as far as such a class exists at all, it consists mainly of Germans and Jews. If this view is correct, it is not difficult to understand why the crudest theories and the most extravagant of beliefs should find a following in the dominions of the Tsar. No wish to extenuate in any way

Socialism and Anarchism.

a series of crimes which during the latter years of the 19th century have shocked humanity is conveyed by the admission that in Russia the outrages of Anarchism may to some extent be accompanied by not ignoble aspirations, and palliated in a degree by the wretchedness of their perpetrators. If Anarchism were confined to Russia there might be ground to hope that this form of mania might disappear as rapidly as it has arisen. Unfortunately the disease has spread all over the mainland of Europe, and has not only reached British shores in the form of the Fenian outrages, but has crossed the Atlantic and found a domicile under the Stars and Stripes. The explanation of this state of things possibly is that the conditions under which Anarchism sprang up in Russia exist, though in a far smaller degree, in all civilized communities. The inequalities of human existence, the contrast between wealth and poverty, the conflict between capital and labour, cannot fail to create a morbid state of mind amidst individual members of the classes which have not drawn prizes in life's lottery. Discontent with the established order of things is pardonable enough. But when discontent develops into outrages on innocent individuals, whose sole offence is that they hold higher stations or are wealthier than their fellows, discontent becomes a crime, and must be crushed in the interests of civilization. Anarchism has driven the great mass of the middle class in all civilized countries to look with suspicion on all popular agitations, and this change of sentiment has been one of the main causes of the Conservative reaction which we consider to have been the distinguishing feature of recent history.

Vanished illusions.

To those who are old enough to remember the earlier days of the Victorian era, it is not altogether pleasant to note how many of the ideas and sympathies which held sway at that period have disappeared from want of sustenance, just as plants die for lack of water. It may be worth while to recall a few of these dispelled illusions. Where is now the cult of foreign patriots? If any successor to the mantles of Kossuth, Garibaldi, Schamyl, Ledru Rollin, or Mazzini were to appear in England, he would be received with absolute indifference, or handed over to the police. If Dr Bernard were placed upon his trial nowadays, not all the successors of the late Mr Edwin James at the bar could secure his acquittal by the verdict of a London jury. Where is the amiable belief that self-government under parliamentary institutions was a sort of universal panacea applicable to all countries at all times? Some words used by the late Prince Consort during the Crimean campaign, to the effect that representative government was on its trial, raised a tremendous outcry at the time of their utterance. If His Royal Highness had stated that the Ten Commandments were open to criticism, he could hardly have been exposed to greater animadversion. But the parliamentary system no longer excites the admiration it formerly obtained, and even Englishmen as a body have drifted back towards the belief of their forefathers, that the system works well in England, but not equally well elsewhere. Again, why are we reminded no longer that "the schoolmaster is abroad"? Since 1870 England has had as good a system of universal compulsory elementary education as British statesmanship could devise, but the most ardent educationalist would probably not deny that the results of the Board Schools have not fulfilled the expectations entertained at their inauguration. The public at large have ceased to accept the doctrine that mental instruction is the one thing needful to raise the moral, intellectual, and material status of the masses. No doubt popular enthusiasm on behalf of popular education has been impaired by the expense of the School Boards and by the extent to which the "Educational Parliaments"—to use the phrase of a bygone day—have disregarded the limitations placed upon their functions as the purveyors of elementary education. Still, the cost of the Board School system would have been overlooked if the public had not learnt to distrust the theory on which the system was founded. The education acquired in virtue of the Act of 1870, whatever its other defects or shortcomings, has no doubt made the British people much more of a newspaper-reading community than they were previously, and has thereby rendered them better citizens and more ardent patriots. But a conviction that this is so does not suffice to restore the enthusiasm with which popular education was regarded at the time of its introduction into England on the eve of the Franco-German war.

ENCYCLOPÆDIA BRITANNICA

NEW VOLUMES.

AUSTRIA-HUNGARY.

GEOGRAPHY AND STATISTICS.—1. *The Whole Monarchy.*

THE Austro-Hungarian monarchy consists of two states: the "kingdoms and lands represented in the council of the empire (Reichsrath)," unofficially also called Austria (Austria proper); and the "lands of St Stephen's Crown," unofficially called Hungary. Austria proper is composed of seventeen "lands," called also "Crown lands." Of these, three—namely, Bohemia, Galicia and Lodomeria, and Dalmatia—are kingdoms; two—Lower and Upper Austria—archduchies; six—Salzburg, Styria, Carinthia, Carniola, Silesia, and Bukovina—duchies; two—Görz-Gradiska and Tirol—counties raised to principalities (*gefürstete grafschaften*); two—Moravia and Istria—margraviates (march counties). Vorarlberg bears the title simply of "land." Trieste, with its district, is a town treated as a special Crown land. For administrative purposes Trieste, with Görz-Gradiska and Istria, constituting the Austro-Illyrian coast land, and Tirol and Vorarlberg, are each comprehended as one administrative territory. The remaining lands constitute each an administrative territory by itself. The "lands of St Stephen's Crown" are composed of—(1) the kingdom of Hungary, with which are incorporated the former grand-principality of Transylvania (Siebenbürgen), and a part of the military frontier; (2) the kingdom of Croatia-Slavonia, to which belongs the former Croato-Slavonian military frontier; and (3) the town and district of Fiume. By the Berlin Treaty of 1878 the principalities of Bosnia and Herzegovina, owning Turkey as suzerain, are placed under the administration of Austria-Hungary; while Austrian garrisons are stationed at three points in the Turkish sanjak of Novi-Bazar.

Administrative Territories.	Areas in English Miles.	Population in 1880.	Population in 1890.		
			Males.	Females.	Total.
AUSTRIA—					
Lower Austria	7,630	2,330,621	1,307,913	1,353,886	2,661,799
Upper Austria	4,617	759,620	388,762	397,069	785,831
Salzburg	2,757	163,570	85,948	87,562	173,510
Styria	8,642	1,213,597	635,967	646,741	1,282,708
Carinthia	3,992	348,730	176,473	184,535	361,008
Carniola	3,844	481,243	238,011	260,947	498,958
Coast Territory	3,074	647,934	351,844	343,540	695,384
Tirol and Vorarlberg	11,287	912,549	454,769	474,000	928,769
Bohemia	19,997	5,560,819	2,821,989	3,021,105	5,843,094
Moravia	8,555	2,153,407	1,087,340	1,189,530	2,276,870
Silesia	1,981	565,475	288,908	316,741	605,649
Galicia	30,212	5,958,907	3,260,433	3,347,383	6,607,816
Bukovina	4,022	571,671	324,469	322,122	646,591
Dalmatia	4,923	476,101	266,303	261,123	527,426
Total	115,533	22,144,244	11,689,129	12,206,284	23,895,413
HUNGARY—					
Hungary proper	108,015	13,812,330	7,548,012	7,683,515	15,231,527
Croatia and Slavonia	16,421	1,905,295	1,105,272	1,096,655	2,201,927
Fiume	8	21,634	14,691	15,446	30,337
Total	124,444	15,739,259	8,667,975	8,795,616	17,463,791
Austro-Hungarian Monarchy	239,977	37,883,503	20,357,104	21,001,900	41,359,204
Bosnia and Herzegovina	19,702	1,361,290	851,134	739,902	1,591,036

Area and Population.—The areas and the populations, according to the censuses of 1880 and 1890, of the different administrative territories are given in the accompanying table. According to the census of 1900, the population of Austria was then some 26,120,000;

that of Hungary in the middle of 1898 was 18,862,269; so that the total population of the whole monarchy at the end of 1900, on these results, aggregated about 45½ millions. The number of inhabitants to an English square mile in 1890 was, in Austria, 206; in Hungary, 140. The average yearly increase of population in Austria from 1869 to 1880 was 0·87, from 1880 to 1890, 0·76 per cent., and from 1890 to 1900, 0·94 per cent.; in Hungary, from 1869 to 1880, 0·13, and from 1880 to 1890, 1·09 per cent. In Bosnia and Herzegovina, the number of inhabitants to an English square mile was 81, and the average yearly increase (1885-95) 1·7 per cent.

Government.—The present constitution of the Austro-Hungarian monarchy is based on the Pragmatic Sanction of the Emperor Charles VI. of 19th April 1722, whereby the succession to the throne is settled in the dynasty of Hapsburg-Lothringen, descending by right of primogeniture and lineal succession to male heirs, and, in case of their extinction, to the female line, and whereby the indissolubility and indivisibility of the monarchy are determined; is based, further, on the diploma of the Emperor Francis Joseph I. of 20th October 1860, whereby the constitutional form of government is introduced; and on the fundamental laws of the 21st December 1867, regulating the affairs common to all lands of the monarchy.

The unity of the monarchy is expressed in the common head of the state (emperor of Austria and apostolic king of Hungary) and in the declared community of certain state departments (Foreign Affairs and the Army), as also of the organs appointed for their maintenance—the Delegations, Common Ministry, Common Supreme Court of Exchequer. In other relations the two states of Austria and Hungary, composing the monarchy, are completely independent, each having its separate parliament and separate Government. The constitutional right of voting money applicable to the common affairs and of its political control is exercised by the Delegations, which consist each of sixty members, chosen for one year, one-third of them by the Austrian Herrenhaus (Upper House) and the Hungarian Table of Magnates (Upper House), and two-thirds of them by the Austrian and the Hungarian Houses of Representatives. The Delegations are annually summoned by the monarch alternately to Vienna and to Budapest. Each delegation has its separate sittings, both alike public. Their decisions are reciprocally communicated in writing, and, in case of non-agreement, their deliberations are renewed. Should three such interchanges be made without agreement, a common plenary sitting is held of an equal number of both delegations; and these collectively, without discussion, decide the question by common vote. The common decisions of both Houses require for their validity the sanction of the monarch. Each delegation has the right to formulate resolutions independently, and to call to account and arraign the common ministers. In the exercise of their office the members of both delegations are irresponsible, enjoying constitutional immunity.

For the administration of common affairs there are three ministries: the Ministry of the Imperial House of Foreign Affairs; the Ministry of War, including the naval department; and the Common Ministry of Finance. For the control of the common finances there is appointed a Common Supreme Court of Exchequer. The Ministry of Foreign Affairs can conclude international treaties. But commercial treaties and such state treaties as impose burdens on the state, or parts of the state, or involve a change of territory, require the parliamentary assent of both states. The Common Ministry of War is the highest authority for the administration of all military affairs, to the exclusion of the functions committed to the ministries for national defence of the two states. For the military and administrative service of the army there are fifteen military territories (fourteen corps-commands and one military command), besides a special corps-command for Bosnia and Herzegovina. Under these territorial authorities are the supplementary (*Ergänzungs*) district-commands (103 for the army, three for the navy), whose business it is to fill up deficiencies in the army and to keep the register of the troops.

The army on a peace footing numbers 21,203 officers and military functionaries, 283,877 men, and 58,475 horses. The strength of the different bodies of troops is:—

	Officers.	Men.	Horses.
Bodyguard Infantry	4	120	...
Infantry	8,816	161,032	1,020
Chasseurs	374	10,691	92
Mounted Bodyguard	4	132	76
Cavalry	1,764	45,720	40,686
Field Artillery	1,583	35,502	13,901
Fortress Artillery	398	7,762	184
Pioneers	480	8,430	15
Railway and Telegraph Regiment	86	1,487	4
Transport Service (train)	417	3,509	1,916
Other Services	217	5,803	1,922
Total	15,443	275,089	59,766
Extraordinary Force	11	4,788	1,688

The navy on its peace footing consists of 811 officers, &c., and 2486 sailors for land service; 638 officers and 5150 sailors for sea service; total number of persons belonging to the navy, 9085. The fleet consists of:—

	Number.	Displacement Tons.	Horse-Power.	Crew.
Battleships and cruisers	27	126,865	160,000	8,087
Torpedo boats	75	7,492	77,500	1,722
Transports	3	5,490	5,500	386
River boats	6	1,556	4,090	230
Ships for mission stations and coast service	15	18,588	18,750	2,781
Ships for special purposes and ships of servitude	10	7,760	5,905	222
Training ships	10	12,920	2,900	1,547
Hulks	5	6,510	...	186
Total	151	187,121	279,005	15,978

The Common Ministry of Finance has charge of the finances of common affairs, of the state debt, consisting of Treasury bills and bills guaranteed in common, and of the still standing common funds. The requisitions of

	(In thousands sterling.)		
	1875.	1885.	1895.
Expenditure—			
Foreign Affairs	396	368·7	333
War and Marine	9005·4	10085	12539
Finance	154·2	167·2	170·4
Board of Control	10·5	10·6	10·7
Total	9566·1	10631·5	13053·1
Revenue—			
For the above Departments	432	258·2	260·7
Customs	997·4	402·2	4476
Proportional Contributions	8136·7	9971·1	8316·4
Total	9566·1	10631·5	13053·1

the departments of common affairs are covered, first, by the revenues proper of the ministries and of the Common Supreme Court of Exchequer; then by the net proceeds of the customs; and the remainder by the proportional con-

tributions of the two states (at present 66⅔ per cent. being paid by the kingdoms and lands represented in the Reichsrath, 33⅓ per cent. by the lands of the Hungarian crown), 2 per cent. of the remainder being, however, previously debited to Hungary on account of the incorporation of the former military frontier.

The budget for the common administration for the year 1900 was as follows:—

	Ordinary.	Extra-ordinary.	Total.
Expenditure.			
1. Ministry of Foreign Affairs	£427,936	£8,422	£436,358
2. Ministry of War { Army	11,559,407	585,867	12,145,274
2. Ministry of War { Navy	1,081,851	579,119	1,660,970
3. Ministry of Finance	177,624	799	178,423
4. Board of Control	12,955	..	12,955
Total	£13,259,773	£1,174,207	£14,433,980
Revenue.			
1. Ministry of Foreign Affairs	£15,075	..	£15,075
2. Ministry of War	370,557	..	370,557
3. Ministry of Finance	3,377	..	3,377
4. Board of Control	529	..	529
5. The Customs	5,201,919	..	5,201,919
6. Payment by Hungary on account of Incorporation of Military Frontier	176,855	..	176,855
7. Austria's Contribution (66⅔ per cent.)	5,754,002	..	5,754,002
8. Hungary's Contribution (33⅓ per cent.)	2,911,666	..	2,911,666
Total	£14,433,980	..	£14,433,980

Commerce.—On the basis of the customs and commercial agreement between Austria and Hungary, concluded in 1867 and renewable every ten years, the following affairs, in addition to the common affairs of the monarchy, are in both states treated according to the same principles:—Commercial affairs, including customs legislation; legislation on the duties closely connected with industrial production—on beer, brandy, sugar, and mineral oils; determination of legal tender and coinage, as also of the principles regulating the Austro-Hungarian Bank; ordinances in respect of such railways as affect the interests of both states. In respect, also, of the principles of the military system and of the yearly vote of the contingent of recruits, the laws passed in both states must always be in accord. In conformity with the customs and commercial compact between the two states, renewed last in 1899, the monarchy constitutes one identical customs and commercial territory, inclusive of the occupied provinces of Bosnia and Herzegovina and the principality of Liechtenstein. Outside of this customs and commercial territory, there are only the two free ports of Trieste and Fiume, and the two small communities of Tirol and Vorarlberg, which are consigned to the German customs territory. The foreign trade of the monarchy, in the scope defined by the inclusions and exclusions above specified, amounted in the three years 1889, 1898, and 1899, to the following respective values in millions sterling:—

	1889.	1898.	1899.
Total Imports	47·4	68·3	65·8
Total Exports	63·8	67·2	77·3

In 1889 and 1899 there was accordingly an excess of exports to the values of £16,400,000 and £11,500,000, whereas in 1898 the imports exceeded the exports by £1,100,000.

Of the total *imports* in 1899, wool and woollen yarns and goods composed 11·35 per cent.; cotton and cotton yarns and goods, 8·63 per cent.; wood, coal, and turf, 5·68 per cent.; silk and silk goods, 5·50 per cent.; animal products, 5·42 per cent.; base metals and wares, 4·15 per cent.; vegetables and fruit, 4·11 per cent.; corn, pulse, and meal, 3·50 per cent.; colonial goods, 2·97 per cent.; leather and leather goods, 2·93 per cent.; machinery and apparatus, 2·90 per cent.; literary and artistic objects, 2·90 per cent.; instruments, watches, and hardware, 2·82 per cent.; flax, hemp, jute, and wares, 2·73 per cent.; drinks, 2·57 per cent. Of *exports*, wood, coal, and turf composed 17·08 per cent.; sugar, 9·33 per cent.; corn, pulse, fruit, and meal, 7·94 per cent.; animal products, 7·80 per cent.; animals for slaughter and beasts of burden, 5·94 per cent.; vegetables and fruit, 5·38 per cent.; wool, yarns, and textiles, 4·42 per cent.; precious metals and coins, 3·82 per cent.; leather and leather goods, 3·25 per cent.; instruments, watches, and hardware, 3·13 per cent.; glass and glass wares, 2·65 per cent.; iron and iron wares, 2·43 per cent.; wooden and bone articles, 2·43 per cent.; drinks, 2·39 per cent.; clothes, linen, finery, 2·31 per cent.

Of agricultural, forest, and fishery produce in the year 1899, the value of imports amounted to £31,300,000; of exports, £28,900,000. Of the products of the mining and smelting industries, the imports (1899) were £8,000,000; the exports, £5,500,000. The imports of the other industries valued £26,600,000; the exports, £42,900,000. Of the total imports about 10 per cent. came, of the total exports about 6 per cent. went, by sea; the rest by land.

The most important place of derivation and of destination for the Austro-Hungarian trade is the German empire, with 35 per cent. of the imports and 54 per cent. of the exports. Great Britain's share is 12 per cent. of the imports and 9 per cent. exports; Italy, 7 per cent. imports, 7 per cent. exports; Russia, 7 per cent. imports, 3 per cent. exports; France, 3 per cent. imports, 3 per cent. exports; the United States of America, 8 per cent. imports, 2 per cent. exports; India, 6 per cent. imports, 2 per cent. exports. Important is the trade also with the Netherlands, Rumania, Servia, Turkey, and Switzerland.

The Austro-Hungarian Bank.—Common to the two states of the monarchy is the "Austro-Hungarian Bank," which possesses a legal exclusive right to the issue of bank notes. In virtue of the new bank statute of the year 1899 the bank is a joint-stock company, with a stock of 210,000,000 crowns (£8,780,000). The bank's notes of issue must be covered to the extent of two-fifths by legal specie (gold and current silver) in reserve; the rest of the paper circulation, according to bank usage. When the amount of bank notes in circulation exceeds the specie in reserve by more than 400,000,000 crowns, the bank has to pay both states a tax of 5 per cent. on the surplus. The management of the bank and the supervision exercised over it by the state are established on a footing of equality, both states having each the same influence.

2. *Austria Proper.*

Austria proper comprises the "kingdoms and lands represented in the Reichsrath," covering an area altogether of 115,533 English square miles, with a population at the census of 31st December 1890 of 23,895,413, or 208 inhabitants per square mile. Of this population over 6,000,000 are distributed among 772 towns, and over 17,000,000 are scattered in 58,479 rural communities. In 1900 the largest towns were:—Vienna, with 1,639,811 inhabitants; Prague, 197,000; Trieste, 167,000; Lemberg, 142,000; Graz, 125,000; Brünn, 105,000. For every 1000 men there are 1044 women. Of the population 60·5 per cent. are single; 33·3 per cent. are married; the rest are widowers, widows, or divorced. For every 1000 inhabitants, again, there are 129 under 6 years of age; 110, from 6 to 10 years old; 103, from 10 to 15 years old; 609, from 16 to 65 years old; and 49 above 65 years of age. Further, for every 1000 inhabitants 16 marry per year; 37 to 39 are born; and 25 to 28 die. Of persons marrying, 88 per cent. are single, and 12 per cent. widowers or widows. For every 1000 children born, 514 are males, 148 illegitimate, and 28 still-born. For every 1000 males that have died, 354 died in their first year and 507 at an age between 1 and 5 years; for every 1000 females that have died, 299 died in their first year and 455 at an age between 1 and 5 years. The proportion of marriages, living births, and deaths for the years 1875, 1885, 1895, and 1898 is shown in the following table:—

Population.

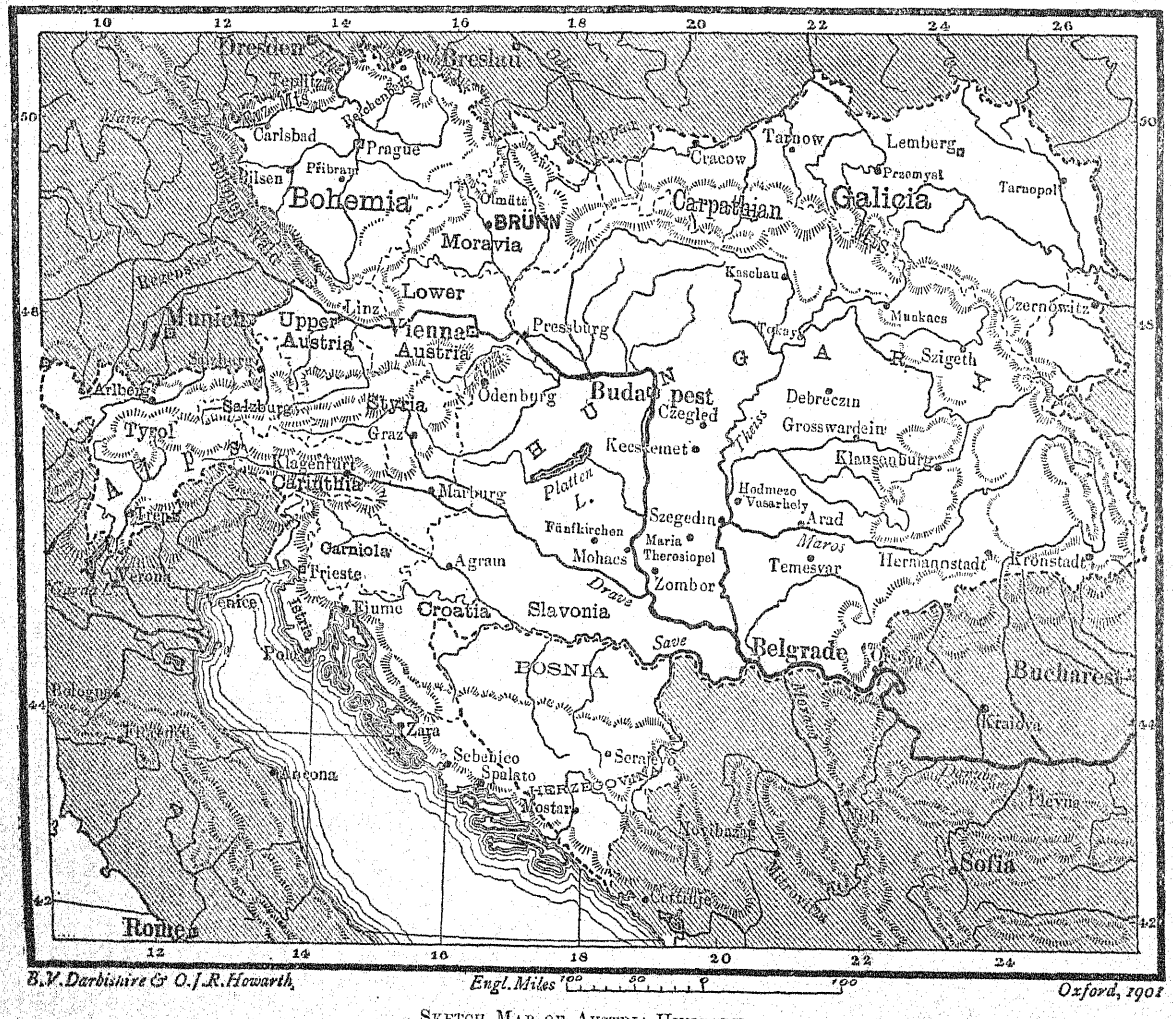
Year.	For every 1000 Inhabitants the number of		
	Marriages.	Born alive.	Deaths.
1875	17·26	40·29	30·33
1885	15·32	37·63	30·15
1895	16·10	37·94	27·53
1898	15·66	37·20	24·90

The transmarine emigration averaged per year, from 1889 to 1893, 38,240; from 1894 to 1898, 31,218 persons. Of these emigrants two-thirds went to North America, and almost all the rest to Brazil, Argentina, and Uruguay.

At the censuses of 1880 and 1890, the different races, as determined by the different languages spoken by them, were represented as follows:—

	In percentages of the Home-born Population.	
	1880.	1890.
Germans	36·75	36·05
Bohemians, Moravians, Slovaks	23·77	23·31
Poles	14·86	15·84
Ruthenians	12·83	13·23
Slovenes	5·23	5·01
Servians and Croats	2·58	2·75
Italians and Ladini	3·07	2·88
Rumanians	0·88	0·89
Magyars	0·05	0·04

Of the Germans, 28 per cent. are in Lower Austria; 25·5 per cent. in Bohemia; 10 per cent. in Styria; 9 per cent. in Upper Austria; 8 per cent. in Moravia; 5 per cent. in Tirol; the rest being scattered over all the other Austrian lands. Of the Bohemians, Moravians, and Slovaks, 66 per cent. are in Bohemia; 29 per cent. in Moravia; 2 per cent. in Silesia; 1·7 per cent. in Lower Austria. The Poles are found almost exclusively in Galicia (94·4 per cent.) and Silesia (4·8 per cent.). The Ruthenians occupy Galicia (91·3 per cent.) and Bukovina (8·6 per cent.). Of the Slovenes 39·6 per cent. are in Carniola; 34 per cent. in Styria; 17·5 per cent. in the Coast Province; 8·6 per cent in Carinthia. Of Servians and Croats, 77·7 per cent. were counted in Dalmatia and 21·9 per cent. in the Coast Province. Of the Italians 53·2 per cent. are settled in Tirol; 43·6 per cent. in the Coast Province; 2·4 per cent. in Dalmatia. The Rumanians are confined almost exclusively in Bukovina (99·6 per cent.). The Magyars belonging to the Austrian state are to be found only in Bukovina. Of Austrian lands, Lower and Upper Austria, Salzburg, and Vorarlberg are almost purely German. In Styria 68 per cent. of the population is German, and 32 per cent. Slovenes. In Carinthia, 71·5 per cent. of the population is German, against 28·5 per cent. of Slovenes. In Tirol 55 per cent. of the population is German and 45 per cent. Italian. In Silesia 48 per cent. of the population is German, against 30 per cent. of Poles and 22 per cent. of Czechs. In Bohemia the Czechs preponderate to



SKETCH MAP OF AUSTRIA-HUNGARY.

the extent of 63 per cent. of the population against 37 per cent. of Germans. Moravia is divided between 70 per cent. Czechs and 30 per cent. Germans. In Carinthia the Slovenes constitute 94 per cent. of the population, the Germans only 6 per cent. In the Coast Province 45 per cent. of the population is Italian, 31 per cent. Slovenes, and 21 per cent. Serbo-Croats, the Germans composing only 2·3 per cent. Galicia has a population 53 per cent. Polish, 43 per cent. Ruthenian, and 3·5 per cent. German. In Bukovina the Ruthenians form 42 per cent. of the population, side by side with a Rumanian population 32 per cent., a German population 21 per cent., Poles 3·7 per cent., and Magyars 1·3 per cent.

Of the total population 91 per cent. belong to the Catholic Church, and by far the greatest part of the Catholics are Catholics according to the Roman rite. Catholics of the Greek and the Armenian rite are con-

fined almost exclusively to Galicia and Bukovina; the former constituting 11·8 per cent. of the total population of the state, the latter 0·01 per cent. In addition, Old Catholics are to be found scattered about, making up a total strength of 0·03 per cent. of the population of Austria. The Greek (*i.e.*, Oriental or Orthodox, not the united) Church is represented in far its greatest strength in Bukovina (70 per cent.) and in Dalmatia (16·5 per cent.). The Protestants compose some 2 per cent. of the total population; nearly three-fourths of them belong to the Augsburg or Lutheran Confession, one-fourth to the Reformed, Calvinistic, or Helvetian Confession. The Protestants are most numerous in Silesia, where they form 14 per cent. of the population; next in Carinthia (5 per cent.), Moravia (2·7 per cent.), Bukovina (2·5 per cent.), and Bohemia (2·2 per cent.). The adherents to the Augsburg Confession are most strongly represented in Silesia (27 per cent. of their total strength), Bohemia (19 per cent.), Lower Austria (14 per cent.), and Galicia (12 per cent.). Of the adherents to the Reformed Confession, 55 per cent. are in Bohemia, 31 per cent. in Moravia, 6 per cent. in Lower Austria, and 4 per cent. in Galicia. Representatives of other Christian Confessions in Austria are Herrnhuters in Bohemia; Anglicans in Lower Austria, Trieste, Bohemia, and Galicia; Mennonites in Galicia; Unitarians in Lower Austria; Lippovanians in Bukovina. The Jews compose 4·8 per cent. of the *entire population*, and are in greatest strength in Galicia, where there are 67·5 per cent. of their total number in Austria; in Lower Austria, 11·3 per cent.; in Bohemia, 8·3 per cent.; in Bukovina, 7·2 per cent.; in Moravia, 4 per cent. The provinces in which the Jewish ingredient in the total population is most pronounced are Bukovina, where they constitute 12·8 per cent. of the total population; Galicia, 11·7 per cent.; Lower Austria, 4·8 per cent. The Catholic Church has 7 Latin archbishopries, 1 Greek and 1 Armenian archbishopric; 23 Latin and 2 Greek bishoprics. The Greek Oriental Church has 2 archbishoprics and 2 bishoprics. The Evangelical Church has 5 superintendents of the Augsburg, 3 of the Helvetian, and 1 of Mixed Confession. The Israelitish Confession has 545 religious communities, most of them in Galicia, Bohemia, and Moravia. The Roman Catholic Church rules over (1895) 488 monasteries with 8530 monks and 647 nunneries with 15,616 nuns. The Greek Oriental Church has 3 monasteries with 48 members. The capital stock of the Catholic Church is authentically estimated at 283,500,000 florins; that of the cloisters and other church establishments at 126,000,000 florins.

Religion.

Public instruction is organized in four groups of educational institutions, high schools, middle schools, technical schools, and elementary schools. There are eight universities:—Vienna, Graz, Innsbruck, Prague (German), and Czernowitz, in all which German is the language of instruction; Prague (Bohemian) with Czech, Cracow and Lemberg with Polish, as the language of instruction. Each university has four faculties

Education.

Year.	Teaching Staff.	Ordinary Professors in Teaching Staff.	Lectures.	Students.	Ordinary Students among the Students.
1875	689	273	1091	9,227	7,616
1885	1029	334	1541	13,069	11,361
1895	1262	424	1925	16,560	13,169
1898	1395	451	2086	17,322	13,624

—theology, law and political science, medicine, and philosophy. In Czernowitz, however, the faculty of medicine is wanting. The theological faculties are all Roman Catholic, except in Czernowitz, where the theological faculty is Greek-Oriental. The preceding table gives summary figures for all the eight universities during the winter sessions of the years specified. The figures of 1875, however, do not include the universities of Bohemian Prague and Czernowitz. There are seven technical high schools in Vienna, Graz, Prague, Brünn, in which German is the language of instruction; Prague and Brünn with Czech, and Lemberg with Polish, as the language of instruction. There is also one high school for agriculture in Vienna. At these high schools there are special technical departments:—Engineering, building (above ground), machine-making, technical chemistry, and a general department. The building department is wanting in Brünn (German), and the general department in Lemberg. The technical high school in Brünn (Czech) was founded in 1899. The high school for agriculture includes a school of husbandry, of forestry, and of technical culture. The attendance at these institutions during the winter sessions was as follows:—

Year.	Teaching Staff.	Ordinary Professors in Teaching Staff.	Lectures.	Students.	Ordinary Students among the Students.
1875	287	102	441	3570	3152
1885	372	120	846	2566	2399
1895	416	130	678	3144	2803
1898	449	135	692	4628	4136

In addition there exist, in the character of high schools, 2 mining academies in Leoben and Pribram; 3 art schools in Vienna, Prague, and Cracow; 2 Catholic theological faculties at Salzburg and Olmütz; 1 evangelical theological faculty at Vienna; and 1 veterinary high school at Vienna. There are, further, 45 theological educational institutions; among them 1 Greek-Catholic and 1 Armenian-Catholic, as also a Greek-Oriental, educational institution. As middle schools there are gymnasia, real-gymnasia, and real-schools. Gymnasia are intended for humane (or classical) culture; the others for general culture. Their growth is shown in the following figures:—

Year.	Gymnasia and Real-Gymnasia.			Real-Schools.		
	Number.	Teachers.	Pupils.	Number.	Teachers.	Pupils.
1875	155	2527	34,137	74	1302	21,552
1885	172	3512	54,288	80	1353	16,969
1895	181	3756	56,152	80	1610	23,600
1898	196	3962	59,980	93	1812	27,011

For the training of teachers of elementary schools, there are 50 institutions for male and 33 for female teachers. Further, there are 187 commercial schools and 940 industrial schools. Among the latter, 21 are national industrial schools and institutions of kindred character; 158 are technical schools for particular industrial branches, 11 are general trades schools, and 750 are industrial adult schools. There are, moreover, 137 schools of agriculture and of forestry, 6 lower-grade mining schools, 3 nautical schools, 8 veterinary and horse-shoeing schools, 15 midwifery schools, 509 schools for musical and dramatic culture, 612 schools for female hand-work and tailoring, and 802 other special teaching and educational institutions. Elementary instruction is given by the national schools (*Volksschulen*), and, in the larger towns, by the burgher schools. By virtue of a law passed in 1869 every community is, in general, bound to establish a public primary school. Apart from certain exceptions, attendance at school is obligatory on all, from the 6th to the 14th year of age. Side by side with the public schools, private schools are also allowed, which, if fulfilling the legal requirements, may

be accorded the validity of public primary schools. The progress of the primary and burgher schools is shown in the following table:—

Year.	Public Schools.			Private Schools.
	Number.	Teachers.	Pupils.	Number.
1875	14,257	27,677	2,050,808	909
1885	16,440	54,467	2,679,638	976
1895	18,285	69,776	3,260,852	987
1898	18,747	74,783	3,359,509	988

Of the public primary schools in 1898, 42 per cent. had each but 1 class; 25 per cent., 2; 11 per cent., 3; 7 per cent., 4; 11 per cent., 5; 4 per cent., 6-8 classes of graduated ascension. In 40 per cent. of the public primary schools, German was the language of instruction; in 26 per cent., Czech; in 11 per cent., Polish; in 10 per cent., Ruthenian; in 4 per cent., Italian; in 4 per cent., Slovenian; in 2 per cent., Serbo-Croatian; in the rest of the schools, Rumanian or Magyar. For every 1000 square kilometres, there are 66, for every 100,000 inhabitants, 77 primary schools. To each primary school there are, on an average, 176·5 pupils; to each teacher, 50 pupils; for every 100 children under obligation to attend, there are 88 actually attending, school.

Government.

The Reichsrath exercises the legislative power for all the kingdoms and lands constituting the state. It consists since 1861 of two Houses; an Upper House (the *Herrenhaus*) and a Lower House (the *Abgeordnetenhaus*). The Upper House has continued unchanged in its composition; the Lower House has undergone considerable changes in 1867, 1873, and 1892. Formerly, the members of the Lower House were returned by the diets of the various provinces; since 1873 they are appointed by the direct vote of the citizens. By an electoral law of the Reichsrath passed on the 14th June 1896, the Lower House consists of 425 representatives chosen in 5 curias: the first curia comprising the representatives of the large landed estates; the second, representatives of the chambers of commerce and manufactures; the third, representatives of the towns, market-places, and industrial localities; the fourth, representatives of the rural communities; the fifth consists of 72 representatives of all duly-qualified citizens over 24 years of age. For this last curia, those also who have already exercised their electoral right in the four other curias are entitled to vote. The Government is constituted of the council of ministers, at whose head is the minister-president. The different ministries are the ministry of the interior, of national defence, of worship and instruction, of finance, of commerce, of agriculture, of justice, of railways. There are, further, two ministries without portfolio for Galicia and Bohemia. The civil administration in the different provinces is carried on by governors or stadholders (*Statthalter*), and, in the smaller provinces, provincial governments; subordinate to them are the heads of the various districts. For the administration of justice in the provinces there are 8 upper provincial courts (*Oberlandesgerichte*), under which are the provincial and district courts (*Landes- und Kreis-gerichte*), as also the county courts (*Bezirksgerichte*). For the administration of the finances there are constituted financial provincial boards of directors (*Finanz landesdirectionen*), and, in the smaller provinces, financial boards of directors (*Finanz directionen*), under which are the financial county boards of directors and the boards of inland revenue. The provincial representation in the 17 provincial diets of the different kingdoms and lands of the state is based on the provincial regulations of the year 1861. The autonomous provincial administration is discharged by the provincial committees of the separate diets. In Bohemia, Styria, and Galicia, autonomous county representation is organized. Local self-administration is everywhere in the competence of the local communities. Among these are 33 with special statute, having, like heads of districts, the management also of the civil administration. The growth of the Austrian budget is shown by the following figures:—

	1875.	1885.	1895.	1900.
Expenditure	£32,647,000	£44,121,600	£55,396,916	£66,003,494
Revenue	£32,647,000	£43,714,666	£57,446,091	£66,020,475

The debt consists of the (earlier) general debt, the later consolidated debt, and the floating debt.

These debts for the four years specified were:—

	1875.	1885.	1895.	1900, end of June.
	(In millions sterling.)			
General State Debt—				
Consolidated	223·33	223·61	225·02	222·76
Floating	7·95	6·28	3·52	3·00
Other debt	1·13	1·13	1·13	1·13
Debts of the Lands of the Reichsrath—				
Consolidated	...	45·81	119·25	134·37
Floating	...	0·12	0·26	1·26
	232·41	276·95	349·18	362·52

The actual financial situation will be seen in detail in the following budget of the Austrian administration for 1900:—

	Ordinary.	Extra-ordinary.	Total.
Expenditure.			
Imperial Household	£387,177	..	£387,177
Imperial Cabinet Chancery	6,669	..	6,669
Reichsrath	99,984	£8,326	108,310
Imperial Court	2,035	..	2,035
Council of Ministers	114,331	83	114,414
Ministry of the Interior	2,039,697	483,953	2,523,650
,, National Defence	2,232,638	22,755	2,255,393
,, Worship and Instruction	2,844,284	289,570	3,133,854
,, Finance	10,517,618	252,818	10,770,436
,, Commerce	4,408,178	238,678	4,646,856
,, Railways	9,072,425	436,295	9,508,720
,, Agriculture	1,488,012	184,237	1,672,249
,, Justice	2,550,111	198,605	2,748,716
Board of Control	17,319	..	17,319
Pensions, Grants, and Subsidies	2,595,104	266,170	2,861,274
Share of Interest on Public Debt	14,322,648	..	14,322,648
Administration of Public Debt	53,990	10,833	64,823
Share of Expenditure on Common Affairs	10,660,234	198,717	10,858,951
Total	£63,412,454	£2,591,040	£66,003,494
Investments	..	..	£2,823,872
Revenue.			
Direct Taxes	£11,133,605	..	£11,133,605
Customs Duties	4,772,848	..	4,772,848
Duties on Articles of Consumption	12,442,381	..	12,442,381
Salt Monopoly	1,878,768	..	1,878,768
Tobacco Monopoly	8,735,479	..	8,735,479
Stamps	2,331,390	..	2,331,390
Judicial Fees	3,931,307	..	3,931,307
State Lottery	1,313,022	..	1,313,022
Other Duties	214,080	..	214,080
State Property and Mint	289,804	..	289,804
Domains and Forests	534,672	£46	534,718
Mines	719,345	..	719,345
Post Office and Telegraphs	4,076,367	..	4,076,367
Miscellaneous	13,195,550	451,811	13,647,361
Total	£65,568,618	£451,857	£66,020,475
Investments	..	..	£47,839

Landed property.

Of the whole territory of the state—in round numbers, 30,000,000 hectares (or 74,100,000 acres)—about 29 per cent. is appropriated to large landed estates; 71 per cent. is disposed of in medium and smaller properties. Large landed property is most strongly represented in Bukovina, where it absorbs 46 per cent. of the whole territory. Large landed property owns 30 to 40 per cent. of all the land of Salzburg, Galicia, Silesia, and Bohemia. In Moravia, Styria, Carinthia, Tirol, and Vorarlberg, Upper and Lower Austria, large landed estates claim 20 to 30 per cent. of the soil. Large landed property holds, in Carniola, 16 per cent. of the ground; in the Coast Province, 8 per cent.; in Dalmatia, 3 per cent. To the state

belongs 4½ per cent. of the total territory. The Church, the communities, and the corporations are also in possession of large areas of land; 4 per cent. (speaking roundly) of the territory of Austria is held on the tenure of fidei-commissum. Of the entire property in large landed estates, 59 per cent. is laid out in woods; of the property in fidei-commissum, 66 per cent. is woodland; of the entire forest land, about 10 per cent. is the property of the state; 14·5 per cent. is communal property; and 3·8 per cent. is the property of the Church. The whole of the territory in large landed estates includes 52 per cent. of the entire forest land. The forest land held under fidei-commissum amounts to over 9 per cent. of the entire forest land.

Agriculture. Agriculture, however, forms the most important source of income. Over 55 per cent. of the population draw their principal revenue from it. Of the whole area of the state, 35·45 per cent. is laid out in arable land; 10·26 per cent. in meadows; 2·07 per cent. in gardens and vineyards; 8·88 per cent. in pastures; 4·66 per cent. in mountain pastures; 32·59 per cent. in woods; 0·38 per cent. in lakes, marshes, and ponds; 3 per cent. of the land is unproductive. The rest of the land is disposed of in other, not agricultural, uses. The lands having the largest proportions of arable soil are Bohemia, with 24·7 per cent.; Moravia, with 11·4 per cent.; and Galicia, with 35·8 per cent. Of land laid out in vineyards, Dalmatia has 33 per cent.; the Coast Province, 22·3 per cent.; Lower Austria, 16 per cent.; and Styria, 13·7 per cent. Of mountain pastures, Tirol has the largest share, 55·6 per cent.; Salzburg has 14·8 per cent.; Carinthia, 12·6 per cent. of woodland; 20·7 per cent. falls to Galicia; 15·4 per cent. to Bohemia; 11·3 per cent. to Tirol; 11 per cent. to Styria. Within the bounds of each province, Styria has the greatest proportion of its surface under wood, namely, 47·9 per cent. of its whole area; Carniola has 44·4 per cent.; Carinthia, 44·2 per cent.; Bukovina, 43·2 per cent.; Tirol, 38·8 per cent. The most thinly-wooded provinces are Galicia, with 25·8 per cent. of its surface in wood; Moravia, with 27·4 per cent.; Bohemia, with 29 per cent.; and Dalmatia, with 29·7 per cent.

The produce of the ploughed land does not, on the whole, suffice for the home requirements. Considerable quantities, in particular of wheat and maize, are imported from Hungary for home consumption. Only barley and oats are usually reaped in quantity for export.

The respective areas of crop lands, the relative average yields and the total yields, in different crops, for different years, may be gathered from the following tables:—

Quinquennial Average in 1000 *Acres.*

	1881-5.	1891-5.	1899.
Under wheat	2614	2677	2600
,, rye and spelt	4724	4675	4464
,, barley	2609	2767	2883
,, oats	4367	4573	4532
,, maize	861	891	817
,, pulse	640	674	(1898) 694
,, potatoes	2522	2677	2866
,, sugar beet	500	610	509
,, (cattle) turnip	349	398	386

For every acre of land the average produce in the different crops in bushels was:—

	1881-5.	1891-5.	1899.
In wheat	15·51	15·81	18·6
,, rye and spelt	15·41	15·49	18·5
,, barley	17·72	19·61	22·3
,, oats	20·88	21·97	26·1
,, maize	18·72	18·93	16·8
,, potatoes	109·26	84·63	(1898) 108·0

For each acre in cwts.:—

	1881-5.	1891-5.	1899.
In sugar beet	157·03	169·54	(1898) 180·1
,, (cattle) turnip	107·50	121·01	(1898) 132·1

The total produce in millions of bushels was accordingly:—

	1881-5.	1891-5.	1899.
In wheat	41·8	43·5	50·0
,, rye and spelt	75·1	74·6	84·9
,, barley	47·6	56·1	66·5
,, oats	94·0	103·7	121·5
,, maize	16·5	16·8	14·1
,, pulse	7·4	8·6	(1898) 9·7
,, potatoes	284·1	232·4	319·3

In millions of cwts.:—

	1870-5.	1881-5.	1891-5.	1899.
In sugar beet	47·4	80·8	112·8	(1898) 94·4
,, (cattle) turnip	26·6	38·6	50·2	(1898) 52·6

Besides these principal crops, other crops of considerable magnitude were: Buckwheat in Styria, Galicia, Carniola, and Carinthia; rape and rape-seed in Bohemia and Galicia; poppy in Moravia and Silesia; flax in Bohemia and Moravia, Styria, and Galicia; hemp in Galicia; chicory in Bohemia; tobacco in Galicia, Dalmatia, and Tirol; fuller's thistle in Upper Austria and Styria; chrysanthemum in Dalmatia; cabbage in Bohemia and Galicia, Lower Austria, and Styria; hops in Bohemia, Galicia, and Moravia; rice in the Coast Province; chestnuts in the Coast Province and Tirol; olive oil in the Coast Province and Dalmatia; mulberry leaves in Tirol, Dalmatia, and the Coast Province; the vine in Lower Austria, Styria, the Coast Province, Tirol, and Dalmatia.

Forests. In the forest land tall timber predominates to the extent of 85 per cent., and consists of conifers much more than of green or leaved trees, in the proportion of 70 against 15 out of the 85 per cent. of the total forests laid out in tall timber. Exceptions are the forest lands of the Karst, where, in the Coast Province, medium-sized trees and underwood occupy 80 per cent., and of Dalmatia, where underwood occupies 92·6 per cent., of the forest land. Green (or leaved) wood is most prevalent in Carniola, where it forms 44·5 per cent. of the total forest; in Galicia it has 24·5 per cent. of the forest; in Bukovina, 22·1 per cent.; in Lower Austria, 17 per cent. Scantiest in green tall timber is Tirol, where greenwood has only 2·2 per cent. of all the forest; Bohemia, with 4 per cent. in greenwood out of the entire forest land; Dalmatia, 4·1 per cent. of greenwood in its forest. Greenwood is poorly represented also in Salzburg and Carinthia, in whose forests its share is only 7 to 8 per cent.

Live stock. The amount of live stock is registered every ten years along with the census of population. The numbers of the different kinds of live stock in 1869, 1880, and 1890 were:—

	1869.	1880.	1890.
Horses	1,389,623	1,463,282	1,548,197
Mules and asses	43,070	49,618	57,952
Cattle	7,425,212	8,584,077	8,643,936
Goats	979,104	1,006,675	1,035,832
Sheep	5,026,398	3,841,340	3,186,787
Pigs	2,551,473	2,721,541	3,549,700
Beehives	913,783	926,312	920,640

The average yearly increase accordingly in horses was 0·53 per cent.; in mules and asses, 1·53 per cent.; in cattle, 0·74 per cent.; in goats, 0·28 per cent.; in pigs, 1·82 per cent.; in beehives, 0·04 per cent. Sheep, on the other hand, have diminished in number by 1·92 per cent. yearly average. Galicia has the greatest number of horses to the square kilometre, viz., 9·75, the horses in the whole of Austria averaging only 5·16 to the square kilometre. Upper Austria has 46·14 head of cattle to the square kilometre, against an average of 28·81 per square kilometre for the entire monarchy. Goats most abound in Dalmatia, numbering 14·04 to the square kilometre, against an average of 3·45 in the whole state. Sheep are most numerous in Dalmatia (61·16) and Istria (49·36), against 10·62 per square kilometre in the entire state. The rearing of pigs is carried on most largely in Styria, 28·43, in Lower and Upper Austria, 20·82 and 20·68 respectively, against 11·83 to the square kilometre in the whole of Austria. The beehives to every square kilometre in Carinthia are 5·25; in Carniola, 4·95; in Styria, 4·48, against 3·07 in all Austria. Galicia has the greatest number of horses to every 100 inhabitants, viz., 11·59; Dalmatia, the greatest number of mules and asses, viz., 5·90 to every 100 inhabitants; Salzburg, the greatest number of cattle, with 82·69, and Upper Austria with 70·38; Dalmatia, the greatest number of goats, with 34·15; Dalmatia, the greatest number of sheep, with 148·80, and Istria, 76·98; Styria, the greatest number of pigs, with 49·71; Carinthia, with 38·36; and Upper Austria, with 31·55; Carinthia, the greatest number of beehives, with 15·03; and Carniola, with 10·06. Altogether, a very important source of revenue is the rearing of cattle, which is quite a characteristic feature in the husbandry of the land and regularly yields a large excess for export.

Minerals. Mining is an industry of the greatest consequence on account not only of the manifold variety of its products, but of the great extension it has attained in certain branches. In quantity, the coal mines yield the heaviest output: in 1899, 115 million metric centners (a centner is nearly $\frac{1}{10}$ ton) of pit coal. Of this amount Silesia yielded 48 millions; Bohemia, 41 millions; Moravia, 16 millions; and Galicia, 9 millions. Of

be accorded the validity of public primary schools. The progress of the primary and burgher schools is shown in the following table:—

Year.	Public Schools.			Private Schools.
	Number.	Teachers.	Pupils.	Number.
1875	14,257	27,677	2,050,808	909
1885	16,440	54,467	2,679,638	976
1895	18,285	69,776	3,260,852	987
1898	18,747	74,783	3,359,509	988

Of the public primary schools in 1898, 42 per cent. had each but 1 class; 25 per cent., 2; 11 per cent., 3; 7 per cent., 4; 11 per cent., 5; 4 per cent., 6-8 classes of graduated ascension. In 40 per cent. of the public primary schools, German was the language of instruction; in 26 per cent., Czech; in 11 per cent., Polish; in 10 per cent., Ruthenian; in 4 per cent., Italian; in 4 per cent., Slovenian; in 2 per cent., Serbo-Croatian; in the rest of the schools, Rumanian or Magyar. For every 1000 square kilometres, there are 66, for every 100,000 inhabitants, 77 primary schools. To each primary school there are, on an average, 176·5 pupils; to each teacher, 50 pupils; for every 100 children under obligation to attend, there are 88 actually attending, school.

Government.

The Reichsrath exercises the legislative power for all the kingdoms and lands constituting the state. It consists since 1861 of two Houses; an Upper House (the *Herrenhaus*) and a Lower House (the *Abgeordnetenhaus*). The Upper House has continued unchanged in its composition; the Lower House has undergone considerable changes in 1867, 1873, and 1892. Formerly, the members of the Lower House were returned by the diets of the various provinces; since 1873 they are appointed by the direct vote of the citizens. By an electoral law of the Reichsrath passed on the 14th June 1896, the Lower House consists of 425 representatives chosen in 5 curias: the first curia comprising the representatives of the large landed estates; the second, representatives of the chambers of commerce and manufactures; the third, representatives of the towns, market-places, and industrial localities; the fourth, representatives of the rural communities; the fifth consists of 72 representatives of all duly-qualified citizens over 24 years of age. For this last curia, those also who have already exercised their electoral right in the four other curias are entitled to vote. The Government is constituted of the council of ministers, at whose head is the minister-president. The different ministries are the ministry of the interior, of national defence, of worship and instruction, of finance, of commerce, of agriculture, of justice, of railways. There are, further, two ministries without portfolio for Galicia and Bohemia. The civil administration in the different provinces is carried on by governors or stadholders (*Statthalter*), and, in the smaller provinces, provincial governments; subordinate to them are the heads of the various districts. For the administration of justice in the provinces there are 8 upper provincial courts (*Oberlandesgerichte*), under which are the provincial and district courts (*Landes- und Kreis-gerichte*), as also the county courts (*Bezirksgerichte*). For the administration of the finances there are constituted financial provincial boards of directors (*Finanz landesdirectionen*), and, in the smaller provinces, financial boards of directors (*Finanz directionen*), under which are the financial county boards of directors and the boards of inland revenue. The provincial representation in the 17 provincial diets of the different kingdoms and lands of the state is based on the provincial regulations of the year 1861. The autonomous provincial administration is discharged by the provincial committees of the separate diets. In Bohemia, Styria, and Galicia, autonomous county representation is organized. Local self-administration is everywhere in the competence of the local communities. Among these are 33 with special statute, having, like heads of districts, the management also of the civil administration. The growth of the Austrian budget is shown by the following figures:—

	1875.	1885.	1895.	1900.
Expenditure	£32,647,000	£44,121,600	£55,396,916	£66,003,494
Revenue	£32,647,000	£43,714,666	£57,446,091	£66,020,475

The debt consists of the (earlier) general debt, the later consolidated debt, and the floating debt.

These debts for the four years specified were:—

	1875.	1885.	1895.	1899, end of June.
	(In millions sterling.)			
General State Debt—				
Consolidated	223·33	223·61	225·02	222·76
Floating	7·95	6·28	3·52	3·09
Other debt	1·13	1·13	1·13	1·13
Debts of the Lands of the Reichsrath—				
Consolidated	...	45·81	119·25	134·37
Floating	...	0·12	0·26	1·26
	232·41	276·95	349·18	362·52

The actual financial situation will be seen in detail in the following budget of the Austrian administration for 1900:—

	Ordinary.	Extra-ordinary.	Total.
Expenditure.			
Imperial Household	£387,177	..	£387,177
Imperial Cabinet Chancery	6,660	..	6,660
Reichsrath	99,984	£8,326	108,310
Imperial Court	2,025	..	2,025
Council of Ministers	114,331	83	114,414
Ministry of the Interior	2,039,607	483,956	2,523,563
„ National Defence	2,232,638	22,755	2,255,393
„ Worship and Instruction	2,844,284	289,570	3,133,854
„ Finance	10,517,618	252,818	10,770,436
„ Commerce	4,408,178	238,678	4,646,856
„ Railways	9,072,425	436,295	9,508,720
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„ Justice	2,550,111	198,605	2,748,716
Board of Control	17,319	..	17,319
Pensions, Grants, and Subsidies	2,595,104	266,170	2,861,274
Share of Interest on Public Debt	14,322,648	..	14,322,648
Administration of Public Debt	53,990	10,833	64,823
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Total	£63,412,454	£2,591,040	£66,003,494
Investments	..	..	£2,832,872
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Direct Taxes	£11,133,605	..	£11,133,605
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Stamps	2,331,390	..	2,331,390
Judicial Fees	3,921,307	..	3,921,307
State Lottery	1,313,022	..	1,313,022
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Miscellaneous	13,195,550	451,811	13,647,361
Total	£65,568,618	£451,857	£66,020,475
Investments	..	..	£47,830

Landed property.

Of the whole territory of the state—in round numbers, 30,000,000 hectares (or 74,100,000 acres)—about 29 per cent. is appropriated to large landed estates; 71 per cent. is disposed of in medium and smaller properties. Large landed property is most strongly represented in Bukovina, where it absorbs 46 per cent. of the whole territory. Large landed property owns 30 to 40 per cent. of all the land of Salzburg, Galicia, Silesia, and Bohemia. In Moravia, Styria, Carinthia, Tirol, and Vorarlberg, Upper and Lower Austria, large landed estates claim 20 to 30 per cent. of the soil. Large landed property holds, in Carniola, 16 per cent. of the ground; in the Coast Province, 8 per cent.; in Dalmatia, 3 per cent. To the state

belongs 4½ per cent. of the total territory. The Church, the communities, and the corporations are also in possession of large areas of land; 4 per cent. (speaking roundly) of the territory of Austria is held on the tenure of fidei-commissum. Of the entire property in large landed estates, 59 per cent. is laid out in woods; of the property in fidei-commissum, 66 per cent. is woodland; of the entire forest land, about 10 per cent. is the property of the state; 14·5 per cent. is communal property; and 3·8 per cent. is the property of the Church. The whole of the territory in large landed estates includes 52 per cent. of the entire forest land. The forest land held under fidei-commissum amounts to over 9 per cent. of the entire forest land.

Agriculture. Agriculture, however, forms the most important source of income. Over 55 per cent. of the population draw their principal revenue from it. Of the whole area of the state, 35·45 per cent. is laid out in arable land; 10·26 per cent. in meadows; 2·07 per cent. in gardens and vineyards; 8·88 per cent. in pastures; 4·66 per cent. in mountain pastures; 32·59 per cent. in woods; 0·38 per cent. in lakes, marshes, and ponds; 3 per cent. of the land is unproductive. The rest of the land is disposed of in other, not agricultural, uses. The lands having the largest proportions of arable soil are Bohemia, with 24·7 per cent.; Moravia, with 11·4 per cent.; and Galicia, with 35·8 per cent. Of land laid out in vineyards, Dalmatia has 33 per cent.; the Coast Province, 22·3 per cent.; Lower Austria, 16 per cent.; and Styria, 13·7 per cent. Of mountain pastures, Tirol has the largest share, 55·6 per cent.; Salzburg has 14·8 per cent.; Carinthia, 12·6 per cent. of woodland; 20·7 per cent. falls to Galicia; 15·4 per cent. to Bohemia; 11·3 per cent. to Tirol; 11 per cent. to Styria. Within the bounds of each province, Styria has the greatest proportion of its surface under wood, namely, 47·9 per cent. of its whole area; Carniola has 44·4 per cent.; Carinthia, 44·2 per cent.; Bukovina, 43·2 per cent.; Tirol, 38·8 per cent. The most thinly-wooded provinces are Galicia, with 25·8 per cent. of its surface in wood; Moravia, with 27·4 per cent.; Bohemia, with 29 per cent.; and Dalmatia, with 29·7 per cent.

The produce of the ploughed land does not, on the whole, suffice for the home requirements. Considerable quantities, in particular of wheat and maize, are imported from Hungary for home consumption. Only barley and oats are usually reaped in quantity for export.

The respective areas of crop lands, the relative average yields and the total yields, in different crops, for different years, may be gathered from the following tables:—

Quinquennial Average in 1000 *Acres.*

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For every acre of land the average produce in the different crops in bushels was:—

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For each acre in cwts.:—

	1881-5.	1891-5.	1899.
In sugar beet	157·03	169·54	(1898) 180·1
,, (cattle) turnip	107·50	121·01	(1898) 132·1

The total produce in millions of bushels was accordingly:—

	1881-5.	1891-5.	1899.
In wheat	41·8	43·5	50·0
,, rye and spelt	75·1	74·6	84·9
,, barley	47·6	56·1	66·5
,, oats	94·0	103·7	121·5
,, maize	16·5	16·8	14·1
,, pulse	7·4	8·6	(1898) 9·7
,, potatoes	284·1	232·4	319·3

In millions of cwts.:—

	1870-5.	1881-5.	1891-5.	1899.
In sugar beet	47·4	80·8	112·8	(1898) 94·4
,, (cattle) turnip	26·6	38·6	50·2	(1898) 52·6

Besides these principal crops, other crops of considerable magnitude were: Buckwheat in Styria, Galicia, Carniola, and Carinthia; rape and rape-seed in Bohemia and Galicia; poppy in Moravia and Silesia; flax in Bohemia and Moravia, Styria, and Galicia; hemp in Galicia; chicory in Bohemia; tobacco in Galicia, Dalmatia, and Tirol; fuller's thistle in Upper Austria and Styria; chrysanthemum in Dalmatia; cabbage in Bohemia and Galicia, Lower Austria, and Styria; hops in Bohemia, Galicia, and Moravia; rice in the Coast Province; chestnuts in the Coast Province and Tirol; olive oil in the Coast Province and Dalmatia; mulberry leaves in Tirol, Dalmatia, and the Coast Province; the vine in Lower Austria, Styria, the Coast Province, Tirol, and Dalmatia.

Forests. In the forest land tall timber predominates to the extent of 85 per cent., and consists of conifers much more than of green or leaved trees, in the proportion of 70 against 15 out of the 85 per cent. of the total forests laid out in tall timber. Exceptions are the forest lands of the Karst, where, in the Coast Province, medium-sized trees and underwood occupy 80 per cent., and of Dalmatia, where underwood occupies 92·6 per cent., of the forest land. Green (or leaved) wood is most prevalent in Carniola, where it forms 44·5 per cent. of the total forest; in Galicia it has 24·5 per cent. of the forest; in Bukovina, 22·1 per cent.; in Lower Austria, 17 per cent. Scantiest in green tall timber is Tirol, where greenwood has only 2·2 per cent. of all the forest; Bohemia, with 4 per cent. in greenwood out of the entire forest land; Dalmatia, 4·1 per cent. of greenwood in its forest. Greenwood is poorly represented also in Salzburg and Carinthia, in whose forests its share is only 7 to 8 per cent.

Live stock. The amount of live stock is registered every ten years along with the census of population. The numbers of the different kinds of live stock in 1869, 1880, and 1890 were:—

	1869.	1880.	1890.
Horses	1,389,623	1,463,282	1,548,197
Mules and asses	43,070	49,618	57,952
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Sheep	5,026,398	3,841,340	3,186,787
Pigs	2,551,473	2,721,541	3,549,700
Beehives	913,783	926,312	920,640

The average yearly increase accordingly in horses was 0·53 per cent.; in mules and asses, 1·53 per cent.; in cattle, 0·74 per cent.; in goats, 0·28 per cent.; in pigs, 1·82 per cent.; in beehives, 0·04 per cent. Sheep, on the other hand, have diminished in number by 1·92 per cent. yearly average. Galicia has the greatest number of horses to the square kilometre, viz., 9·75, the horses in the whole of Austria averaging only 5·16 to the square kilometre. Upper Austria has 46·14 head of cattle to the square kilometre, against an average of 28·81 per square kilometre for the entire monarchy. Goats most abound in Dalmatia, numbering 14·04 to the square kilometre, against an average of 3·45 in the whole state. Sheep are most numerous in Dalmatia (61·16) and Istria (49·36), against 10·62 per square kilometre in the entire state. The rearing of pigs is carried on most largely in Styria, 28·43, in Lower and Upper Austria, 20·82 and 20·68 respectively, against 11·83 to the square kilometre in the whole of Austria. The beehives to every square kilometre in Carinthia are 5·25; in Carniola, 4·95; in Styria, 4·48, against 3·07 in all Austria. Galicia has the greatest number of horses to every 100 inhabitants, viz., 11·59; Dalmatia, the greatest number of mules and asses, viz., 5·90 to every 100 inhabitants; Salzburg, the greatest number of cattle, with 82·69, and Upper Austria with 70·38; Dalmatia, the greatest number of goats, with 34·15; Dalmatia, the greatest number of sheep, with 148·80, and Istria, 76·98; Styria, the greatest number of pigs, with 49·71; Carinthia, with 38·36; and Upper Austria, with 31·55; Carinthia, the greatest number of beehives, with 15·03; and Carniola, with 10·06. Altogether, a very important source of revenue is the rearing of cattle, which is quite a characteristic feature in the husbandry of the land and regularly yields a large excess for export.

Minerals. Mining is an industry of the greatest consequence on account not only of the manifold variety of its products, but of the great extension it has attained in certain branches. In quantity, the coal mines yield the heaviest output: in 1899, 115 million metric centners (a centner is nearly $\frac{1}{20}$ ton) of pit coal. Of this amount Silesia yielded 48 millions; Bohemia, 41 millions; Moravia, 16 millions; and Galicia, 9 millions. Of

brown coal, the mines of Austria yielded 218 million metric centners, of which Bohemia contributed 180 millions; Styria, 26 millions; Upper Austria, 4 millions. Of iron ores, over 17 million metric centners were mined, Styria yielding 10 millions; Bohemia, 5 millions. 2·8 million metric centners of petroleum were produced in Galicia; 923,000 metric centners of quicksilver in Carniola. Austria yielded 318,000 metric centners of graphite, of which Bohemia produced 199,000; while Moravia, Styria, and Lower Austria also contributed their quotas. Of 371,000 metric centners of zinc ores for all Austria, Carinthia produced 219,000; Galicia, 71,000; Bohemia, 21,000; and Tirol, 43,000. Of alum and alum slate 199,000 metric centners were dug out in Bohemia; 215,000 metric centners of silver ores in Bohemia. Out of 135,000 metric centners of lead ores produced in Austria, 99,000 were the product of Carinthia, and 19,000 of Galicia. Austria yielded 67,000 metric centners of copper ores, to which Salzburg contributed 58,000; and Tirol, 9000 metric centners. 69,000 metric centners of ozocerite were raised in Galicia; 54,000 metric centners of manganese ores in Carniola and Bukovina. Small quantities of gold ores are mined in Bohemia and Salzburg. Uranium, tin, bismuth, antimony, and wolfram ores are dug out in Bohemia; pyrites in Tirol, Bohemia, and Styria; asphalt in Tirol. The increase in the value of the mining products in the most important branches is seen in the following table:—

Minerals.	(In millions of florins.)			
	1875.	1885.	1895.	1899.
Pit coal	18·2	22·2	34·1	47·7
Brown coal	15·1	17·8	34·9	47·6
Iron ores	2·8	2·2	3·0	4·9
Petroleum	0·7	1·6	4·5	3·0
Ozocerite	...	0·2	1·9	0·9
Silver ores	2·4	3·2	2·3	1·8

The total annual value of the mining products amounts to about 100 million florins. The total value of the products of the foundries amounts to 40 million florins. Of this amount, 32 millions represent the value of the fined iron and steel and pig-iron; 1·8 millions, of lead and litharge; 1·95 millions, of silver; 1·2 millions, of quicksilver; 1·2 millions, of zinc. On account of the Government monopoly, the production of salt is wholly under state control, and is therefore almost exclusively restricted to the satisfaction of the home demand. In 1899 somewhat over 3·3 million metric centners of salt were produced, of which 0·43 million metric centners were rock-salt, obtained almost wholly from Galicia and Bukovina; 1·85 million metric centners salt obtained by decoction from the salt-pits in the Salzkammergut, in Tyrol, Galicia, and Bukovina; 0·31 million metric centners sea-salt obtained in Istria and Dalmatia; 0·66 million metric centners salt for manufacturing purposes, obtained principally in Galicia. On the basis of the prices of the monopoly, the value of the yearly salt production is calculated at 25,310,000 florins.

Industry.

Since 1875 industry has, in many branches, made very considerable advance. Out of every 1000 persons there were in 1870 hardly 200 engaged in any industries; in 1880 the number per 1000 had risen to 228, and in 1890 to 258. The industrial development applies principally to the following branches:—For the production of raw iron wares there were in 1890, 74 blast furnaces at work, giving a yearly output of about 6 million metric centners of bloom-iron and 1 million metric centners of pig-iron. The production of fined iron and steel amounted to about 5 million metric centners; just as much was the amount of the production of the iron and steel refining works. A speciality are the rod-iron wares produced in the Alpine lands. For metallic alloys (*Packfong* or German silver, an alloy of nickel and copper, and another alloy of nickel and tin), the works in Lower Austria (particularly those at Berndorf) are celebrated. The manufacture of machinery employed in 1890, 304 works, chiefly in Lower Austria and Bohemia. The industry in the means of transport (carriages and railway waggons) yields an excess for export. In the manufacture of musical and scientific instruments, and also in pottery wares, Austria plays an important part. The porcelain industry of the Eger district has a world-wide reputation. The glass industry, too, in Bohemia is richly developed, and rules the markets of the world. The production in bottle, plate, and mirror-glass amounts in round figures to one million metric centners yearly. The industry in wood, particularly in stylish furniture, has attained great development, and large supplies are exported. The manufacture of buttons is also a very active branch of industry. The leather industry, which is widely extended, yields, particularly in gloves and fancy articles, excellent products also for export. The manufacture of silk and velvet goods employed in 1890 about 52,000 spindles (against 70,000 in 1880), 4900 handlooms (against 4000 in 1880), and over 3000 power-looms (against 700 in 1880). Silk-spinning is carried on only in Tirol and Görz; silk and velvet weaving principally in Vienna. The woollen industry employed:—

	1880.	1890.
Carded yarn spindles	570,000	392,000
Worsted yarn spindles	73,200	262,256
Carded yarn handlooms	17,600	2,045
,, ,, power-looms	3,130	6,351
Worsted yarn handlooms	7,560	7,600
,, ,, power-looms	5,000	15,700

The woollen industry has its principal seats in Bohemia, Moravia, Silesia, and Lower Austria.

The cotton industry employed:—

	1880.	1890.
Fine spindles	1,760,000	3,121,000
Handlooms	...	5,200
Power-looms	31,000	48,000
(In connexion with the power-looms) handlooms	62,000	21,300

The industry is mostly carried on in Bohemia, Lower Austria, and Vorarlberg. Handloom weaving is in fast decline.

The linen and jute industry has likewise reached a high degree of development, forming an important branch of the textile industry. It employed:—

	1880.	1890.
Flax yarn and thread-fine spindles	320,000	356,000
Power-looms for linen weaving	500	1,560
Handlooms	36,500	11,150
Hemp and jute spindles	12,696	39,000
Power-looms for hemp and jute	873	1,440

The most important places for linen spinning are in Bohemia (Trautenau), Moravia, and Silesia, where, too, linen weaving is also chiefly carried on. Both branches of the linen industry export their products in large quantities. The manufacture of ribbons, embroidery, and lace, the two latter being carried on principally as a professional house industry in Vorarlberg and in the Bohemian Erzgebirge, also thrives. The industry in stitched stuffs is especially developed in Northern Bohemia. Ready-made men's clothes and Oriental caps (fezes) are produced on a large scale in Bohemia and Moravia.

The industry in paper suffices also for export. The total production of paper in 1890 amounted to over 1,300,000 metric centners in 191 mills. Its principal seats are Bohemia, Moravia, Lower and Upper Austria. Of eatables and drinkables, besides flour products, there are manufactured sugar, Kaffee-surrogate and chocolate, beer and brandy. Of sugar factories there were in 1897 210, with a net production of more than 7 million metric centners. Of beer breweries there were 1553, producing more than 19 million hectolitres. Of brandy distilleries there were about 1100 large, 6000 medium, and 25,000 small establishments, yielding a total production of 1,400,000 hectolitres of alcohol. The sugar industry is carried on almost exclusively in Bohemia, Moravia, Silesia, and Galicia. Beer-brewing is most active in Bohemia, Lower Austria, Moravia, and Upper Austria. The manufacture of brandy is mainly conducted in Galicia, Bohemia, Moravia, and Lower Austria, which all produce large quantities for export.

Communications.

Internal communication is effected by land, water, and railways. The highways by land have a total length of 67,500 miles. Of this 10,000 miles are highways belonging to the state; 3560 miles belong to the provinces and districts; the rest of the highways belong to the communes. The navigable waterways have a total length of 4050 miles, of which 60 per cent. are navigable only for rafts, 40 per cent. for ships. The waterways of greatest value as means of intercommunication are the Danube, the Elbe, the Vistula, and the Dniester. On the Danube there ply 190 steamers of the Danube Steam Navigation Company and 10 other steamers, to which have to be added 3000 rowing craft and rafts. The total goods traffic on the Danube amounts to about 7,000,000 metric centners. The Elbe is a waterway for four steam navigation companies, running within its Austrian limits about 150 steamers altogether. In all, the shipping traffic on the Elbe comprises about 13,000 ships and 2000 rafts, with a total goods traffic of 27,000,000 metric centners down the river and 5,000,000 metric centners up the river. The traffic on the Vistula at all the stations gives a total of over 8000 vessels, more than half of which, however, might be reckoned twice; the goods traffic amounts to about 2,500,000 metric centners. Other rivers with a service of steamers and sailing vessels are the Arsa (in Istria), Kerka, Zermagna, and Narenta in Dalmatia. There is,

further, shipping traffic on the Dniester, and raft traffic on the Styrian courses of the Ems, Drave, Mur, Salza, Save, and Sann.

The Austrian railways in 1898 had a total length of 11,000 miles, more than half of which is under state management. The progress of railway communication is shown in the following figures :—

	(In statute miles.)			
	1875.	1885.	1895.	1899.
Total length of railway .	64,600	83,457	102,769	117,662
Amount belonging to the state	1,207	22,994	45,975	47,728
Amount worked by the state	719	32,219	54,981	67,400
For every 1000 sq. kilometres	21·5	27·8	34·3	39·2
For every 100,000 inhabitants	31·7	37·8	43·1	47·3

The work of the railways in 1899 comprised the carriage of persons and goods over a distance, altogether, of 81 million miles. The invested capital employed in the total railways amounted in 1898 to, in round numbers, 3 milliards of florins.

The post office forwarded in 1899, 1194 million missives and 4·12 milliard florins in money and articles of value, and post-office orders for 584 million florins were paid in and for 650 million florins paid out; 14,700,000 communications were sent by telegraph, and 83,400,000 conversations negotiated by telephone.

The strength of the commercial marine of Austria in 1900 was as follows :—

	Number of Vessels.	Tonnage.	Crews.
Sea-going vessels, steamers . .	103	178,649	3,130
,, ,, sailing ships . .	20	13,427	223
Large coasting vessels, steamers .	20	5,300	262
,, ,, ,, sailing ships .	11	946	50
Small coasters, steamers . . .	72	6,649	517
,, ,, sailers . . .	1,411	16,982	3,524
Fishing vessels, ,, . . .	3,673	8,606	13,401
Numbered barks, ,, . . .	7,325	13,720	12,386
Total steamers	195	190,598	3,909
,, sailing vessels	12,440	53,681	29,584
Total steamers and sailing vessels .	12,635	244,279	33,493
,, ,, ,, ,, ,, 1878	7,381	257,652	26,297

The greatest navigation company is the Austrian Lloyd in Trieste, which in 1900 employed 70 ships of 165,430 tons, covered a distance of 2,000,000 nautical miles, and carried 275,000 passengers and 9,500,000 metric centners of goods.

Banks.—In Austria there were in 1898, 61 banking establishments; 44 of them joint-stock banks, and 17 banks without joint stock. The largest bank is the Austro-Hungarian Bank, common to Austria and Hungary, which possesses the monopoly of the issue of bank notes for the whole monarchy. Its joint stock amounted in 1899 to 180,000,000 crowns; the reserve fund to 36,500,000 crowns; the bank note circulation to 1,458,000,000 crowns; bullion to 1,018,000,000 crowns, of which 806,000,000 crowns were in gold and bills payable in gold. The total banks in 1898 had a balance of 6294 million crowns, with a joint stock of 671 million crowns. The Savings Banks, numbering 531, had in 1898 over 3,000,000 depositors, with a balance in their favour of 3518 million crowns.

For HUNGARY and BOSNIA AND HERZEGOVINA see under those heads.

The following is a list of the most important publications relating to Austria-Hungary as a whole and to Austria proper :—

(*a*) **Monarchy.**—CZÖRNIG. *Oesterreichs Neugestaltung*, 1858.—*Statistisches Handbuch der österreich-ungarischen Monarchie*, 1891.—*Militär-statistisches Jahrbuch*, an annual publication.—*Delegationen-Vorlagen und Protocolle.*—ULBRICH. *Das Staatsrecht der öst.-ung. Monarchie*, 1884.—MISCHLER and ULBRICH. *Oesterreichisches Staats Wörterbuch*, 1895.—FICKER. *Die Völkerstämme der öst.-ung. Monarchie*, 1869.—SIDNEY WHITMAN. *The Realm of the Habsburgs*, 1893.—A. BEER. *Die Finanzen Oesterreichs im 19 Jahrh.*, 1877.—COMPASS. *Finanzielles Jahrbuch*, von Heller since 1889.—UMLAUFT. *Die oster.-ung. Monarchie*, 1896.—MATLECOVITZ. *Die ost.-ung. Handelspolitik*, 1899.

(*b*) **Austria Proper.**—*Oesterreichische Statistik*, since 1882. Statist.-Central-Commission.—*Oesterr.-Statistisches Handbuch*, since 1882. Statist.-Central-Commission.—*Statistische Monatsschrift*, since 1875. Statist.-Central-Commission.—*Nachrichten über Industrien, Handel und Verkehr*, since 1872. Handels ministerium *Statistisches Jahrbuch des Ackerbau Minist.*, since 1873.—*Statistische Nachrichten aus dem Gesamtgebiete der Landwirthschaft*, since 1899.—*Annuario marittimo.* Trieste. Annual.—*Navigazione e Commercio.* Trieste. Annual.—*Statistiches Jahrbuch der autonomen Verwaltung*, I., 1900.—*Oesterr. Städtebuch* 1-8, 1887 and subsequent years.—*Sociale Rundschau d. arbeitsstat.* Amtes I. 1900.—*Mittheilungen des Finanz ministeriums*, since 1894.

(K. T. I.-S.)

HISTORY.—1. *The Whole Monarchy.*

The war of 1866 began a new era in the history of the Austrian empire. By the treaty of Prague the emperor surrendered the position in Germany which his ancestors had held for so many centuries; Austria and Tirol, Bohemia and Salzburg, ceased to be German, and eight million Germans were cut off from all political union with their fellow-countrymen. At the same time the surrender of Venetia completed the work of 1859, and the last remnant of the old-established Hapsburg domination in Italy ceased. The war was immediately followed by a reorganization of the Government. The Magyar nation, as well as the Czechs, had refused to recognize the validity of the constitution of 1861 which had established a common parliament for the whole empire; they demanded that the independence of the kingdom of Hungary should be restored. After the defeats on the field of battle their claim could no longer be resisted, and in the negotiations the Hungarian Diet was able to make its own terms. They recognized no union between their country and the other parts of the monarchy except that which was based on the Pragmatic Sanction of 1722. All recent innovations, all attempts made during the last hundred years to absorb Hungary in a greater Austria, were revoked. An agreement was made by which the emperor was to be crowned at Pest and take the ancient oath to the Golden Bull; Hungary (including Transylvania and Croatia) was to have its own parliament and its own ministry; Magyar was to be the official language; the emperor was to rule as king; there was to be complete separation of the finances; not even a common nationality was recognized between the Hungarians and the other subjects of the emperor; a Hungarian was to be a foreigner in Vienna, an Austrian a foreigner in Budapest. A large party wished indeed that nothing should be left but a purely personal union similar to that between England and Hanover. Deak and the majority agreed, however, that the arrangements of 1722 implied, and the older constitutional practice allowed, that there should be certain institutions common to Hungary and the rest of the monarchy; these were—(1) foreign affairs, including the diplomatic and consular service; (2) the army and navy; (3) the control of the expenses required for these branches of the public service.

Establishment of the dual monarchy.

Recognizing in a declaratory act the legal existence of these common institutions, they also determined the method by which they should be administered. In doing so they carried out with great exactitude the principle of dualism, establishing in form a complete parity between Hungary on one side and the other territories of the king on the other. They made it a condition that there should be constitutional government in the rest of the monarchy as well as in Hungary, and a parliament in which all the other territories should be represented. From both the Hungarian and the Austrian[1] parliament there was to be elected a *Delegation*, consisting of sixty members; to these Delegations the common ministers were to be responsible, and to them the budget was to be submitted. The annual meetings were to be held alternately in Vienna and in Pest. They were very careful that

Delegations.

[1] For the use of this term, see section (2) on AUSTRIA below.

these Delegations should not overshadow the parliaments by which they were appointed. The Delegations were not to sit together; each was to meet separately; they were to communicate by writing, every document being accompanied by a translation in Magyar or German, as the case might be; only if after three times exchanging notes they failed to agree was there to be a common session; in that case there would be no discussion, and they were to vote in silence; a simple majority was sufficient. There were to be three ministers for common purposes—(1) for foreign affairs; (2) for war; (3) for finance; these ministers were responsible to the Delegations, but the Delegations were really given no legislative power. The minister of war controlled the common army, but even the laws determining the method by which the army was to be recruited had to be voted separately in each of the parliaments. The minister of finance had to lay before them the common budget, but they could not raise money or vote taxes; after they had passed the budget the money required had to be provided by the separate parliaments. Even the determination of the proportion which each half of the monarchy was to contribute was not left to the Delegations. It was to be fixed once every ten years by separate committees chosen for that purpose from the Austrian Reichsrath and the Hungarian Reichstag, the so-called *Quota-Deputations*. In addition to these "common affairs" the Hungarians, indeed, recognized that there were certain other matters which it was desirable should be managed on identical principles in the two halves of the monarchy—namely, customs and excise currency; the army and common railways. For these, however, no common institutions were created; they must be arranged by agreement; the ministers must confer and then introduce identical acts in the Hungarian and the Austrian parliaments.

The main principles of this agreement were decided during the spring of 1867; but during this period the Austrians were not really consulted at all. The negotiations on behalf of the court of Vienna were entrusted to Beust, whom the emperor appointed chancellor of the empire and also minister-president of Austria. He had no previous experience of Austrian affairs, and was only anxious at once to bring about a settlement which would enable the empire to take a strong position in international politics. In the summer of 1867, however (the Austrian Reichsrath having met), the two parliaments each elected a deputation of fifteen members to arrange the financial settlement. The first matter was the debt, amounting to over 3000 million gulden, in addition to the floating debt, which had been contracted during recent years. The Hungarians laid down the principle that they were in no way responsible for debts contracted during a time when they had been deprived of their constitutional liberties; they consented, however, to pay each year 29½ million gulden towards the interest. The whole responsibility for the payment of the remainder of the interest, amounting annually to over a hundred million gulden, and the management of the debt, was left to the Austrians. The Hungarians wished that a considerable part of it should be repudiated. It was then agreed that the two states should form a Customs Union for the next ten years; the customs were to be paid to the common exchequer; all sums required in addition to this to meet the expenses were to be provided as to 30 per cent. by Hungary and as to 70 per cent. by Austria. After the financial question had been thus settled, the whole of these arrangements were then, on 21st and 24th December 1867, enacted by the two parliaments, and the system of dualism was established.

Financial settlement.

The Acts were accepted in Austria out of necessity; but no parties were really satisfied. The Germans, who accepted the principle of dualism, were indignant at the financial arrangements; for Hungary, while gaining more than an equal share of power, paid less than one-third of the common expenses. On the other hand, according to British ideas of taxable capacity, Hungary paid, and still pays, more than her share. The Germans, however, could at least hope that in the future the financial arrangements might be revised; the complaints of the Slavonic races were political, and within the constitution there was no means of remedy, for, while the settlement gave to the Hungarians all that they demanded, it deprived the Bohemians or Galicians of any hope that they would be able to obtain similar independence. Politically, the principle underlying the agreement was that the empire should be divided into two portions; in one of these the Magyars were to rule, in the other the Germans; in either section the Slavonic races—the Serbs and Croatians, the Czechs, Poles, and Slovenians—were to be placed in a position of political inferiority.[1]

The logical consistency with which the principle of Dualism was carried out is shown in a change of title. By a letter to Beust of 14th November 1868 the emperor ordered that he should henceforward be styled, not as before "Emperor of Austria, King of Hungary, King of Bohemia, etc.," but "Emperor of Austria, King of Bohemia, etc., and Apostolic King of Hungary," thereby signifying the separation of the two districts over which he rules. His shorter style is "His Majesty the Emperor and King," and "His Imperial and Apostolic Royal Majesty"; the lands over which he rules are called "The Austrian-Hungarian Monarchy" or "The Austrian-Hungarian Realm." The new terminology, "Imperial and Royal" (*Kaiserlich und Königlich*), has since then been applied to all those branches of the public service which belong to the common ministries; this was first the case with the diplomatic service; not till 1889 was it applied to the army, which for some time kept up the old style of *Kaiserlich-Königlich*; in 1895 it was applied to the ministry of the imperial house, an office always held by the minister for foreign affairs. The minister for foreign affairs was at first called the *Reichskanzler*; but in 1871, when Andrassy succeeded Beust, this was given up in deference to Hungarian feeling, for it might be taken to imply that there was a single state of which he was minister. The old style *Kaiserlich-Königlich*, the "K. K." which has become so familiar through long use, is still retained in the Austrian half of the monarchy. There are therefore, *e.g.*, three ministries of finance: the *Kaiserlich und Königlich* for joint affairs; the *Kaiserlich-Königlich* for Austrian affairs; the *Königlich* for Hungary.

The settlement with Hungary consisted then of three parts:—(1) the political settlement, which was to be permanent and has since remained part of the fundamental constitution of the monarchy; (2) the periodical financial settlement, determining the partition of the common expenses as arranged by the Quota-Deputations and ratified by the parliaments; (3) the Customs Union and the agreement as to currency—a voluntary and terminable arrangement made between the two Governments and parliaments. The history of the common affairs which fall under the management of the common ministries is, then, the history of the foreign policy of the empire and of the army. It is with this and this alone that the Delegations are occupied, and it is to this that we must now turn. The annual meetings call for little notice; they have generally been the occasion on which the foreign minister has explained and justified his policy; according to the English custom, red books, sometimes containing important despatches, have been laid before them; but the debates have caused less embarrassment to the Government than is generally the case in parliamentary assemblies, and the army budget has generally been passed with few and unimportant alterations.

Common affairs.

[1] Baron H. de Worms. *The Austro-Hungarian Empire.* London, 1876, and BEUST'S *Memoirs.*

For the first four years, while Beust was chancellor, the foreign policy was still influenced by the feelings left by the war of 1866. We do not know how far there was a real intention to revenge Königgrätz and recover the position lost in Germany. This would be at least a possible policy, and one to which Beust by his previous history would be inclined. There were sharp passages of arms with the Prussian Government regarding the position of the South German states; a close friendship was maintained with France; there were meetings of the emperor and of Napoleon at Salzburg in 1868, and the next year at Paris; the death of Maximilian in Mexico cast a shadow over the friendship, but did not destroy it. The opposition of the Hungarians and financial difficulties probably prevented a warlike policy. In 1870 there were discussions preparatory to a formal alliance with France against the North German Confederation, but nothing was signed.[1] The war of 1870 put an end to all ideas of this kind; the German successes were so rapid that Austria was not exposed to the temptation of intervening, a temptation that could hardly have been resisted had the result been doubtful or the struggle prolonged. The absorption of South Germany in the German empire took away the chief cause for friction; and from that time warm friendship, based on the maintenance of the established order, has existed between the two empires. Austria gave up all hope of regaining her position in Germany; Germany disclaimed all intention of acquiring the German provinces of Austria. Beust's retirement in 1871 put the finishing touch on the new relations. His successor, Count Andrassy, a Hungarian, established a good understanding with Bismarck; and in 1872 the visit of the Emperor Francis Joseph, accompanied by his minister, to Berlin, was the final sign of the reconciliation with his uncle. The Tsar was also present on that occasion, and for the next six years the close friendship between the three empires removed all danger of war. Three years later the full reconciliation with Italy followed, when Francis Joseph consented to visit Victor Emmanuel in the city of Venice.

Foreign policy.

The outbreak of disturbance in the Balkans ended this period of calm. The insurrection in Bosnia and Herzegovina immediately affected Austria; refugees in large numbers crossed the frontier and had to be maintained by the Government. The political problem presented was a very difficult one. The sympathy of the Slavonic inhabitants of the empire made it impossible for the Government of Vienna to regard with indifference the sufferings of Christians in Turkey. Active support was impossible, because the Hungarians, among whom the events of 1848 had obliterated the remembrance of the earlier days of Turkish conquest, were full of sympathy for the Turks. It was a cardinal principle of Austrian policy that she could not allow the erection of new Slavonic states on her southern frontier. Moreover, the disturbances were fomented by Russian agents, and any increase of Russian influence (for which the Pan-Slavonic party was working) was full of danger to Austria. For a time the mediation of Germany preserved the good understanding between the two eastern empires. In 1875 Andrassy drafted a Note, which was accepted by the Powers, requiring Turkey to institute the reforms necessary for the good government of the provinces. Turkey agreed to do this, but the insurgents required a guarantee from the Powers that Turkey would keep her engagements. This could not be given, and the rebellion continued and spread to Bulgaria. The lead then passed to Russia, and Austria, even after the outbreak of war, did not oppose Russian measures. At the beginning of 1877 a secret understanding had been made between the two powers, by which Russia undertook not to annex any territory, and in other ways not to take steps which would be injurious to Austria. The advance of the Russian army on Constantinople, however, was a serious menace to Austrian influence; Andrassy therefore demanded that the terms of peace should be submitted to a European conference, which he suggested should meet at Vienna. The Peace of San Stefano violated the engagements made by Russia, and Andrassy was therefore compelled to ask for a credit of 60 million gulden and to mobilize a small portion of the army; the money was granted unanimously in the Hungarian Delegation, though the Magyars disliked a policy the object of which appeared to be not the defence of Turkey against Russia, but an agreement with Russia which would give Austria compensation at the expense of Turkey; in the Austrian Deputation it was voted only by a majority of 39 to 20, for the Germans were alarmed at the report that it would be used for an occupation of part of the Turkish territory.

The Eastern question.

The active share taken by Great Britain, however, relieved Austria from the necessity of having recourse to further measures. By an arrangement made beforehand, Austria was requested at the Congress of Berlin to undertake the occupation and administration of Bosnia and Herzegovina—an honourable but arduous task. The provinces could not be left to the Turks; Austria could not allow them to fall under Russian influence. The occupation was immediately begun, and 60,000 Austrian troops, under the command of General Philippovitch, crossed the frontier on 29th July. The work was, however, more difficult than had been anticipated; the Mahommedans offered a strenuous resistance; military operations were attended with great difficulty in the mountainous country; 200,000 men were required, and they did not succeed in crushing the resistance till after some months of obstinate fighting. The losses on either side were very heavy; even after the capture of Serajevo in August, the resistance was continued; and besides those who fell in battle, a considerable number of the insurgents were put to death under military law. The opposition in the Delegations, which met at the end of the year, was so strong that the Government had to be content with a credit to cover the expenses for 1879 of less than half what they had originally asked, and the supplementary estimate of 40,000,000 gulden for 1878 was not voted till the next year. In 1879 the Porte, after long delay, recognized the occupation on the distinct understanding that the sovereignty of the sultan was acknowledged. A civil administration was then established, the provinces not being attached to either half of the empire, but placed under the control of the joint minister of finance. The Government during the first two years was not very successful; the Christian population were disappointed at finding that they still had, as in the old days, to pay rent to the Mahommedan Begs. There were difficulties also between the Roman Catholics and the members of the Greek Church. In 1881 disturbances in Dalmatia spread over the frontier into Herzegovina, and another expedition had to be sent to restore order. When this was done Herr von Kallay was appointed minister, and under his judicious government order and prosperity were established in the provinces. In accordance with another clause of the Treaty of Berlin, Austria was permitted to place troops in the sanjak of Novi-Bazar, a district of great strategic importance, which separated Servia and Montenegro, and through which the communication between Bosnia and Salonica passed. This was done in September 1879, an

Bosnia and Herzegovina.

[1] See General Le Brun, *Souvenirs Militaires*, 1866-70. Paris, 1895; also, Baron de Worms, *op. cit.*, and the article on BEUST.

agreement with Turkey having specified the numbers and position of the garrison. Another slight alteration of the frontier was made in the same year, when, during the delimitation of the new frontier of Montenegro, the district of Spizza was incorporated in the kingdom of Dalmatia.

Italy and the Irredentists.

The Congress of Berlin indirectly caused some difficulties with Italy. In that country was a large party which, under the name of the "Irredentists," demanded that those Italian-speaking districts, South Tirol, Istria, and Trieste, which were under Austrian rule, should be joined to Italy; there were public meetings and riots in Italy; the Austrian flag was torn down from the consulate in Venice and the embassy at Rome insulted. The excitement spread across the frontier; there were riots in Trieste, and in Tirol it was necessary to make some slight movement of troops as a sign that the Austrian Government was determined not to surrender any territory. For a short time there was apprehension that the Italian Government might not be strong enough to resist the movement, and might even attempt to realize these wishes by means of an alliance with Russia; but the danger quickly passed away.

Alliance with Germany.

In the year 1879 the European position of the empire was placed on a more secure footing by the conclusion of a formal alliance with Germany. In the autumn of that year Bismarck visited Vienna and arranged with Andrassy a treaty by which Germany bound herself to support Austria against an attack from Russia, Austria pledging herself to help Germany against a combined attack of France and Russia; the result of this treaty, of which the Tsar was informed, was to remove, at least for the time, the danger of war between Austria and Russia. It was the last achievement of Andrassy, who had already resigned, but it was maintained by his successor, Baron Haymerle, and after his death in 1880 by Count Kalnoky. It was strengthened in 1883 by the adhesion of Italy, for after 1881 the Italians required support, owing to the French occupation of Tunis, and after five years it was renewed. Since that time it has been the foundation on which the policy of Austria has depended, and it has survived all dangers arising either from commercial differences (as between 1880 and 1890) or national discord. The alliance was naturally very popular among the German Austrians; some of them went so far as to attempt to use it to influence internal policy, and suggested that fidelity to this alliance required that there should be a ministry at Vienna which supported the Germans in their internal struggle with the Slavs; they represented it as a national alliance of the Teutonic races, and there were some Germans in the Empire who supported them in this view. The Governments on both sides could of course give no countenance to this theory; Bismarck especially was very careful never to let it be supposed that he desired to exercise influence over the internal affairs of his ally. Had he done so, the strong anti-German passions of the Czechs and Poles, always inclined to an alliance with France, would have been aroused, and no Government could have maintained the alliance. After 1880, the exertions of Count Kalnoky again established a fairly good understanding with Russia, as was shown by the meetings of Francis Joseph with the Tsar in 1884 and 1885, but the outbreak of the Bulgarian question in 1885 again brought into prominence the opposed interests of Russia and Austria. In the December of this year Austria indeed decisively interfered in the war between Bulgaria and Servia, for at this time Austrian influence predominated in Servia, and after the battle of Slivnitza the Austrian ambassador warned Prince Alexander of Bulgaria that if he advanced farther he would be met by Austrian as well as Servian troops. But after the abdication of Alexander, Count Kalnoky stated in the Delegations that Austria would not permit Russia to interfere with the independence of Bulgaria. This decided step was required by Hungarian feeling, but it was a policy in which Austria could not depend on the support of Germany, for—as Bismarck stated—Bulgaria was not worth the bones of a single Pomeranian grenadier. Austria also differed from Russia as to the position of Prince Ferdinand of Bulgaria, and during 1886-87 much alarm was caused by the massing of Russian troops on the Galician frontier. Councils of war were summoned to consider how this exposed and distant province was to be defended, and for some months war was considered inevitable; but the danger was averted by the renewal of the Triple Alliance and the other decisive steps taken at this time by the German Government (*vide* GERMANY).[1]

Since this time the foreign policy of Austria has been peaceful and unambitious; the close connexion with Germany has so far been maintained, though during the last few years it has been increasingly difficult to prevent the violent passions engendered by national enmity at home from reacting on the foreign policy of the empire; it would scarcely be possible to do so, were it not that discussions on foreign policy take place not in the parliaments but in the Delegations where the numbers are fewer and the passions cooler. In 1896 Count Kalnoky had to retire, owing to a difference with Banffy, the Hungarian minister, arising out of the struggle with Rome. He was succeeded by Count Goluchowski, the son of a well-known Polish statesman. In 1898 the expulsion of Austrian subjects from Prussia, in connexion with the anti-Polish policy of the Prussian Government, caused a passing irritation, to which Count Thun, the Austrian minister, gave expression. The chief objects of the Government in recent years have been to maintain Austrian trade and influence in the Balkan States by the building of railways, by the opening of the Danube for navigation, and by commercial treaties with Rumania, Servia, and Bulgaria; since the abdication of King Milan especially, the affairs of Servia and the growth of Russian influence in that country have caused serious anxiety.

The army.

The disturbed state of European politics and the great increase in the military establishments of other countries made it desirable for Austria also to strengthen her military resources. The bad condition of the finances rendered it, however, impossible to carry out any very great measures. In 1868 there had been introduced compulsory military service in both Austria and Hungary; the total of the army available in war had been fixed at 800,000 men. Besides this joint army placed under the joint ministry of war, there was in each part of the monarchy a separate militia and a separate minister for national defence. In Hungary this national force or *honved* was kept quite distinct from the ordinary army; in Austria, however (except in Dalmatia and Tirol, where there was a separate local militia), the Landwehr, as it was called, was practically organized as part of the standing army. At the renewal of the *Ausgleich* in 1877 no important change was made, but in 1882 the system of compulsory service was extended to Bosnia and Herzegovina, and a reorganization was carried out, including the introduction of army corps and local organization on the Prussian plan. This was useful for the purposes of speedy mobilization, though there was some danger that the local and national spirit might penetrate into the

[1] Sir Charles Dilke, *The Present Position of European Politics*, London, 1887.

army. In 1886 a law was carried in either parliament creating a Landsturm, and providing for the arming and organization of the whole male population up to the age of forty-two in case of emergency, and in 1887 a small increase was made in the annual number of recruits. A further increase was made in 1892-93. In contrast, however, with the military history of other continental powers, that of Austria shows a small increase in the army establishment. Of recent years there have been signs of an attempt to tamper with the use of German as the common language for the whole army. This, which is now the principal remnant of the old ascendency of German, and the one point of unity for the whole empire, is a matter on which the Government and the emperor allow no concession, but in the Hungarian parliament protests against it have been raised, and in 1899 and 1900 it was necessary to punish recruits from Bohemia, who answered the roll call in the Czechish "zde" instead of the German "hier."

In those matters which belong to the periodical and terminable agreement, the most important is the Customs Union, which was established in 1867, and it is convenient to treat separately the commercial policy of the dual state.[1] At first the customs tariff in Austria-Hungary, as in most other countries, was based on a number of commercial treaties with Germany, France, Italy, Great Britain, &c., each of which specified the maximum duties that could be levied on certain articles, and all of which contained a "most favoured nation" clause. The practical result was a system very nearly approaching to the absence of any customs duties, and for the period for which these treaties lasted a revision of the tariff could not be carried out by means of legislation. After the year 1873, a strong movement in favour of protective duties made itself felt among the Austrian manufacturers who were affected by the competition of German, English, and Belgian goods, and Austria was influenced by the general movement in economic thought which about this time caused the reaction against the doctrines of free trade. Hungary, on the other hand, was still in favour of free trade, for there were no important manufacturing industries in that country, and it required a secure market for agricultural produce. After 1875 the commercial treaties expired; Hungary thereupon also gave notice to terminate the commercial union with Austria, and negotiations began as to the principle on which it was to be renewed. This was done during the year 1877, and in the new treaty, while raw material was still imported free of duty, a low duty was placed on textile goods as well as on corn, and the excise on sugar and brandy was raised. All duties, moreover, were to be paid in gold—this at once involving a considerable increase. The tariff treaties with Great Britain and France were not renewed, and all attempts to come to some agreement with Germany broke down, owing to the change of policy which Bismarck was adopting at this period. The result was that the system of commercial treaties ceased, and Austria-Hungary was free to introduce a fresh tariff depending simply on legislation, an "autonomous tariff" as it is called. With Great Britain, France, and Germany, there was now only a "most favoured nation" agreement; fresh commercial treaties were made with Italy (1879), Switzerland, and Servia (1881). During 1881-82 Hungary, desiring means of retaliation against the duties on corn and the impediments to the importation of cattle recently introduced into Germany, withdrew her opposition to protective duties; the tariff was completely revised, protective duties were introduced on all articles of home production, and high finance duties on other articles such as coffee and petroleum. At the same time special privileges were granted to articles imported by sea, so as to foster the trade of Trieste and Fiume; as in Germany, a subvention was granted to the great shipping companies, the Austrian Lloyd and Adria; the area of the Customs Union was enlarged so as to include Trieste, Istria, and Dalmatia, as well as Bosnia and Herzegovina. In 1887 a further increase of duties was laid on corn (this was at the desire of Hungary as against Rumania, for a vigorous customs war was being carried on at this time) and on woollen and textile goods. Austria therefore during these years completely gave up the principle of free trade, and adopted a nationalist policy similar to that which prevailed in Germany. A peculiar feature of these treaties was that the Government was empowered to impose an additional duty (Retorsion Zoll) on goods imported from countries in which Austria-Hungary received unfavourable treatment. In 1881 this was fixed at 10 per cent. (5 per cent. for some articles), but in 1887 it was raised to 30 and 15 per cent. respectively. In 1892 Austria-Hungary joined with Germany, Italy, Belgium, and Switzerland in commercial treaties to last for twelve years, the object being to secure to the states of Central Europe a stable and extended market; for the introduction of high tariffs in Russia and America had crippled industry. Two years later Austria-Hungary also arranged with Russia a treaty similar to that already made between Russia and Germany; the reductions in the tariff secured in these treaties were applicable also to Great Britain, with which there still was a most favoured nation treaty. The system thus introduced gave commercial security till the year 1903.

The Customs Union.

The result of these and other laws was an improvement in financial conditions, which enabled the Government at last to take in hand the long-delayed task of reforming the currency. Hitherto the currency had been partly in silver (gulden), the "Austrian Currency" which had been introduced in 1857, partly in paper money, which took the form of notes issued by the Austro-Hungarian Bank. This institution had, in 1867, belonged entirely to Austria; it had branches in Hungary, and its notes were current throughout the monarchy, but the direction was entirely Austrian. The Hungarians had not sufficient credit to establish a national bank of their own, and at the settlement of 1877 they procured, as a concession to themselves, that it should be converted into an Austro-Hungarian bank, with a head office at Pest as well as at Vienna, and with the management divided between the two countries. This arrangement was renewed in 1887. In 1848 the Government had been obliged to authorize the bank to suspend cash payments, and the wars of 1859 and 1866 had rendered abortive all attempts to renew them. The notes therefore formed an inconvertible paper currency. The bank by its charter had the sole right of issuing notes, but during the war of 1866 the Government, in order to raise money, had itself issued notes (*staatsnoten*) to the value of 312 million gulden, thereby violating the charter of the bank. The operation begun in 1892 was therefore threefold: (1) the substitution of a gold for a silver currency; (2) the redemption of the *staatsnoten*; (3) the resumption of cash payments by the bank.

Reform of the currency.

In 1867 Austria-Hungary had taken part in the monetary conference which led to the formation of the Latin Union; it was intended to join the Union, but this was not done. A first step, however, had been taken in this direction by the issue of gold coins of the value of eight and four guldens. No attempt was made, however, to regulate the relations of these coins to the "Austrian" silver coinage; the two issues were not brought into connexion, and every payment was made in silver, unless it was definitely agreed that it should be paid in gold. In 1879, owing to the continued depreciation of silver, the free coinage of silver was suspended. In 1892 laws introducing a completely new coinage were carried in both parliaments, in accordance with agreements made by the ministers. The unit in the new issue was to be the krone, divided into 100 heller; the krone being almost of the same value as the franc. (The twenty-krone piece in gold weighs 6·775 gr., the twenty-franc piece 6·458.) The gold krone was equal

[1] Matlekovits. *Die Zollpolitik des Oesterreichish-Ungarischen Monarchie*, Leipzig, 1891, gives the Hungarian point of view.—Bazant. *Die Handelspolitik Oesterreich-Ungarns*, 1875-92. Leipzig, 1894.

to ·42 of the gold gulden, and it was declared equal to ·5 of the silver gulden, so much allowance being made for the depreciation of silver. The first step towards putting this Act into practice was the issue of one-krone pieces (silver), which circulated as half guldens, and of nickel coins; all the copper coins and other silver coins were recalled, the silver gulden alone being left in circulation. The coinage of the gold four- and eight-gulden was suspended. Nothing more could be done till the supply of gold had been increased. The bank was required to buy gold (during 1892 it bought over forty M. gulden), and was obliged to coin into twenty- or ten-krone pieces all gold brought to it for that purpose. Then a loan of 150 M. gulden at 4 per cent. was made, and from the gold (chiefly bar gold and sovereigns) which Rothschild, who undertook the loan, paid in, coins of the new issue were struck to the value of over 34 million krone. This was, however, not put into circulation; it was used first for paying off the *staatsnoten*. By 1894 the state was able to redeem them to the amount of 200 million gulden, including all those for one gulden. It paid them, however, not in gold, but in silver (one-krone pieces and gulden) and in bank notes, the coin and notes being provided by the bank, and in exchange the newly-coined gold was paid to the bank to be kept as a reserve to cover the issue of notes. At the same time arrangements were made between Austria and Hungary to pay off about 80 million of exchequer bills which had been issued on the security of the Government salt-works, and were therefore called "salinenscheinen." In 1899 the remainder of the *staatsnoten* (112 million gulden) were redeemed in a similar manner. The bank had in this way acquired a large reserve of gold, and in the new charter which was (after long delay) passed in 1899, a clause was introduced requiring the resumption of cash payments, though this was not to come into operation immediately. Then from 1st January 1900 the old reckoning by gulden was superseded, that by krone being introduced in all Government accounts, the new silver being made a legal tender only for a limited amount. For the time, however, the old guldens were left in circulation, payments made in them, at the rate of two krone to one gulden, being legal up to any amount.

This important reform has thereby been brought to a satisfactory conclusion, and at a time when the political difficulties had reached a most acute stage. It is indeed remarkable that notwithstanding the complicated machinery of the dual monarchy, and the numerous obstacles which have to be overcome before a reform affecting both countries can be carried out, the financial, the commercial, and the foreign policy has been conducted since 1870 with success. The credit of the state has risen, the chronic deficit has disappeared, the currency has been put on a sound basis, and part of the unfunded debt has been paid off. Universal military service has been introduced, and all this has been done in the presence of difficulties greater than existed in any other civilized country.

The Ausgleich with Hungary.

Each of the financial and economic reforms described above was, of course, the subject of a separate law, but, so far as they are determined at the general settlement which takes place between Austria and Hungary every ten years, they are comprised under the expression "Ausgleich," which includes especially the determination of the Quota, and to this extent they are all dealt with together as part of a general settlement and bargain. In this settlement a concession on commercial policy would be set off against a gain on the financial agreement; *e.g.*, in 1877 Austria gave Hungary a share in the management of the bank, while the arrangement for paying the bonus on exported sugar was favourable to Austria; on the other hand, since the increased duty on coffee and petroleum would fall more heavily on Austria, the Austrians wished to persuade the Hungarians to pay a larger quota of the common expenses, and there was also a dispute whether Hungary was partly responsible for a debt of 80 M. gulden to the bank. Each measure had therefore to be considered not only on its own merits, but in relation to the general balance of advantage, and an amendment in one might bring about the rejection of all. The whole series of Acts had to be carried in two parliaments, each open to the influence of national jealousy and race hatred in its most extreme form, so that the negotiations have been conducted under serious difficulties, and the periodical settlement has always been a time of great anxiety. The first settlement occupied two full years, from 1876, when the negotiations began, to June 1878, when at last all the Bills were carried successfully through the two parliaments; and it was necessary to prolong the previous arrangements (which expired at the end of 1877) till the middle of 1878. First the two ministries had to agree on the drafts of all the Bills; then the Bills had to be laid before the two parliaments. Each parliament elected a committee to consider them, and the two committees carried on long negotiations by notes supplemented by verbal discussions. Then followed the debates in the two parliaments; there was a ministerial crisis in Austria, because the House refused to accept the tax on coffee and petroleum which was recommended by the ministers; and finally a great council of all the ministers, with the emperor presiding, determined the compromise that was at last accepted. In 1887 things went better; there was some difficulty about the tariff, especially about the tax on petroleum, but Count Taaffe had a stronger position than the Austrian ministers of 1877. Ten years later, on the third renewal, the difficulties were still greater. They sprang from a double cause. First the Austrians were determined to get a more favourable division of the common expenses; that of 1867 still continued, although Hungary had grown relatively in wealth.[1] Moreover a proposed alteration in the taxes on sugar would be of considerable advantage to Hungary; the Austrians therefore demanded that henceforth the proportion should be not 68·6 : 31·4 but 58 : 42. On this there was a deadlock; all through 1897 and 1898 the Quota Deputations failed to come to an agreement. This, however, was not the worst. Parliamentary Government in Austria had broken down; the opposition had recourse to obstruction, and no business could be done. Their object was to drive out the Badeni Government, and for that reason the obstruction was chiefly directed against the renewal of the Ausgleich; for, as this was the first necessity of state, no Government could remain in office which failed to carry it through. The extreme parties of the Germans and the anti-Semites were also, for national reasons, opposed to the whole system. When, therefore, the Government at the end of 1897 introduced the necessary measures for prolonging the existing arrangements provisionally till the differences with Hungary had been settled, scenes of great disorder ensued (see section AUSTRIA, pages 26, 27), and at the end of the year the financial arrangements had not been prolonged, and neither the Bank Charter nor the Customs Union had been renewed. The Government, therefore (Badeni having resigned), had to proclaim the necessary measures by imperial warrant. Next year it was even worse, for there was obstruction in Hungary as well as in Austria; the Quota Deputations again came to no agreement, and the proposals for the renewal of the Bank Charter, the reform of the currency, the renewal of the Customs Union, and the new taxes on beer and brandy, which were laid before parliament both at Vienna and Pest, were not carried in either country; this time, therefore, the existing arrangements had to be prolonged provisionally by imperial and royal warrant both in Austria and Hungary. During 1899 parliamentary peace was restored in Hungary by the resignation of Banffy; in Austria, however, though there was again a change of ministry the only result was that the Czechs imitated the example of the Germans and resorted to obstruction so that still no business could be done. The Austrian ministry, therefore, came to an agreement with the Hungarians that the terms of the new Ausgleich should be finally proclaimed in Austria by

[1] The only change was that as the military frontier had been given over to Hungary, Hungary in consequence of this addition of territory had to pay 2 per cent., the remaining 98 per cent. being divided as before, so that the real proportion was 31·4 and 68·6.

imperial warrant; the Hungarians only giving their assent to this in return for considerable financial concessions.

The main points of the agreement were: (1) the Bank Charter was to be renewed till 1910, the Hungarians receiving a larger share in the direction than they had hitherto enjoyed; (2) the Customs Union so far as it was based on a reciprocal and binding treaty lapsed, both sides, however, continuing it in practice, and promising to do so until 31st December 1907. Not later than 1901 negotiations were to be begun for a renewal of the alliance, and if possible it was to be renewed from the year 1903, in which year the commercial treaties expire. If this is done, then the tariff is to be revised before any fresh commercial treaties are made. If it is not done, then no fresh treaties are to be made extending beyond the year 1907, so that if the Commercial Union of Austria and Hungary is not renewed before 1907, each party will be able to determine its own policy unshackled by any previous treaties.[1] These arrangements in Hungary received the sanction of the Reichstag; but this could not be procured in Austria, and they were therefore proclaimed by imperial warrant; first of all, on 20th July, the new duties on beer, brandy, and sugar; then on 23rd September the Bank Charter, &c. In November the Quota Deputations at last agreed that Hungary should henceforward pay $33\frac{4}{5}$. a very small increase, and this was also in Austria proclaimed in the same way. The result is that a working agreement has been made, by which the Union is preserved for a few years; the fact that this was done, notwithstanding the political difficulties, being the best proof of the great importance which the financial and commercial union has for the whole monarchy.

In Austria all classes regard with the most serious discontent an arrangement by which their share of the common expenses is so great. Even in such matters as the management and opening up of new railways, the Hungarians generally make terms very advantageous to themselves, *e.g.*, in Bosnia the first railways built are those which open up Hungarian traffic, though Austria provides two-thirds of the capital. All protests on the part of the Austrians are, however, unavailing because of the weakness arising from the political quarrels between the different races. Experience shows that the Hungarian ministers can generally depend on the united support of all parties in their discussions with Austria; in Austria this is not the case, for while all parties complain of the unfair burdens laid upon them, they will not join to support the ministry. It is this political disunion which brings it about that in determining the policy of the joint state the Hungarians have more influence than the Austrians; on those occasions when the Delegations have been unable to agree, and a common meeting has been held, the Hungarian view has always prevailed, for all the Hungarian Delegation vote for the proposals of their own side, while the minority in the Austrian Delegation has voted against the proposals which have been adopted by the majority. This has happened because the political principle on which the dual monarchy is founded does not correspond with facts. It was assumed that in the Austrian half of the empire the Germans would be sufficiently powerful to rule and control the other races as the Magyars do in the other; but experience has shown that they are unable to do so, while in attempting the task they have brought about a condition of political disorganization bordering on civil war, and making them helpless in their relations with Hungary. For the causes of this state of things we must turn to the history of Austria.

The weakness of Austria.

2. *Austria Proper.*

As explained at the opening of the geographical section on the Whole Monarchy, the name Austria is used for convenience to designate those portions of the possessions of the house of Hapsburg, which were not included by the settlement of 1867 among the lands of the Hungarian crown. The separation of Hungary made it necessary to determine the method by which these territories[2] were henceforth to be governed. It was the misfortune of the country that there was no clear legal basis on which new institutions could be erected. Each of the territories was a separate political unit with a separate history, and some of them had a historic claim to a large amount of self-government; in many the old feudal estates had survived till 1848. Since that year the empire had been the subject of numerous experiments in government; by the last, which began in 1860, Landtags or Diets have been instituted in each of the territories on a nearly uniform system and with nearly identical powers, and by the constitution published in February 1861 (the February Constitution, as it is called), which is still the ultimate basis for the Government, there was instituted a *Reichsrath* or parliament for the whole empire; it consisted of a House of Lords, in which sat the archbishops and prince bishops, members of the imperial family, and other members appointed for life, besides some hereditary members, and a chamber of deputies. The members of the latter for each territory were not chosen by direct election, but by the Landtags. The Landtags themselves were elected for six years; they were chosen generally (there were slight local differences) in the following way: (*a*) a certain number of bishops and rectors of universities sat in virtue of their office; (*b*) the rest of the members were chosen by four electoral bodies or *curiæ*,—(1) the owners of estates which before 1848 had enjoyed certain feudal privileges, the so-called great proprietors; (2) the chambers of commerce; (3) the towns; (4) the rural districts. In the two latter classes all had the suffrage who paid at least ten gulden in direct taxes. The districts were so arranged as to give the towns a very large representation in proportion to their populations. In Bohemia, *e.g.*, the Diet consisted of 241 members: of these five were *ex-officio* members; the feudal proprietors had seventy; the towns and chambers of commerce together had eighty-seven; the rural districts seventy-nine. The electors in the rural districts were 236,000, in the towns 93,000. This arrangement seems to have been deliberately made by Schmerling, so as to give greater power to the German inhabitants of the towns; the votes of the proprietors would moreover nearly always give the final decision to the court and the Government, for the influence exercised by the Government over the nobility would generally be strong enough to secure a majority in favour of the Government policy.

The February Constitution.

This constitution had failed; territories so different in size, history, and circumstances, were not contented with similar institutions, and a form of self-government which satisfied Lower Austria and Salzburg did not satisfy Galicia and Bohemia. The Czechs of Bohemia, like the Magyars, had refused to recognize the common parliament on the ground that it violated the historic rights of the Bohemian as of the Hungarian crown, and in 1865 the constitution of 1861 had been superseded, while the territorial Diets

[1] *Jahrbuch für gesetzgebung des deutschen Reichs.* January 1900.

[2] It is impossible to avoid using the word "Austria" to designate these territories, though it is probably incorrect. Officially the word "Austria" is not found, and though the sovereign is emperor of Austria, an Austrian empire appears not to exist; the territories are spoken of in official documents as "the territories represented in the Reichsrath." The Hungarians and the German party in Austria have expressed their desire that the word Austria should be used, but it has not been gratified. On the other hand, expressions such as "Austrian citizens," "Austrian law," are found. The reason of this peculiar use is probably twofold. On the one hand, a reluctance to confess that Hungary is no longer in any sense a part of Austria; on the other hand, the refusal of the Czechs to recognize that their country is part of Austria. Sometimes the word *Erbländer*, which properly is applied only to the older ancestral dominions of the house of Hapsburg, is used for want of a better word.

remained. In 1867 it was necessary once more to summon, in some form or another, a common parliament for the whole of Austria, by which the settlement with Hungary could be ratified.

Centralists and Federalists.

This necessity brought to a decisive issue the struggle between the parties of the Centralists and Federalists. The latter claimed that the new constitution must be made by agreement with the territories; the former maintained that the constitution of 1861 was still valid, and demanded that in accordance with it the Reichsrath should be summoned and a "constitutional" Government restored. The difference between the two parties was to a great extent, though not entirely, one of race. The kernel of the empire was the purely German district, including Upper and Lower Austria, Salzburg, Tirol (except the south), and Vorarlberg, all Styria except the southern districts, and a large part of Carinthia. There was strong local feeling, especially in Tirol, but it was local feeling similar to that which formerly existed in the provinces of France; among all classes and parties there was great loyalty both to the ruling house and to the idea of the Austrian state; but while the Liberal party, which was dominant in Lower Austria and Styria, desired to develop the central institutions, there was a strong Conservative and Clerical party which supported local institutions as a protection against the Liberal influence of a centralized parliament and bureaucracy, and the bishops and clergy were willing to gain support in the struggle by alliance with the Federalists.

The Slavonic lands.

Very different was it in the other territories where the majority of the population was not German—and where there was a lively recollection of the time when they were not Austrian. With Palacky, they said, "We existed before Austria; we shall continue to exist after it is gone." Especially was this the case in Bohemia. In this great country, the richest part of the Austrian dominions, where over three-fifths of the population were Czech, national feeling was supported by the appeal to historic law. A great party, led by Palacky and Rieger, demanded the restoration of the Bohemian monarchy in its fullest extent, including Moravia and Silesia, and insisted that the emperor should be crowned in Prague as his predecessors had been, and that Bohemia should have a position in the empire similar to that obtained by Hungary. Not only did the party include all the Czechs, but they were supported by many of the great nobles who were of German descent, including Count Leo Thun, his brother-in-law Clam-Martinicz, and Prince Schwarzenberg, Cardinal Archbishop of Prague, who hoped in a self-governing kingdom of Bohemia to preserve that power which was threatened by the German Liberals. The feudal nobles had great power arising from their wealth, the great traditions of their families, and the connexion with the court, and by the electoral law they had a large number of representatives in the Diet. On the other hand the Germans of Bohemia, fearful of falling under the control of the Czechs, were the most ardent advocates of centralization. The Czechs were supported also by their fellow-countrymen in Moravia, and some of the nobles, headed by Count Belcredi, brother of the minister; but in Brunn there was a strong German party. In Silesia the Germans had a considerable majority, and as there was a large Polish element which did not support the Czechs, the Diet refused to recognize the claims of the Bohemians.

The Poles of Galicia stood apart from the other Slavonic races. The German-speaking population was very small, consisting chiefly of Government officials, railway servants, and Jews; but there was a large minority (some 43 per cent.) of Ruthenians. The Poles wished to gain as much autonomy as they could for their own province, but they had no interest in opposing the centralization of other parts; they were satisfied if Austria would surrender the Ruthenians to them. They were little influenced by the pan-Slavonic agitation; it was desirable for them that Austria, which gave them freedom and power, should continue strong and united. Their real interests were outside the monarchy, and they did not cease to look forward to a restoration of the Polish kingdom. The great danger was that they might entangle Austria in a war with Russia.

The southern Slavs had neither the unity, nor the organization, nor the historical traditions of the Czechs and Poles; but the Slovenians, who formed a large majority of the population in Carniola and a considerable minority in the adjoining territory of Carinthia and the south of Styria, demanded that their language should be used for purposes of government and education. Their political ideal was an "Illyrian" kingdom, including Croatia and all the south Slavonians in the coast district, and a not very successful movement had been started to establish a so-called Illyrian language, which should be accepted both by Croatians and Slovenians. There was, however, another element in the southern districts, viz., the Serbs, who, though of the same race and language as the Croatians, were separated from them by religion. Belonging to the Orthodox Church they were attracted by Russia. They were in constant communication with Servia and Montenegro; and their ultimate hope, the creation of a great Servian kingdom, was less easy to reconcile with loyalty to Austria. Of late years attempts have been made to turn the Slovenian national movement into this direction, and to attract the Slovenians also towards the Orthodox non-Austrian Slavs.

South Dalmatia.

In the extreme south of Dalmatia is a small district which had not formed part of the older duchy of Dalmatia, and had not been joined to the Austrian empire till 1814; in former years part of it formed the republic of Ragusa, and the rest belonged to Albania. The inhabitants of this part, who chiefly belonged to the Greek Church, still kept up a close connexion with Albania and with Montenegro, and Austrian authority was maintained with difficulty. Disturbances had already broken out once before; and in 1869 another outbreak took place. This district had hitherto been exempted from military service; by the law of 1869, which introduced universal military service, those who had hitherto been exempted were required to serve, not in the regular army but in the militia. The inhabitants of the district round the Bocche de Cattaro (the Bocchese, as they are commonly called) refused to obey this order, and when a military force was sent it failed to overcome their resistance; and by an agreement made at Knezlac in December 1869, Rodics, who had taken command, granted the insurgents all they asked and a complete amnesty. After the conquest of Bosnia another attempt was made to enforce military service; once more a rebellion broke out, and spread to the contiguous districts of Herzegovina. This time, however, the Government, whose position in the Balkans had been much strengthened by the occupation of the new provinces, did not fear to act with decision. A considerable force was sent under Jovanowitch; they were supported from sea by the navy, and after the taking of Crevoscia the rebellion was crushed. An amnesty was proclaimed, but the greater number of the insurgents sought refuge in Montenegro rather than submit to military service.

The Italians of Trieste and Istria were the only people of the empire who really desired separation from Austria; annexation to Italy was the aim of the *Italianissimi*, as they were called. The feeling was less strong in Tirol, where, except in the city of Trent, they seem chiefly to have wished for separate local institutions, so that they should no longer be governed from Innsbruck. The Italian-speaking population on the coast of Dalmatia only asked that the Government should uphold them against the pressure of the Slavonic races in the interior, and for this reason were ready to support the German constitutionalists.

The party of centralization was then the Liberal German party, supported by a few Italians and the Ruthenians,

and as years went by it was to become the National German party. They hoped by a common parliament to create the feeling of a common Austrian nationality, by German schools to spread the use of the German language. Every grant of self-government to the territories must diminish the influence of the Germans, and bring about a restriction in the use of the German language; moreover, in countries such as Bohemia, full self-government would almost certainly mean that the Germans would become the subject race. This was a result which they could not accept. It was intolerable to them that just at the time when the national power of the non-Austrian Germans was so greatly increased, and the Germans were becoming the first race in Europe, they themselves should resign the position as rulers which they had won during the last three hundred years. They maintained, moreover, that the ascendency of the Germans was the only means of preserving the unity of the monarchy; German was the only language in which the different races could communicate with one another; it must be the language of the army, the civil service, and the parliament. They laid much stress on the historic task of Austria in bringing German culture to the half-civilized races of the east. They demanded, therefore, that all higher schools and universities should remain German, and that so far as possible the elementary schools should be Germanized. They looked on the German schoolmaster as the apostle of German culture, and they looked forward to the time when the feeling of a common Austrian nationality should obscure the national feeling of the Slavs, and the Slavonic idioms should survive merely as the local dialects of the peasantry, the territories becoming merely the provinces of a united and centralized state. The total German population was not quite a third of the whole. The maintenance of their rule was therefore only possible by the exercise of great political ability, the more so, since, as we have seen, they were not united among themselves, the clergy and Feudal party being opposed to the Liberals. Their watchword was the constitution of 1861, which had been drawn up by their leaders; they demanded that it should be restored, and with it parliamentary government. They called themselves, therefore, the Constitutional party. But the introduction of parliamentary government really added greatly to the difficulty of the task before them. In the old days German ascendency had been secured by the common army, the civil service, and the court. As soon, however, as power was transferred to a parliament, the Germans must inevitably be in a minority, unless the method of election was deliberately arranged so as to give them a majority. Parliamentary discussion, moreover, was sure to bring out those national differences which it was desirable should be forgotten, and the elections carried into every part of the empire a political agitation which was very harmful when each party represented a different race.

German Constitutional party.

The very first events showed one of those extraordinary changes of policy so characteristic of modern Austrian history. The decision of the Government on the constitutional question was really determined by immediate practical necessity. The Hungarians required that the settlement should be ratified by a parliament, therefore a parliament must be procured which would do this. It must be a parliament in which the Germans had a majority, for the system of dualism was directly opposed to the ambitions of the Slavs and the Federalists. Belcredi, who had come into power in 1865 as a Federalist, and had suspended the constitution on the 2nd January, ordered new elections for the Landtags, which were then to elect deputies to an extraordinary Reichsrath which should consider the Ausgleich. The wording of the decree implied that the February Constitution did not exist as of law; the Germans and Liberals maintaining that it did exist, and that changes could only be introduced by a regular Reichsrath summoned in accordance with it, protested against the decree, and, in some cases, threatened not to take part in the elections. As the Federalists were all opposed to the Ausgleich, it was clear that a Reichsrath chosen in these circumstances would refuse to ratify it, and this was probably Belcredi's intention. As the existence of the empire would thereby be endangered, Beust interfered; Belcredi was dismissed, Beust himself became minister-president in February 1867, and a new edict was issued from Vienna ordering the Landtags to elect a Reichsrath, according to the constitution, which was now said to be completely valid. Of course, however, those Landtags in which there was a Federalist majority, viz., those of Bohemia, Moravia, Carinthia, and Tirol, which were already pledged to support the January policy of the Government, did not acquiesce in the February policy; and they refused to elect except on terms which the Government could not accept. The first three were immediately dissolved. In the elections which followed in Bohemia the influence of the Government was sufficient to secure a German majority among the landed proprietors; the Czechs, who were therefore in a minority, declared the elections invalid, refused to take any part in electing deputies for the Reichsrath, and seceded altogether from the Landtag. The result was that Bohemia now sent a large German majority to Vienna, and the few Czechs who were chosen refused to take their seat in the parliament. Had the example of the Czechs been followed by the other Slavonic races it would still have been difficult to get together a Reichsrath to pass the Ausgleich. It was, however, easier to deal with the Poles of Galicia, for they had no historical rights to defend; and by sending delegates to Vienna they would not sacrifice any principle or prejudice any legal claim; they had only to consider how they could make the best bargain. Their position was a strong one; their votes were essential to the Government, and the Government could be useful to them; it could give them the complete control over the Ruthenians. A compact then was easily arranged.

Crisis of 1867.

Beust's compact with the Poles.

Beust promised them that there should be a special minister for Galicia, a separate board for Galician education, that Polish should be the language of instruction in all secondary schools, that Polish instead of German should be the official language in the law courts and public offices, Ruthenian being only used in the elementary schools under strict limitations. On these terms the Polish deputies, led by Ziemialkowski, agreed to go to Vienna and vote for the Ausgleich.

When the Reichsrath met, the Government had a large majority; and in the House, in which all the races except the Czechs were represented, the Ausgleich was ratified almost unanimously. This having been done, it was possible to proceed to special legislation for the territories, which were henceforward officially known as "the territories represented in the Reichsrath." A series of fundamental laws were carried, which formally established parliamentary government, with responsibility of ministers, and complete control over the budget, and there were included a number of clauses guaranteeing personal rights and liberties in the way common to all modern constitutions. The influence of the Poles was still sufficient to secure considerable concessions to the wishes of the Federalists, since if they did not get what they wished they would leave the House, and the Slovenians, Dalmatians, and Tirolese,

The constitution of 1867.

would certainly follow them. Hence the German Liberals were prevented from introducing direct elections to the Reichsrath, and the functions of the Reichsrath were slightly less extensive than they had hitherto been. Moreover the Delegation was to be chosen not by the House as a whole, but by the representatives of the separate territories. This is one reason for the comparative weakness of Austria as compared with Hungary, where the Delegation is elected by each House as a whole; the Bohemian representatives, *e.g.*, meet and choose 10 delegates, the Galicians 7, those from Trieste 1; the Delegation is therefore not representative of the majority of the Chamber of Deputies, but includes representatives of all the groups which there may be opposing the Government, and they can carry on their opposition even in the Delegation. So it came about in 1869, that on the first occasion when there was a joint sitting of the Delegations to settle a point in the budget, which Hungary had accepted and Austria rejected, the Poles and Tirolese voted in favour of the Hungarian proposal.

As soon as these laws had been carried (Dec. 1867), Beust retired from the post of minister-president; and in accordance with constitutional practice a parliamentary ministry was appointed entirely from the ranks of the Liberal majority; a ministry generally known as the "Burger Ministerium" in which Giskra and Herbst—the leaders of the German party in Moravia and Bohemia—were the most important members. Austria now began its new life as a modern constitutional state. From this time the maintenance of the revised constitution of 1867 has been the watchword of what is called the Constitutional party. The first use which the new Government made of their power was to settle the finances, and in this their best work was done. Among them were nearly all the representatives of trade and industry, of commercial enterprise and financial speculation; they were the men who hoped to make Austria a great industrial state, and at this time they were much occupied with railway enterprise. Convinced free-traders, they hoped by private energy to build up the fortunes of the country, parliamentary government—which meant for them the rule of the educated and well-to-do middle class—being one of the means to this end. They accepted the great burden of debt which the action of Hungary imposed upon the country, and rejected the proposals for repudiation, but notwithstanding the protest of foreign bond-holders they imposed a tax of 16 per cent. on all interest on the debt. They carried out an extension of the commercial treaty with Great Britain by which a further advance was made in the direction of free trade.

The Burger Ministerium.

Of equal importance was their work in freeing Austria from the control of the Church, which checked the intellectual life of the people. The *concordat* of 1855 had given the Church complete freedom in the management of all ecclesiastical affairs; there was full liberty of intercourse with Rome, the state gave up all control over the appointment of the clergy, and in matters of church discipline the civil courts had no voice—the clergy being absolutely subject to the power of the bishops, who could impose temporal as well as spiritual penalties. The state had even resigned to the Church all authority over some departments of civil life, and restored the authority of the canon law. This was the case as regards marriage; all disputes were to be tried before ecclesiastical courts, and the marriage registers were kept by the priests. All the schools were under the control of the Church; the bishops could forbid the use of books prejudicial to religion; in elementary schools all teachers were subject to the inspection of the Church, and in higher schools only Roman Catholics could be appointed. It had been agreed that the whole education of the Roman Catholic youth, in all schools, private as well as public, should be in accordance with the teaching of the Roman Catholic Church. The authority of the Church extended even to the universities. Some change in this system was essential; the Liberal party demanded that the Government should simply state that the concordat had ceased to exist. To this, however, the emperor would not assent, and there was a difficulty in overthrowing an act which took the form of a treaty. The Government wished to come to some agreement by friendly discussion with Rome, but Pius IX. was not willing to abate anything of his full claims. The ministry therefore proceeded by internal legislation, and in 1868 introduced three laws: (1) a marriage law transferred the decisions on all questions of marriage from the ecclesiastical to the civil courts, abolished the authority of the canon law, and introduced civil marriage in those cases where the clergy refused to perform the ceremony; (2) the control of secular education was taken from the Church, and the management of schools transferred to local authorities which were to be created by the Landtags; (3) complete civil equality between Catholics and non-Catholics was established. These laws, notwithstanding the protest of all the bishops, led by Cardinal Rauscher, archbishop of Vienna, who appealed directly to the emperor, were carried through both Houses in May amid almost unparalleled excitement, and at once received the imperial sanction.

The Liberals and the concordat.

The ministry had the enthusiastic support of the German population in the towns. They were also supported by the teaching profession, which desired emancipation from ecclesiastical control, and hoped that German schools and German railways were to complete the work which Joseph II. had begun. But the hostility of the Church was dangerous. The pope, in an allocution of 22nd June 1868, declared that these "damnable and abominable laws" which were "contrary to the concordat, to the laws of the Church, and to the principles of Christianity," were "absolutely and for ever null and void." The natural result was that when they were carried into effect the bishops in many cases refused to obey. They claimed that the laws were inconsistent with the concordat, that the concordat still was in force, and that the laws were consequently invalid. The argument was forcible, but the courts decided against them. Rudigier, bishop of Linz, was summoned to a criminal court for disturbing the public peace; he refused to appear, for by the concordat bishops were not subject to temporal jurisdiction; and when he was condemned to imprisonment the emperor at once telegraphed his full pardon. In the rural districts the clergy had much influence; they were supported by the peasants, and the Landtags of Tirol and Vorarlberg, where there was a clerical majority, refused to carry out the school law.

On the proclamation of papal infallibility in 1870, the Government took the opportunity of declaring that the concordat had lapsed, on the ground that there was a fundamental change in the character of the papacy. Nearly all the Austrian prelates had been opposed to the new doctrine; many of them remained to the end of the council and voted against it, and they only declared their submission with great reluctance. The New-Catholic movement, however, never made much progress in Austria. Laws regulating the position of the Church were carried in 1874. (For the concordat see LAVELEYE, *La Prusse et l'Autriche*, Paris, 1870.)

During 1868 the constitution then was open to attack on two sides, for the nationalist movement was gaining ground in Bohemia and Galicia. In Galicia the extreme party, headed by Smolka, had always desired to imitate the Czechs and not attend at Vienna; they were outvoted,

but all parties agreed on a declaration in which the final demands of the Poles were drawn up;[1] they asked that the powers of the Galician Landtag should be much increased, and that the members from Galicia should cease to attend the Reichsrath on the discussion of those matters with which the Galician Landtag should be qualified to deal. If these demands were not granted they would leave the Reichsrath. In Bohemia the Czechs were very active; while the Poles were parading their hostility to Russia in such a manner as to cause the emperor to avoid visiting Galicia, some of the Czech leaders attended a Slavonic demonstration at Moscow, and in 1868 they drew up and presented to the Diet at Prague a "declaration" which has since been regarded as the official statement of their claims. They asked for the full restoration of the Bohemian kingdom; they contended that no foreign assembly was qualified to impose taxes in Bohemia; that the Landtag was not qualified to elect representatives to go to Vienna, and that a separate settlement must be made with Bohemia similar to that with Hungary. This declaration was signed by eighty-one members, including many of the feudal nobles and bishops.[2] The German majority declared that they had forfeited their seats, and ordered new elections. The agitation spread over the country, serious riots took place, and with a view to keeping order the Government decreed exceptional laws. Similar events happened in Moravia, and in Dalmatia the revolt broke out among the Bocchese.

Nationalism in Galicia and Bohemia.

Before the combination of Clericals and Federalists the ministry broke down; they were divided among themselves; Counts Taaffe and Potocki wished to conciliate the Slavonic races—a policy recommended by Beust, probably with the sympathy of the emperor; the others determined to cripple the opposition by taking away the elections for the Reichsrath from the Landtags. Taaffe and his friends resigned, but the majority did not long survive. In March 1870, after long delay, the new Galician demands were definitely rejected; the whole of the Polish club, followed by the Tirolese and Slovenians, left the House, which consequently consisted of 110 members—the Germans and German representatives from Bohemia and Moravia. It was clearly impossible to govern with such a parliament. Not four years had gone by, and the new constitution seemed to have failed like the old one. The only thing to do was to attempt a reconcilation with the Slavs. The ministry resigned, and Potocki and Taaffe formed a Government with this object. Potocki then entered on negotiations, hoping to persuade the Czechs to accept the constitution. Rieger and Thun were summoned to Vienna; he himself went to Prague, but after two days he had to give up the attempt in despair. Feudals and Czechs all supported the declaration of 1868, and would accept no compromise, and he returned to Vienna after what was the greatest disappointment of his life. Government, however, had to be carried on; the war between Germany and France broke out in July, and Austria might be drawn into it; the emperor could not at such a crisis alienate either the Germans or the Slavs. The Reichsrath and all the Landtags were dissolved. This time in Bohemia the Czechs, supported by the Feudals and the Clericals, gained a large majority; they took their seats in the Landtag only to declare that they did not regard it as the legal representative of the Bohemian kingdom, but merely an informal assembly, and refused to elect delegates for the Reichsrath. The Germans in their turn now left the Diet, and the Czechs voted an address to the Crown, drawn up by Count Thun, demanding the restoration of the Bohemian kingdom. When the Reichsrath met there were present only 130 out of 203 members, for the whole Bohemian contingent was absent; the Government then, under a law of 1868, ordered that as the Bohemian Diet had sent no delegates, they were to be chosen directly from the people. Twenty-four Constitutionalists and thirty *Declaranten* were chosen; the latter, of course, did not go to Vienna, but the additional twenty-four made a working majority by which the Government was carried on for the rest of the year.

Parliamentary breakdown of 1870.

But Potocki's influence was gone, and as soon as the European crisis was over, in February 1871, the emperor appointed a ministry chosen not from the Liberals but from the Federalists and Clericals, led by Count Hohenwart and Schäffle, a German professor chiefly known for his writings on political economy. They attempted to solve the problem by granting to the Federalists all their demands. So long as parliament was sitting they were kept in check; as soon as it had voted supplies and the Delegations had separated, they ordered new elections in all those Landtags where there was a Liberal majority. By the help of the Clericals they won enough seats to put the Liberals in a minority in the Reichsrath, and it would be possible to revise the constitution if the Czechs consented to come. They would only attend, however, on their own terms, which were a complete recognition by the Government of the claims made in the Declaration. This was agreed to; and on the 12th September, at the opening of the Landtag, the Governor read a royal message recognizing the separate existence of the Bohemian kingdom, and promising that the emperor should be crowned. It was received with delight throughout Bohemia; and the Czechs drew a draft constitution of fundamental rights. On this the Germans, now that they were in a minority, left the Landtag, and began preparations for resistance. In Upper Austria, Moravia, and Carinthia, where they were outvoted by the Clericals, they seceded, and the whole work of 1867 was on the point of being overthrown. Were the movement not stopped the constitution would be superseded, and the union with Hungary endangered. Beust and Andrassy warned the emperor of the danger, and the crown prince of Saxony was summoned by Beust to remonstrate with him. A great council was called at Vienna (Oct. 20), at which the emperor gave his decision that the Bohemian demands could not be accepted. The Czechs must come to Vienna, and consider a revision of the constitution in a constitutional manner. Hohenwart resigned, but at the same time Beust was dismissed, and a new Cabinet was chosen once more from among the German Liberals, under the leadership of Prince Anton Auersperg, whose brother Carlos had been one of the chief members in the Burger Ministerium. For the second time in four years the policy of the Government had completely changed within a few months. On 12th September the decree had been published accepting the Bohemian claims; before the end of the year copies of it were seized by the police, and men were thrown into prison for circulating it.

The Ministry of Hohenwart.

Auersperg's ministry held office for eight years. They began, as had the Burger Ministerium, with a vigorous Liberal centralizing policy. In Bohemia they succeeded at first in almost crushing the opposition. In 1872 the Landtag was dissolved; and the whole influence of the Government was used to procure a German majority. Koller, the governor, acted with great vigour. Opposition newspapers were suppressed; cases in which Czechish journalists were concerned were transferred to the German districts, so that they were tried by a

Auersperg's ministry, 1871 to 1879.

[1] The documents are printed in Baron de Worms, *op. cit.*
[2] It is printed in the *Europäischer Geschichtskalendar*, 1868.

hostile German jury. Czechish manifestoes were confiscated, and meetings stopped at the slightest appearance of disorder; and the riots were punished by quartering soldiers upon the inhabitants. The decision between the two races turned on the vote of the feudal proprietors, and in order to win this a society was formed among the German capitalists of Vienna (to which the name of *Chabrus* was popularly given) to acquire by real or fictitious purchase portions of those estates to which a vote was attached. These measures were successful; a large German majority was secured; Jews from Vienna sat in the place of the Thuns and the Schwarzenbergs; and as for many years the Czechs refused to sit in the Landtag, the Government could be carried on without difficulty. A still greater blow to the Federalists was the passing of a new electoral law in 1873. The measure transferred the right of electing members of the Reichsrath from the Landtags to the direct vote of the people, the result being to deprive the Federalists of their chief weapon; it was no longer possible to take a formal vote of the legal representatives in any territory refusing to appoint deputies, and if a Czechish or Slovenian member did not take his seat the only result was that a single constituency was unrepresented, and the opposition weakened. The measure was strongly opposed. A petition with 250,000 names was presented from Bohemia; and the Poles withdrew from the Reichstag when the law was introduced. But enough members remained to give the legal quorum, and it was carried by 120 to 2 votes. At the same time the number of members was increased to 353, but the proportion of representatives from the different territories was maintained and the system of election was not altered. The proportion of members assigned to the towns was increased, the special representatives of the Chambers of Commerce and of the landed proprietors were retained, and the suffrage was not extended. The artificial system which gave to the Germans a parliamentary majority continued.

At this time the Czechs were much weakened by quarrels among themselves. A new party had arisen, calling themselves the *Freisinige* or Radicals, but generally known as the Young Czechs. They disliked the alliance with the aristocracy and the clergy; they wished for universal suffrage, and recalled the Hussite traditions. They desired to take their seats in the Landtag, and to join with the Germans in political reform. They violently attacked Rieger, the leader of the Old Czechs, who maintained the alliance with the Feudalists and the policy of passive opposition. Twenty-seven members of the Landtag, led by Gregr and Stadkowsky, being outvoted in the Czechish Club, resigned their seats. They were completely defeated in the elections which followed, but for the next four years the two parties among the Czechs were as much occupied in opposing one another as in opposing the Germans. These events might have secured the predominance of the Liberals for many years. The election after the Reform Bill gave them an increased majority in the Reichsrath. Forty-two Czechs who had won seats did not attend; forty-three Poles stood aloof from all party combination, giving their votes on each occasion as the interest of their country seemed to require; the real opposition was limited to forty Clericals and representatives of the other Slavonic races, who were collected on the Right under the leadership of Hohenwart. Against them were 227 Constitutionalists, and it seemed to matter little that they were divided into three groups; there were 105 in the Liberal Club under the leadership of Herbst, 57 Constitutionalists, elected by the landed proprietors, and a third body of Radicals, some of whom were more democratic than the old Constitutional party, while others laid more stress on nationality. They used their majority to carry a number of important laws regulating ecclesiastical affairs. Yet within four years the Government was obliged to turn for support to the Federalists and Clericals, and the rule of the German Liberals was overthrown. Their influence was indirectly affected by the great commercial crisis of 1873. For some years there had been active speculation on the Stock Exchange; a great number of companies, chiefly banks and building societies, had been founded on a very insecure basis. The inevitable crisis began in 1872; it was postponed for a short time, and there was some hope that the Exhibition, fixed for 1873, would bring fresh prosperity; the hope was not, however, fulfilled, and the final crash, which occurred in May, brought with it the collapse of hundreds of undertakings. The loss fell almost entirely on those who had attempted to increase their wealth by speculative investment. Sound industrial concerns were little touched by it, but speculation had become so general that every class of society was affected, and in the investigation which followed it became apparent that some of the most distinguished members of the governing Liberal party, including at least two members of the Government, were among those who had profited by the unsound finance. It appeared also that many of the leading newspapers of Vienna, by which the Liberal party was supported, had received money from financiers. For the next two years political interest was transferred from Parliament to the law courts, in which financial scandals were exposed, and the reputations of some of the leading politicians were destroyed.[1]

Czech dissensions.

Financial crisis of 1873.

This was to bring about a reaction against the economic doctrines which had held the field for nearly twenty years; but the full effect of the change was not seen for some time. What ruined the Government was the want of unity in the party, and their neglect to support a ministry which had been taken from their own ranks. In a country like Austria, in which a mistaken foreign policy or a serious quarrel with Hungary might bring about the disruption of the monarchy, parliamentary government was impossible unless the party which the Government helped in internal matters were prepared to support it in foreign affairs and in the commercial policy bound up with the settlement with Hungary. This the Constitutional parties did not do. During discussions on the Ausgleich in 1877 a large number voted against the duties on coffee and petroleum, which were an essential part of the agreement; they demanded, moreover, that the treaty of Berlin should be laid before the House, and 112 members, led by Herbst, gave a vote hostile to some of its provisions, and in the Delegation refused the supplies necessary for the occupation of Bosnia. They doubtless were acting in accordance with their principles, but the situation was such that it would have been impossible to carry out their wishes; the only result was that the Austrian ministers and Andrassy had to turn for help to the Poles, who began to acquire the position of a Government party, which they have kept since then. At the beginning of 1879 Auersperg's resignation, which had long been offered, was accepted. The Constitutionalists remained in power; but in the reconstructed Cabinet, though Stremeyer was president, Count Taaffe, as minister of the interior, was the most important member.

Fall of the Liberal ministry.

Parliament was dissolved in the summer, and Taaffe, by private negotiations, first of all persuaded the Bohemian feudal proprietors to give the Feudalists, who had long

[1] See Wirth, *Geschichte der Handelskrisen*, Frankfurt, 1885; and an interesting article by Schäffle in the *Zeitschrift f. Staatswissenschaft*, Stuttgart, 1874.

been excluded, a certain number of seats; secondly, he succeeded where Potocki had failed, and came to an agreement with the Czechs; they had already, in 1878, taken their seats in the Diet at Prague, and now gave up the policy of "passive resistance," and consented to take their seats also in the parliament at Vienna.

Count Taaffe.

On entering the House they took the oath without reservation, but in the speech from the throne the emperor himself stated that they had entered without prejudice to their convictions, and on the first day of the session Rieger read a formal reservation of right. The Liberals had also lost many seats, so that the House now had a completely different aspect; the Constitutionalists were reduced to 91 Liberals and 54 Radicals; but the Right, under Hohenwart, had increased to 57, and there were 57 Poles and 54 Czechs. A combination of these three parties might govern against the Constitutionalists. Taaffe, who now became first minister, tried first of all to govern by the help of the Moderates of all parties, and he included representatives of nearly every party in his Cabinet. But the Liberals again voted against the Government on an important military bill, an offence almost as unpardonable in Austria as in Germany, and a great meeting of the party decided that they would not support the Government. Taaffe, therefore, was obliged to turn for support to the Right. The German members of the Government resigned, their place was taken by Clericals, Poles, and Czechs, Smolka was elected president of the Reichsrath, and the German Liberals found themselves in a minority opposed by the "iron ring" of these three parties, and helpless in the parliament of their own creation. For fourteen years Taaffe succeeded in maintaining the position he had thus secured. He was not himself a party man; he had sat in a Liberal Government; he had never assented to the principles of the Federalists, nor was he an adherent of the Clerical party. He continued to rule according to the constitution; his watchword was "unpolitical politics," and he brought in little contentious legislation. The great source of his strength was that he stood between the Right and a Liberal Government. There was a large minority of Constitutionalists; they might easily become a majority, and the Right were therefore obliged to support Taaffe in order to avert this. They continued to support him, even if they did not get from him all that they could have wished, and the Czechs acquiesced in a foreign policy with which they had little sympathy. Something, however, had to be done for them, and from time to time concessions had to be made to the Clericals and the Federalists.

The Clericals.

The real desire of the Clericals was an alteration of the school law, by which the control of the schools should be restored to the Church and the period of compulsory education reduced. In this, however, the Government did not meet them, and in 1882 the Clericals, under Prince Alfred v. Liechtenstein, separated from Hohenwart's party and founded their own club, so that they could act more freely. Both the new Clerical Club and the remainder of the Conservatives were much affected by the reaction against the doctrines of economic Liberalism. They began to adopt the principles of Christian Socialism expounded by Rudolf Mayer and Baron von Vogelfang, and the economic revolt against the influence of capital was with them joined to a half-religious attack upon the Jews. They represented that Austria was being governed by a close ring of political financiers, many of whom were Jews or in the pay of the Jews, who used the forms of the constitution, under which there was no representation of the working classes, to exploit the labour of the poor at the same time that they ruined the people by alienating them from Christianity in "godless schools." It was during these years that the foundation for the democratic clericalism of the future was laid. The chief political leader in this new tendency was Prince Aloys v. Liechtenstein, who complained of the political influence exercised by the chambers of commerce, and demanded the organization of working men in guilds. It was by their influence that a law was introduced limiting the rate of interest, and they co-operated with the Government in legislation for improving the material condition of the people, which had been neglected during the period of Liberal government, and which was partly similar to the laws introduced at the same time in Germany.

Social legislation.

There seems no doubt that the condition of the workmen in the factories of Moravia and the oil-mines of Galicia was peculiarly unfortunate; the hours of work were very long, the conditions were very injurious to health, and there were no precautions against accidents. The report of a parliamentary inquiry, called for by the Christian Socialists, showed the necessity for interference. In 1883 a law was carried, introducing factory inspection, extending to mines and all industrial undertakings. The measure seems to have been successful, and there is a general agreement that the inspectors have done their work with skill and courage. In 1884 and 1885 important laws were passed regulating the work in mines and factories, and introducing a maximum working day of eleven hours in factories, and ten hours in mines. Sunday labour was forbidden, and the hours during which women and children could be employed were limited. Great power was given to the administrative authorities to relax the application of these laws in special cases and special trades. This power was at first freely used, but it was closely restricted by a further law of 1893. In 1887-88 laws, modelled on the new German laws, introduced compulsory insurance against accidents and sickness. These measures, though severely criticized by the Opposition, were introduced to remedy obvious, and in some cases terrible social evils. Other laws to restore guilds among working men had a more direct political object. Another form of State Socialism was the acquisition of railways by the state. Originally railways had been built by private enterprise, supported in some cases by a state guarantee; a law of 1877 permitted the acquisition of private lines; when Taaffe retired the state possessed nearly 5000 miles of railway, not including these which belonged to Austria and Hungary conjointly. In 1899 a minister of railways was appointed. In this policy military considerations as well as economic were of influence. In every department we find the same reaction against the doctrines of *laissez-faire*. In 1889 for the first time the Austrian budget showed a surplus, partly the result of the new import duties, partly due to a reform of taxation.

For a fuller description of these social reforms, see the *Jahrbuch für Gesetzgebung*, Leipzig, 1886, 1888, and 1894; also the annual summary of new laws in the *Zeitschrift für Staatswissenschaft*, Stuttgart. For the Christian Socialists, see NITTI, *Catholic Socialism*, London, 1895.

The language question.

Meanwhile it was necessary for the Government to do something for the Czechs and the other Slavs, on whose support they depended for their majority. The influence of the Government became more favourable to them in the matter of language, and this caused the struggle of nationalities to assume the first place in Austrian public life—a place which it has ever since maintained. The question of language becomes a political one, so far as it concerns the use of different languages in the public offices and law courts, and in the schools. There never was any

general law laying down clear and universal rules, but since the time of Joseph II. German had been the ordinary language of the Government. All laws were published in German; German was the sole language used in the central public offices in Vienna, and the language of the court and of the army; moreover, in almost every part of the monarchy it had become the language of what is called the *internal service* in the public offices and law courts; all books and correspondence were kept in German, not only in the German districts, but also in countries such as Bohemia and Galicia. The bureaucracy and the law courts had therefore become a network of German-speaking officialism extending over the whole country; no one had any share in the Government unless he could speak and write German. The only exception was in the Italian districts; not only in Italy itself (in Lombardy, and afterwards in Venetia), but in South Tirol, Trieste, Istria, and Dalmatia, Italian has always been used, even for the internal service of the Government offices, and it remains to this day the language of the Austrian navy. Any interference with the use of German would be a serious blow to the cause of those who hoped to Germanize the whole empire. Since 1867 the old rules have been maintained absolutely as regards the army, and German has also, as required by the military authorities, become the language of the railway administration. It remains the language of the central offices in Vienna, and is the usual, though not the only, language used in the Reichsrath. In 1869 a great innovation was made, when Polish was introduced throughout the whole of Galicia as the normal language of Government; and since that time the use of German has almost entirely disappeared in that territory. Similar innovations have also begun, as we shall see, in other parts.

Different from this is what is called the *external service*. Even in the old days it was customary to use the language of the district in communication between the Government offices and private individuals, and evidence could be given in the law courts in the language generally spoken. This was not the result of any law, but depended on administrative regulations of the Government service; it was practically necessary in remote districts, such as Galicia and Bukovina, where few of the population understood German. In some places a Slavonic-speaking individual would himself have to provide the interpreter, and approach the Government in German. Local authorities, *e.g.*, town councils and the Diets, were free to use what language they wished, and in this matter the Austrian Government has shown great liberality. The constitution of 1867 laid down a principle of much importance, by which previous custom became established as a right. Article 19 runs: "All races of the empire have equal rights, and every race has an inviolable right to the preservation and use of its own nationality and language. The equality of all customary (*landesüblich*) languages in school, office, and public life, is recognized by the state. In those territories in which several races dwell, the public and educational institutions are to be so arranged that, without applying compulsion to learn a second *Landessprache*, each of the races receives the necessary means of education in its own language." The application of this law gives great power to the Government, for everything depends on what is meant by *landesüblich*, and it rests with them to determine when a language is customary. The Germans demand the recognition of German as a customary language in every part of the empire, so that a German may claim to have his business attended to in his own language, even in Dalmatia and Galicia. In Bohemia the Czechs claim that their language shall be recognized as customary, even in those districts such as Reichenberg, which are almost completely German; the Germans, on the other hand, claim that Czechish shall only be recognized in those towns and districts where there is a considerable Czech population. What Taaffe's Administration did was to interpret this law in a sense more favourable to the Slavs than had hitherto been the case.

Peculiar importance is attached to the question of education. The law of 1867 required that the education in the elementary schools in the Slavonic districts should be given in Czech, or Slovenian, as the case might be. The Slavs, however, required that, even when a small minority of Slavonic race settled in any town, they should not be compelled to go to the German schools, but should have their own school provided for them; and this demand was granted by Prazak, minister of education under Count Taaffe. The Germans had always hoped that the people as they became educated would cease to use their own particular language. Owing to economic causes the Slavonic races, who increase more rapidly than the Germans, tend to move westwards, and large numbers settle in the towns and manufacturing districts. It might have been expected that they would then cease to use their own language and become Germanized; but, on the contrary, the movement of population is spreading their language, and they claim that special schools shall be provided for them, and that men of their own nationality should be appointed to Government offices to deal with their business. This has happened not only in many places in Bohemia, but in Styria, and even in Vienna, where there has been a great increase in the Czechish population and a Czechish school has been founded. The introduction of Slavonic into the middle and higher schools has affected the Germans in their most sensitive point. They have always insisted that German is the *Kultur-sprache*. On one occasion Count A. Auersperg (Anastasius Grün) entered the Landtag of Carniola carrying the whole of the Slovenian literature under his arm, as evidence that the Slovenian language could not well be substituted for German as a medium of higher education.

The first important regulations which were issued under the law of 1867 applied to Dalmatia, and for that country between 1872 and 1876 a series of laws and edicts were issued determining to what extent the Slavonic idioms were to be recognized. Hitherto all business had been done in Italian, the language of a small minority living in the seaport towns. The effect of these laws has been to raise Croatian to equality with Italian. It has been introduced in all schools, so that nearly all education is given in Croatian, even though a knowledge of Italian is quite essential for the maritime population; and it is only in one or two towns, such as Zara, the ancient capital of the country, that Italian is able to maintain itself. Since 1882 there has been a Slavonic majority in the Diet, and Italian has been disused in the proceedings of that body. In this case the concessions to the Servo-Croatians had been made by the Liberal ministry; they required the parliamentary support of the Dalmatian representatives, who were more numerous than the Italian, and it was also necessary to cultivate the loyalty of the Slavonic races in this part so as to gain a support for Austria against the Russian party, which was very active in the Balkan Peninsula. It was better to sacrifice the Italians of Dalmatia than the Germans of Carinthia.[1]

It was not till 1879 that the Slovenians received the support of the Government. In Carniola they succeeded, in 1882, in winning a majority in the Diet, and from this time while the Diet of Styria is the centre of the German, that of Carniola is the chief support of the Slovenian

[1] For Dalmatia, see T. G. Jackson, *Dalmatia*, &c. Oxford, 1889.

agitation. In the same year they won the majority in the town council of Laibach, which had hitherto been German. They were able, therefore, to introduce Illyrian as the official language, and cause the names of the streets to be written up in Illyrian. This question of street names is, as it were, a sign of victory. Serious riots broke out in some of the towns of Istria when, for the first time, Illyrian was used for this purpose as well as Italian. In Prague the victory of the Czechs has been marked by the removal of all German street names, and the Czechish town council even passed a bye-law forbidding private individuals to have tablets put up with the name of the street in German. In consequence of a motion by the Slovenian members of the Reichsrath and a resolution of the Diet of Carniola, the Government also declared Slovenian to be a recognized language for the whole of Carniola, for the district of Cilli in Styria, and for the Slovenian and mixed districts in the south of Carinthia, and determined that in Laibach a Slovenian gymnasium should be maintained as well as the German one.

The Germans complain that in many cases the Government acted very unfairly to them. They constantly refer to the case of Klagenfurt. This town in Carinthia had a population of 16,491 German-speaking Austrians; the Slovenian-speaking population numbered 568, of whom 180 were inhabitants of the gaol or the hospital. The Government, however, in 1880 declared Slovenian a customary language, so that provision had to be made in public offices and law courts for dealing with business in Slovenian. It must be remembered, however, that even though the town was German, the rural population of the surrounding villages was chiefly Slovenian.

It was in Bohemia and Moravia that the contest was fought out with the greatest vehemence. The two races were nearly equal, and the victory of Czechish would mean that nearly two million Germans would be placed in a position of subordination; but for the last twenty years there had been a constant encroachment by Czechish on German. This was partly due to the direct action of the Government. An ordinance of 1880 determined that henceforward all business which had been brought before any government office or law court should be dealt with, within the office, in the language in which it was introduced; this applied to the whole of Bohemia and Moravia, and meant that Czechish would henceforward have a position within the Government service. It was another step in the same direction when, in 1886, it was ordered that "to avoid frequent translations" business introduced in Czechish should be dealt with in the same language in the high courts of Prague and Brunn. Then not only were a large number of Czechish elementary schools founded, but also many middle schools were given to the Czechs, and Czechish classes introduced in German schools; and, what affected the Germans most, in 1882 classes in Czechish were started in the university of Prague—a desecration, as it seemed, of the oldest German university.

The growth of the Slavonic races was, however, not merely the result of Government assistance; it had begun long before Taaffe assumed office; it was to be seen in the census returns and in the results of elections. Prague was no longer the German city it had been fifty years before; the census of 1880 showed 36,000 Germans to 120,000 Czechs. It was the same in Pilsen. In 1861 the Germans had a majority in this town; in 1880 they were not a quarter of the population. This same phenomenon, which occurs elsewhere, cannot be attributed to any laxity of the Germans. The generation which was so vigorously demanding national rights had themselves all been brought up under the old system in German schools, but this had not implanted in them a desire to become German. It was partly due to economic causes—the greater increase among the Czechs, and the greater migration from the country to the towns; partly the result of the romantic and nationalist movement which had arisen about 1830, and partly the result of establishing popular education and parliamentary government at the same time. As soon as these races which had so long been ruled by the Germans received political liberty and the means of education, they naturally used both to reassert their national individuality.

It may be suggested that the resistance to the German language is to some extent a result of the increased national feeling among the Germans themselves. They have made it a matter of principle. In the old days it was common for the children of German parents in Bohemia to learn Czechish; since 1867 this has ceased to be the case. It may almost be said that they make it a point of honour not to do so. A result of this is that, as educated Czechs are generally bilingual, it is easier for them to obtain appointments in districts where a knowledge of Czechish is required, and the Germans therefore regard every order requiring the use of Czechish as an order which excludes Germans from a certain number of posts. This attitude of hostility and contempt is strongest among the educated middle class; it is not shown to the same extent by the clergy and the nobles.

The influence of the Church is also favourable to the Slavonic races, not so much from principle as owing to the fact that they supply more candidates for ordination than the Germans. There is no doubt, however, that the tendency among Germans has been to exalt the principle of nationality above religion, and to give it an absolute authority in which the Roman Catholic Church cannot acquiesce. In this, as in other ways, the Germans in Austria have been much influenced by the course of events in the German empire. This hostility of the Church to the German nationalist movement led in 1898 to an agitation against the Roman Catholic Church, and among the Germans of Styria and other territories large numbers left the Church, going over either to Protestantism or to Old Catholicism. This "Los von Rom" movement, which was caused by the continued alliance of the Clerical party with the Slavonic parties, is more of the nature of a political demonstration than of a religious movement.

[There is a very extensive literature on the question of languages and nationality in Austria. The best statement of the legal question will be found in ULBRICH and MISCHLER, *Oesterreichisches Staats-Wörterbuch*. See also DUMMREICHER, *Südostdeutsche Betrachtungen*. Leipzig, 1893.—HAINISCH. *Die Zukunft der Deutsch. Oesterreicher*. Vienna, 1892.—HERKNER. *Die Zukunft der Deutsch. Oesterreicher*. Vienna, 1893.—SCHLESINGER. *Die Nationalitäts Verhältnisse Böhmens*. Prague, 1886.—LÉGER. *La Save, le Danube et le Balkan*. Paris, 1884.—BRESSNITZ VON SYDACOFF, *Die Panslavistische Agitation*. Berlin, 1899.]

German hostility.

The Germans, so long accustomed to rule, now saw their old ascendency threatened, and they defended it with an energy that increased with each defeat. In 1880 they founded a great society, the *Deutscher Schul-Verein*, to establish and assist German schools. It spread over the whole of the empire; in a few years it numbered 100,000 members, and had an income of nearly 300,000 gulden; no private society in Austria had ever attained so great a success. In the Reichsrath a motion was introduced, supported by all the German Liberal parties, demanding that German should be declared the language of state and regulating the conditions under which the other idioms could be recognized; it was referred to a committee from which it never emerged, and a bill to the same effect, introduced in 1886, met a similar fate. In Bohemia they demanded, as a means of protecting themselves against the effect of the language ordinances, that the country should be divided into two parts; in one German was to be the sole language, in the other Czech was to be recognized. A proposal to this effect was introduced by them in the Landtag at the end of 1886, but since 1882 the Germans had been in a minority. The Czechs, of course, refused even to consider it; it would have cut away the ground on which their whole policy was built up, namely, the indissoluble unity of the Bohemian kingdom, in which German and Czech should throughout be recognized as equal and parallel

languages. It was rejected on a motion of Prince Karl Schwarzenberg without discussion, and on this all the Germans rose and left the Landtag, thereby imitating the action of the Czechs in old days when they had the majority.

These events produced a great change on the character of the German opposition. It became more and more avowedly racial; the defence of German nationality was put in the front of their programme. The growing national animosity added bitterness to political life, and destroyed the possibility of a strong homogeneous party on which a government might depend. The beginning of this movement can be traced back to the year 1870. About that time a party of young Germans had arisen who professed to care little for constitutionalism and other "legal mummies," but made the preservation and extension of their own nationality their sole object. As is so often the case in Austria, the movement began in the university of Vienna, where a *Lese-Verein* of German students was formed as a point of cohesion for Germans, which had eventually to be suppressed. The first representative of the movement in parliament was Herr von Schoenerer, who did not scruple to declare that the Germans looked forward to union with the German empire. They were strongly influenced by men outside Austria. Bismarck was their national hero, the anniversary of Sedan their political festival, and approximation to Germany was dearer to them than the maintenance of Austria. After 1878 a heightening of national feeling began among the Radicals, and in 1881 all the German parties in opposition joined together in a club called the *United Left*, and in their programme put in a prominent place the defence of the position of the Germans as the condition for the existence of the state, and demanded that German should be expressly recognized as the official language. The younger and more ardent spirits, however, found it difficult to work in harmony with the older constitutional leaders. They complained that the party leaders were not sufficiently decisive in the measures for self-defence. In 1885 great festivities in honour of Bismarck's eightieth birthday, which had been arranged in Gratz, were forbidden by the Government, and the Germans of Styria were very indignant that the party did not take up the matter with sufficient energy. After the elections of 1885 the Left therefore broke up again into two clubs, the *German Austrian*, which included the more moderate, and the *German*, which wished to use sharper language. The German Club, *e.g.*, congratulated Bismarck on his measures against the Poles; the German Austrians refused to take cognizance of events outside Austria with which they had nothing to do. Even the German Club was not sufficiently decided for Herr von Schoenerer and his friends, who broke off from it and founded a *National German Union*. They spoke much of *Germanenthum* and "Unverfälschtes Deutschthum," and they advocated a political union with the German empire, and were strongly anti-Hungarian and wished to resign all control over Galicia, if by a closer union with Germany they could secure German supremacy in Bohemia and the south Slavonian countries. They play the same part in Austria as does the "pan-Germanic Union" in Germany. When in 1888 the two clubs, the German Austrians and the Germans, joined once more under the name of the *United German Left* into a new club with eighty-seven members, so as the better to guard against the common danger and to defeat the educational demands of the Clericals, the National Germans remained apart with seventeen members. They were also infected by the growing spirit of anti-Semitism. The German parties had originally been the party of the capitalists, and comprised a large number of Jews; this new German party committed itself to violent attacks upon the Jews, and for this reason alone any real harmony between the different branches would have been impossible.

New German parties.

Notwithstanding the concessions about language the Czechs had, however, made no advance towards their real object—the recognition of the Bohemian kingdom. Perhaps the leaders of the party, who were now growing old, would have been content with the influence they had already attained, but they were hard pressed at home by the Young Czechs, who were more impatient. When Count Thun was appointed governor of Bohemia their hopes ran high, for he was supposed to favour the coronation of the emperor at Prague. In 1890, however instead of proceeding to the coronation as was expected, Taaffe attempted to bring about a reconciliation between the opposing parties. The influence by which his policy was directed is not quite clear, but the Czechs had been of recent years less easy to deal with, and Taaffe had never really shown any wish to alter the constitution; his policy always was to destroy the influence of parliament by playing off one party against the other, and so to win a clear field for the Government. During the month of January conferences were held at Vienna, with Taaffe in the chair, to which were invited representatives of the three groups into which the Bohemian representatives were divided, the German party, the Czechs, and the Feudal party. After a fortnight's discussion an agreement was made on the basis of a separation between the German and the Czechish districts, and a revision of the electoral law. A protocol enumerating the points agreed on was signed by all who had taken part in the conference, and in May Bills were laid before the Landtag incorporating the chief points in the agreement. But they were not carried; the chief reason being that the Young Czechs had not been asked to take part in the conference, and did not consider themselves bound by its decisions; they opposed the measures and had recourse to obstruction, and a certain number of the Old Czechs gradually came over to them. Their chief ground of criticizing the proposed measures was that they would threaten the unity of the Bohemian country.[1] At the elections in 1891 a great struggle took place between the Old and the Young Czechs. The latter were completely victorious; Rieger, who had led the party for thirty years, disappeared from the Reichsrath. The first result was that the proposed Ausgleich with Bohemia came to an end. But the disappearance of the Old Czechs made the parliamentary situation very insecure. The Young Czechs could not take their place; their Radical and anti-Clerical tendencies alarmed the Feudalists and Clericalists who formed so large a part of the Right; they attacked the alliance with Germany; they made public demonstration of their French sympathies; they entered into communication with other Slavonic races, especially the Serbs of Hungary and Bosnia; they demanded universal suffrage, and occasionally supported the German Radicals in their opposition to the Clerical parties, especially in educational matters; under their influence disorder increased in Bohemia, a secret society called the *Umladina* (in imitation of the Servian society of that name) was discovered, and stringent measures had to be taken to preserve order. The Government therefore veered round towards the German Liberals; some of the ministers most obnoxious to the Germans resigned, and their places were taken by Germans. For two years the Government seemed to waver, looking now to the Left,

The Ausgleich with Bohemia.

[1] On this see Menger, *Der Ausgleich mit Böhmen*, Vienna, 1891, where the documents are printed.

now to Hohenwart and his friends; for a time Taaffe really had the support of all parties except the Young Czechs.

After two years he gave up his cautious policy and took a bold move. In October 1893 he introduced a Reform Bill. Universal suffrage had long been demanded by the working men and the Socialists; the Young Czechs also had put it on their programme, and many of the Christian Socialists and anti-Semites desired an alteration of the franchise. Taaffe's Bill, while keeping the *Curiæ* of the feudal proprietors and the chambers of commerce as they were, and making no change in the number of members, proposed to give the franchise in both towns and rural districts to every one who could read and write, and had resided six months in one place. This was opposed by the Liberals, for with the growth of Socialism and anti-Semitism, they knew that the extension of the franchise would destroy their influence. On this Taaffe had probably calculated, but he had omitted to inquire what the other parties would do. He had not even consulted Hohenwart, to whose assistance he owed his long tenure of power. Not even the pleasure of ruining the Liberals was sufficient to persuade the Conservatives to vote for a measure which would transfer the power from the well-to-do to the indigent, and Hohenwart justly complained that they ought to have been secure against surprises of this kind. The Poles also were against a measure which would give more influence to the Ruthenians. The position of the Government was hopeless, and without waiting for a division Taaffe resigned.

Electoral reform.

The event to which for fourteen years the Left had looked forward had now happened. Once more they could have a share in the Government, which they always believed belonged to them by nature. Taught by experience and adversity, they did not scruple to enter into an alliance with their old enemies, and a coalition ministry was formed from the Left, the Clericals, and the Poles. The president was Prince Alfred Windisch-Grätz, grandson of the celebrated general, one of Hohenwart's ablest lieutenants; Hohenwart himself did not take office. Of course an administration of this kind could not take a definite line on any controversial question, but during 1894 they carried through the commercial treaty with Russia and the laws for the continuance of the currency reform. The differences of the clubs appeared, however, in the discussions on reform; the Government, not strong enough to have a policy of its own, had referred the matter to a committee; for the question having once been raised, it was impossible not to go on with it. This would probably have been fatal to the coalition, but the final blow was given by a matter of very small importance arising from the disputes on nationality. The Slovenians had asked that in the gymnasium at Cilli classes in which instruction was given in Slovenian should be formed parallel to the German classes. This request caused great excitement in Styria and the neighbouring districts; the Styrian Diet (from which the Slovenian minority had seceded) protested. The Slovenians were, however, members of the Hohenwart Club, so Hohenwart and his followers supported the request, which was adopted by the ministry. The German Left opposed it; they were compelled to do so by the popular indignation in the German districts; and when the vote was carried against them (12th June 1895) they made it a question of confidence, and formally withdrew their support from the Government, which therefore at once resigned.

The coalition ministry, 1893.

After a short interval the emperor appointed as minister-president Count Badeni, who had earned a great reputation as governor of Galicia. He formed an administration the merit of which, as of so many others, was that it was to belong to no party and to have no programme. He hoped to be able to work in harmony with the moderate elements of the Left; his mission was to carry through the Ausgleich with Hungary; to this everything else must be subordinated. During 1896 he succeeded in carrying a Reform Bill, which satisfied nearly all parties. All the old categories of members were maintained, but a fifth *curia* was added, in which almost any one might vote who had resided six months in one place and was not in domestic service; in this way seventy-two would be added to the existing members. This matter having been settled, parliament was dissolved. The result of the elections of 1897 was the return of a House so constituted as to make any strong Government impossible. On both sides the anti-Semitic parties representing the extreme demagogic elements were present in considerable numbers. The United German Left had almost disappeared; it was represented only by a few members chosen by the great proprietors; in its place there were the three parties—the German Popular party, the German Nationalists, and the German Radicals—who all put questions of nationality first and had deserted the old standpoint of the constitution. Then there were the fourteen Social Democrats who had won their seats under the new franchise. The old party of the Right was however also broken up; side by side with forty-one Clericals there were twenty-eight Christian Socialists led by Dr Lueger, a man of great oratorical power, who had won a predominant influence in Vienna, so long the centre of Liberalism, and had quite eclipsed the more modest efforts of Prince Liechtenstein. As among the German National party, there were strong nationalist elements in his programme, but they were chiefly directed against Jews and Hungarians; Lueger had already distinguished himself by his violent attacks on Hungary, which had caused some embarrassment to the Government at a time when the negotiations for the Ausgleich were in progress. Like anti-Semites elsewhere, the Christian Socialists were reckless and irresponsible, appealing directly to the passions and prejudices of the most ignorant. There were altogether 200 German members of the Reichsrath, but they were divided into eight parties, and nowhere did there seem to be the elements on which a Government could be built up.

Badeni's ministry.

The Parliamentary situation is best explained by the following table showing the parties:—

	1897.		1901.	
German Liberals—				
Constitutional Landed Proprietors	28		28	
German Radicals	49		41	
German Popular Party	42		51	
Schoenerer Group	5		21	
Kronawetter	1		...	
Democrat	1		...	
	—	126	—	141
Social Democrats	14			10
German Conservatives—				
German Clericals	30		37	
Catholic Popular Party	15			
Christian Socialists	28		23	
	—	73	—	60
Federalist Great Proprietors	16			16
Czechs—				
Young Czechs	60		53	
Radical Young Czechs	1		4	
Clerical Czechs	1		2	
Agrarian Czechs	1		6	
	—	63	—	65
Poles—				
Polish Club	59		60	
Stoyalovski Group	6		...	
Popular Polish Party	3		11	
	—	68	—	71
Carry forward		360		363

	1897.		1901.	
Brought forward		360		363
Slovenians—				
Clerical Slovenians	11		...	
Radical ,,	5		...	
	—	16	—	16
Italians—				
Liberal Italians	14		...	
Clerical ,,	5		...	
	—	19	—	19
Croatians		11	...	9
Serbs		2	...	2
Ruthenians—				
Ruthenians	6		...	
Young Ruthenians	5		...	
	—	11	—	11
Rumanians—				
Rumanians	5		...	
Young Rumanian	1		...	
	—	6	—	5
Total		425		425

The most remarkable result of the elections was the disappearance of the Liberals in Vienna. In 1879, out of 37 members returned in Lower Austria, 33 were Liberals. Now the Christian Socialists were first with 28, then the Socialists with 14, and the few remaining seats were divided between the Nationalists and the Radicals. It was impossible to maintain a strong party of moderate constitutionalists, on whom the Government could depend, unless there was a large nucleus from Lower Austria. The influence of Lueger was very embarrassing; he had now a majority of two-thirds in the town council, and had been elected burgomaster. The emperor had refused to confirm the election; he had been re-elected, and then the emperor, in a personal interview, appealed to him to withdraw. He consented to do so; but, after the election of 1897 had given him so many followers in the Reichsrath, Badeni advised that his election as burgomaster should be confirmed. There was violent antipathy between the Christian Socialists and the German Nationalists, and the transference of their quarrels from the Viennese Council Chamber to the Reichsrath was very detrimental to the orderly conduct of debate.

Socialism.

The limited suffrage had hitherto prevented Socialism from becoming a political force in Austria as it had in Germany, and the national divisions have always impeded the creation of a centralized Socialist party. The first object of the working classes necessarily was the attainment of political power; in 1867 there had been mass demonstrations and petitions to the Government for universal suffrage. During the next years there was the beginning of a real Socialist movement in Vienna and in Styria, where there is a considerable industrial population; after 1879, however, the growth of the party was interrupted by the introduction of anarchical doctrines. Most's paper, the *Freiheit*, was introduced through Switzerland, and had a large circulation. The anarchists, under the leadership of Peukert, seem to have attained considerable numbers. In 1883-84 there were a number of serious strikes, collisions between the police and the workmen, followed by assassinations; it was a peculiarity of Austrian anarchists that in some cases they united robbery to murder. The Government, which was seriously alarmed, introduced severe repressive measures; the leading anarchists were expelled or fled the country. In 1887, under the leadership of Dr Adler, the Socialist party began to revive (the party of violence having died away), and since then it has steadily gained in numbers; in the forefront of the political programme is put the demand for universal suffrage. In no country is the 1st of May, as the festival of Labour, celebrated so generally.

Badeni after the election sent in his resignation, but the emperor refused to accept it, and he had therefore to do the best he could and turn for support to the other nationalities. The strongest of them were the fifty-nine Poles and sixty Young Czechs; he therefore attempted, as Taaffe had done, to come to some agreement with them. The Poles were always ready to support the Government: among the Young Czechs the more moderate had already attempted to restrain the wilder spirits of the party, and they were quite prepared to enter into negotiations. They did not wish to lose the opportunity which now was open to them of winning influence over the administration. What they required was further concession as to the language in Bohemia. In May 1897 Badeni therefore published his celebrated *ordinances*. They determined (1) that all correspondence and documents regarding every matter brought before the Government officials should be conducted in the language in which it was first introduced. This applied to the whole of Bohemia, and meant the introduction of Czech into the government offices throughout the whole of the kingdom; (2) after 1903 no one was to be appointed to a post under the Government in Bohemia until he had passed an examination in Czech. These ordinances fulfilled the worst fears of the Germans. The German Nationalists and Radicals declared that no business should be done till they were repealed and Badeni dismissed. They resorted to obstruction. They brought in repeated motions to impeach the ministers, and parliament had to be prorogued in June, although no business of any kind had been transacted. Badeni had not anticipated the effect his ordinances would have; as a Pole he had little experience in the western part of the empire. During the recess he tried to open negotiations, but the Germans refused even to enter into a discussion until the ordinances had been withdrawn. The agitation spread throughout the country; great meetings were held at Eger and Aussig, which were attended by Germans from across the frontier, and led to serious disturbances; the cornflower, which had become the symbol of German nationality and union with Germany, was freely worn, and the language used was in many cases treasonable. The emperor insisted that the Reichsrath should again be summoned to pass the necessary measures for the Ausgleich; scenes then took place which have no parallel in parliamentary history. To meet the obstruction it was determined to sit at night, but this was unsuccessful. On one occasion Dr Lecher, one of the representatives of Moravia, spoke for twelve hours, from 9 P.M. till 9 A.M., against the Ausgleich. The opposition was not always limited to feats of endurance of this kind. On 3rd November there was a free fight in the House; it arose from a quarrel between Dr Lueger and the Christian Socialists on the one side (for the Christian Socialists had supported the Government since the confirmation of Lueger as burgomaster) and the German Nationalists under Dr Wolff, a German from Bohemia, the violence of whose language had already caused Badeni to challenge him to a duel. The Nationalists refused to allow Lueger to speak, clapping their desks, hissing, and making other noises, till at last the Young Czechs attempted to prevent the disorder by violence. On 24th November the scenes of disturbance were renewed. The president, Herr v. Abramovitch, an Armenian from Galicia, refused to call on Schoenerer to speak. The Nationalists therefore stormed the platform, and the president and ministers had to fly into their private rooms to escape personal violence, until the Czechs came to their rescue, and by superiority in numbers and physical strength severely punished Herr Wolff and his friends. The rules of the House giving the president no authority for maintaining order, he determined, with the assent of the ministers, to propose

The language ordinances of 1897.

alterations in procedure. The next day, when the sitting began, one of the ministers, Count Falkenhayn, a Clerical who was very unpopular, moved "That any member who continued to disturb a sitting after being twice called to order could be suspended—for three days by the president, and for thirty days by the House." The din and uproar was such that not a word could be heard, but at a pre-arranged signal from the president all the Right rose, and he then declared that the new order had been carried, although the procedure of the House required that it should be submitted to a committee. The next day, at the beginning of the sitting, the Socialists rushed on the platform, tore up and destroyed all the papers lying there, seized the president, and held him against the wall. After he had escaped eighty police were introduced into the House and carried out the fourteen Socialists. The next day Herr Wolff was treated in the same manner. The excitement spread to the street. Serious disorders took place in Vienna and in Gratz; the German opposition had the support of the people, and Lueger warned the ministers that as burgomaster he would be unable to maintain order in Vienna; even the Clerical Germans showed signs of deserting the Government. The emperor, hastily summoned to Vienna, accepted Badeni's resignation, the Germans having thus by obstruction attained part of their wishes. The new minister, Gautsch, a man popular with all parties, held office for three months; he proclaimed the budget and the Ausgleich, and in February replaced the language ordinances by others, under which Bohemia was to be divided into three districts—one Czechish, one German, and one mixed. The Germans, however, were not satisfied with this; they demanded absolute repeal. The Czechs also were offended; they arranged riots at Prague; the professors in the university refused to lecture unless the German students were defended from violence; Gautsch resigned, and Thun, who had been governor of Bohemia, was appointed minister. Martial law was proclaimed in Bohemia, and strictly enforced. Thun then arranged with the Hungarian ministers a compromise about the Ausgleich.

Badeni resigns.

The Reichsrath was again summoned, and the meetings were less disturbed than in the former year, but the Germans still prevented any business from being done. The Germans now had a new cause of complaint. Paragraph 14 of the law of 1867 provided that, in cases of pressing necessity, orders for which the assent of the Reichsrath was required might, if the Reichsrath were not in session, be proclaimed by the emperor; they had to be signed by the whole ministry, and if they were not laid before the Reichsrath within four months of its meeting, or if they did not receive the approval of both Houses, they ceased to be valid. The Germans contended that the application of this clause to the Ausgleich was invalid, and demanded that it should be repealed. Thun had in consequence to retire, in September 1899. His successor, Count Clary, began by withdrawing the ordinances which had been the cause of so much trouble, but it was now too late to restore peace. The Germans were not sufficiently strong and united to keep in power a minister who had brought them the relief for which they had been clamouring for two years. The Czechs, of course, went into opposition, and used obstruction. The extreme German party, however, took the occasion to demand that paragraph 14 should be repealed. Clary explained that this was impossible, but he gave a formal pledge that he would not use it. The Czechs, however, prevented him passing a law on excise which was a necessary part of the agreements with Hungary; it was therefore impossible for him to carry on the government without breaking his word; there was therefore nothing left for him to do but to resign, after holding office for less than three months. The emperor then appointed a ministry of officials, who were not bound by his pledge, and used paragraph 14 for the necessary purposes of state. They then made way for a ministry under Herr v. Körber. During the early months of 1900 matters were more peaceful, and Körber hoped to be able to arrange a compromise; but the Czechs now demanded the restoration of their language in the internal service of Bohemia, and on 8th June, by noise and disturbance, obliged the president to suspend the sitting. The Reichsrath was immediately dissolved, the emperor having determined to make a final attempt to get together a parliament with which it would be possible to govern. The new elections on which so much was to depend did not take place till January. They resulted in a great increase of the extreme German Nationalist parties. Schoenerer and the German Radicals —the fanatical German party who in their new programme advocated union of German Austria with the German Empire—now numbered twenty-one, who chiefly came from Bohemia. They were able for the first time to procure the election of one of their party in the Austrian Delegation, and threatened to introduce into the Assembly scenes of disorder similar to those which they had made common in the Reichsrath. All those parties which did not primarily appeal to national feeling suffered loss; especially was this the case with the two sections of the Clericals, the Christian Socialists and the Ultramontanes; and the increasing enmity between the German Nationalists (who refused even the name German to a Roman Catholic) and the Church became one of the most conspicuous features in the political situation. The loss of seats by the Socialists showed that even among the working men the national agitation was gaining ground; the diminished influence of the anti-Semites was the most encouraging sign.

Renewed conflict between Germans and Czechs.

Notwithstanding the result of the elections, the first months of the new Parliament passed in comparative peace. There was a truce between the nationalities. The Germans were more occupied with their opposition to the Clericals than with their feud with the Slavs. The Czechs refrained from obstruction, for they did not wish to forfeit the alliance with the Poles and Conservatives, on which their parliamentary strength depended, and the Germans used the opportunity to pass measures for promoting the material prosperity of the country, especially for an important system of canals which would bring additional prosperity to the coal-fields and manufactures of Bohemia. It is, however, impossible permanently to postpone the more contentious questions; it remains to be seen whether the influence of the moderate parties, the authority of the government, and the personal influence of the emperor will be able to restrain another outbreak of those passions which for a short time have to some extent been kept in check.

AUTHORITIES.—Besides the special works already referred to see ROGGE. *Oesterreich von Világos bis zur Gegenwart.* Leipzig, 1872-73; and *Oesterreich seit der Katastrophe Hohenwart-Beust.* Leipzig, 1879; by the same author. These two works give a full narrative to the year 1879.—SCHULTHESS. *Europäischer Geschichtskalendar*, Nordlingen, 1866-99, gives a useful chronicle of events. See also W. MÜLLER. *Politische Geschichte der Gegenwart.* Berlin, 1871-99, The later volumes of WURZBACH, *Biographisches Lexicon.* Vienna, 1856-91, are useful. A good account of Austrian political parties is to be found in LOWELL, *Governments and Parties in Continental Europe*, London, 1896. See also MISCHLER and ULBRICH, *Oesterreichisches Staats-Wörterbuch*, Vienna, 1895-97, some of the articles in which are of great assistance; also, the article on Austria in MARQUARDSEN, *Handbuch des Oeffentlichen Rechts*, by Ulbrich. Other works are BARON H. DE WORMS (Lord Pirbright), *The Austro-Hungarian Empire*, London, 1877. COUNT JULIUS ANDRASSY, *Ungarns Ausgleich mit Oesterreich von Jahre 1867.* Leipzig, 1897. LAVELEYE, *La Prusse et l'Autriche depuis Sadowa*, Paris, 1870, which contains a very useful account of the political

situation between 1867 and 1870. LÉGER, *Histoire de l'Autriche-Hongrie*, Paris, 1895, a short sketch of the whole of Austrian history. CHÉLARD, *L'Autriche Contemporaine*, Paris, 1894. BEER, *Der Staatshaushalt Oesterreiche-Ungarns seit 1868*, Prague, 1881. BAZANT, *Die Handelspolitik Oesterreich Ungarns*, 1875-92, Leipzig, 1892. Also, articles by LANIN, in the *Contemporary Review*, vol. lxiii. 1893; BENOIST, in the *Révue des deux Mondes*, vols. cxliii. and cxliv., 1897, and articles in the *Annales de l'École libre des Sciences Politiques* for 1889 and 1891 by KRAMAR, and for 1894 by L. PINKAS, explaining the position of the young Czechs, also the volumes for 1897 and 1898; also an article in the *Edinburgh Review*, July 1898. See also the biographical articles elsewhere in this work on EMPEROR FRANZ-JOSEF, ANDRASSY, BEUST, TAAFFE, THUN, &c. (J. W. HE.)

Austria, Lower (German, *Niederösterreich* or *Oesterreich unter der Enns, i.e.*, Austria below the river Enns), an archduchy and crown land in the Cisleithan half of the Austro-Hungarian monarchy. It is bounded on the N. by Bohemia and Moravia, on the S. by Styria, on the E. by Hungary, and on the W. by Upper Austria. The chief town is Vienna, the capital of Austria, or the Cisleithan half of the dual monarchy. The original archduchy, which included the adjoining Upper Austria, is the birthplace and cradle of the Austrian empire, and the oldest possession of the House of Hapsburg in its present dominions. (For historical sketch see *Ency. Brit.* iii. 123.) Lower Austria has an area of 7654 square miles. It is divided into two parts by the Danube, which enters at its most westerly point and leaves at its eastern extremity, near Pressburg. North of this line is the low hilly country of the northern Alpine foreland, lying at the foot of, and forming a continuation of, the system of the Bohemian and Moravian plateau. This constitutes towards the west the "Waldviertel," of which the highest point is the Paulstein (3478 feet). Farther east there is a gradual decline in the altitude and frequency of the hills, which give place to larger valleys and comparatively fertile plains. In the main the southern division of the province is mountainous and hilly. Part of it is occupied by the northern or Austrian limestone Alps, of which the Schneeberg (6808 feet) is the highest summit. With one exception all the rivers are tributaries of the Danube. The most important are the Enns and the March. The lakes are comparatively few and of small extent. Of its mineral springs, the best known are those of Baden bei Wien and Deutsch Altenburg (sulphur), the iron springs of Pyrawarth, and the thermal baths of Vöslau. Lower Austria is remarkable among the provinces of the empire for the variety of its flora. In general the climate, which varies with the configuration of the surface, is moderate and healthy, although subject to rapid changes of temperature. It is mildest in the northern part and generally in the valleys. The soil is of moderate fertility, and only $3\frac{1}{2}$ per cent. is unproductive. Woods occupy 34·24 per cent. of the total area, 43·41 per cent. is arable, 13·15 per cent. consists of gardens and meadows, 2 per cent. of vineyards, and 3·19 per cent. of pastures. Agriculture and forestry afford sustenance to about a quarter of the population. Cereals and vegetables of all kinds are cultivated. Some fair wine is grown on the slopes of the Wiener Wald and elsewhere, averaging 874,000 hectolitres per annum.

In 1890 there were 120,755 horses, 554,154 horned cattle, 115,052 sheep, 81,772 goats, and 412,703 pigs. Large quantities of poultry are also bred, and game and fish are plentiful. While mining is of comparatively slight significance (total value of product in 1897, £26,945), Lower Austria (including Vienna) is one of the most important industrial centres of the empire, surpassing in this respect all other provinces, excepting Bohemia and Moravia. It has 12 per cent. of the total number of factories, 13 per cent. of the motive power, and 16 per cent. of all the factory hands employed in Austria. Of the total of 69,636 industrial firms registered in 1890, 1367 were factories employing 139,000 hands.

With the exception of its connexion with the sea at Trieste, it is fairly well provided for in the matter of communications. In 1897 it had 1790 kilometres of railway (10·28 per cent. of the total length in Austria), 12,413 kms. of roads, and 319 kms. of navigable waterway. There were 698 post and 463 telegraph offices, with 3135 kms. of line and 14,601 of wire.

Population in 1869, 1,990,708; in 1880, 2,330,621; and in 1890, including garrison of 31,363 men, 2,661,779, equivalent to 347·7 inhabitants per square mile. Thus, including Vienna, Lower Austria is the most populous Austrian province. Deducting the capital, however, with its population of 1,341,897, there are only 174 inhabitants per square mile. Proportion of females to males, 1036 to 1000. Reckoning according to the language in common use, 96·1 per cent. of the population is German, and 3·9 Slav. The latter, mostly Czechs, are settled in Vienna and on the Bohemian and Moravian border, while there are a number of Croatians in the Marchfeld. Nearly 93 per cent. are Roman Catholic, the rest consisting of 128,784 Jews, 50,591 Protestants, 1356 Old Catholics, 2654 members of the Greek Church, and 2258 persons of no religion. Population in 1900, 3,086,382. In 1896 the marriage-rate was 8·43; the birth-rate, 33·83, or excluding still-births, 32·73; and the death-rate, 22·83 per thousand. Of the births 26·23 per cent. were illegitimate, an advancing ratio. The marriage-rate is rising, the birth- and death-rates are declining. Lower Austria sends 46 members to the Reichsrath, all of German nationality.

With the exception of Bohemia, Lower Austria is the most advanced province of the empire in the matter of elementary education. Both had the same proportion of illiterates in 1880 (8·5 per cent.), but in 1890 the improvement of Lower Austria (6·2 per cent.) was slightly behind that of Bohemia (5·8 per cent.). In the matter of higher education a comparison between the two would be unfair, in view of the special advantages enjoyed by the capital. In addition to the Vienna University, Polytechnic, School of Agriculture, and academies of commerce and of art, there are 19 gymnasia, 23 real gymnasia, 555 technical and special schools (of which a fifth are devoted to music and singing), and 1680 intermediate and elementary schools. Of the 1156 periodicals and newspapers published in 1898, 1102 were in German, 14 in French, 8 in Czech, 12 in other Slav languages, the rest being Italian, Hungarian, Hebraic, Spanish, and polyglott.

See *Topographie von Niederösterreich*, a publication begun in 1871 by the "Verein für Landeskunde" in Vienna.—M. A. BECKER. *Niederösterreichische Landschaften*. Vienna, 1879.—UMLAUFT. *Das Erzherzogthum Oesterreich*. Vienna, 1893; and *Statistischer Bericht über die Volkswirthschaftlichen Zustände des Erzherzogthums Oesterreich für das Jahr 1890*. Published by the Vienna Chamber of Commerce in 1894. (Æ. O'N.)

Austria, Upper (German, *Oberösterreich* or *Oesterreich ob der Enns*, "Austria above the river Enns"), an archduchy and crown-land in the Cisleithan half of the Austria-Hungarian monarchy. It is bounded on the N. by Bohemia, on the S. by Salzburg and Styria, on the W. by Bavaria, and on the E. by the archduchy of Lower Austria, from which it is separated by the river Enns. It has an area of 4627 square miles, of which 262 are occupied by the Salzkammergut. Like Lower Austria, it is divided into two unequal parts by the Danube, which flows through it from west to east, draining the whole country, with the exception of a small portion adjoining Bohemia. Its principal tributaries are the Inn, Salzach, Traun, Enns, Steyr, and the Great and Little Mühl rivers. The smaller northern part of the province is a prolongation of the southern angle of the Bohemian forest. The Danube is approached from the south by the verge of the Alpine region (the Salzkammergut and the Upper Austrian Alps). Towards the river there is a gradual decline in the altitude of the summits. Of the numerous and beautiful Alpine lakes, the most important are the Traunsee, and those of Hallstatt, Atter, Wolfgang, and Mond. There are about thirty mineral springs, the best known being the salt baths of Ischl and the iodine waters at Hall. The climate, which varies according to the altitude, is on the whole moderate, although slightly colder than that of Lower Austria, precluding the culture of the vine. In the north

it is somewhat severe, but is mild in the Salzkammergut.

The most populous and most important towns are Linz, the capital (58,788 inhabitants) and Steyr (17,592), both autonomous municipalities, Wels (12,187), Gmunden (7126), Ischl, and Hallstatt. The last two are important centres of the salt industry. The soil in the valleys and on the lower slopes of the hills is fertile, indeed 35·08 of the whole area is arable. Woods occupy 34·02 per cent., while 4·93 per cent. is unproductive or consists of lakes, ponds, and marshes. It has the largest proportion of meadows in all Austria, 18·54, 2·49 per cent. of lowland and Alpine pasturage, and 1·99 per cent. of gardens. Agriculture and cattle breeding are both in an advanced state; relatively large quantities of the principal cereals are produced. Cattle breeding is equally advanced. In 1890 there were 553,074 head of horned cattle (the largest proportion of any Austrian province), 60,404 horses, 60,310 sheep, 31,592 goats, 247,902 pigs, and 38,125 beehives. Fish is artificially cultivated, and the wealth of game in the Salzkammergut (red deer, chamois, &c.) is a considerable resource of the province, as is also the important timber trade. Salt (a state monopoly) is the most valuable mineral. In 1897, Upper Austria produced 29·13 per cent. of the total Austrian product, its share being valued at £620,570. Other important products are lignite (£80,465), gypsum, and a variety of valuable stones and clays. The principal industries are the iron and metal manufactures, chiefly centred at Steyr, with its well-known small-arms factory. Next in importance are the machine, linen, cotton, and paper manufactures, the milling, brewing, and distilling industries and shipbuilding. The principal articles of export are salt, stone (including the granite pavements of Vienna), timber, live stock, wooden and iron wares, &c. In 1897 there were 864 kilometres of railway, 8499 kms. of roads, and 618 kms. of waterway, of which only 249 kms. is available for floating timber. There were 370 post and 153 telegraph offices, with 1887 kms. of line, and 5428 kms. of wire. Pop. in 1869, 731,579; in 1880, 759,620; in 1890, 785,831; which is equivalent to 169·8 inhabitants per square mile, the greatest density of any of the Alpine provinces. It is almost exclusively German and Roman Catholic, the Czechs forming less than ½ per cent., the Protestants 2·2 per cent., and the Jews 0·1 per cent. Population (1900), 809,918. In 1896 the marriage-rate was 7·11, the birth-rate 32·21, or excluding still-births 30·95, and the death-rate 23·31 per thousand. Of the births 18·71 per cent. were illegitimate, a declining ratio. The death-rate is also declining. The province sends 20 representatives to the Reichsrath, all German. Elementary education is practically on a level with that of Lower Austria, the proportion of illiterates (6·3 per cent.) being but $\frac{1}{10}$ per cent. less favourable. There are 534 elementary and 10 intermediate schools, 4 gymnasia, 2 real gymnasia, and 113 technical and special schools.

See PILLWEIN. *Geschichte, Geographie, und Statistik des Erzherzogthums Oesterreich ob der Enns.* Linz, 1827-39. EDLBACHER. *Landeskunde von Oberösterreich.* Linz, 1883. (Æ. O'N.)

Automatic Couplings. See RAILWAYS.

Automobiles. See MOTOR CARS.

Autun, chief town of arrondissement, department of Saône-et-Loire, France, 66 miles N.N.W. of Macon, on railway from Paris to Lyons. It is noted for its educational establishments. The Hôtel de Ville, Palais de Justice, and theatre are modern buildings, and on the *Promenade des Marbres* is a bronze statue of Divitiacus (1893). The leading industry is now the extraction of mineral oil from bituminous schists; iron and bronze founding are also important. Population (1881), 10,695; (1896), 11,873, (comm.) 13,512; (1901), 15,764.

Auxerre, chief town of department Yonne, France, 105 miles S.E. of Paris, on railway from Laroche to Nevers. It has a tribunal and chamber of commerce. The ancient fortifications are replaced by boulevards. On the bridge over the Yonne is a statue of Paul Bert (d. 1886). The principal manufactures now are heavy iron goods, machinery, tools, waggons, and carriages, and there are important ochre works. Population (1881), 13,752; (1891), 14,553; (1896), 15,082; (1901), 18,901.

Auxonne, a town in the arrondissement of Dijon, department of Côte d'Or, France, 19 miles E.S.E. of Dijon, on railway to Belfort. There is a tribunal of commerce. The artillery school has been removed to Besançon. Population (1881), 3002; (1891), 2938; (1896), 2873, (comm.) 4529; (1901), 7706.

Ava, formerly the capital of Burma for nearly 400 years, from 1364 to 1733, with a succession of thirty kings, but now merely a subdivision of the Sagaing district in the northern division of Upper Burma. It formed a separate district from the date of its annexation by the British (1886) until 1889, and was then amalgamated with Sagaing on the opposite bank of the Irrawaddy. For picturesque beauty it is unequalled in Burma, but it is now more like a park than the site of an old capital. The township had a population of 39,477 in 1891, and it is likely to remain what it was when the British first occupied it—a collection of cultivators' hamlets scattered amidst the remains of former greatness. Some of the pagodas were founded nearly a thousand years ago.

Avebury, John Lubbock, 1st BARON (1834-——), English banker, politician, and naturalist, was born in London, 30th April 1834, being the son of Sir John William Lubbock, third baronet, himself a highly distinguished man of science. John Lubbock was sent to Eton in 1845; but three years later (when only fourteen years of age) was taken into his father's bank, and became a partner at twenty-two. In 1865 he succeeded to the baronetcy. His love of science kept pace with his increasing participation in public affairs. He served on commissions upon coinage and other financial questions; and at the same time acted as president of the Entomological Society, and of the Anthropological Institute. Early in his career several banking reforms of great importance were due to his initiative, while such works as *Prehistoric Times* (1865) and *The Origin of Civilization* (1870) were proceeding from his pen. In 1870, and again in 1874, he was elected member of Parliament for Maidstone. He lost the seat at the election of 1880; but was at once elected member for London University, of which he had been vice-chancellor since 1872. He held this seat until his elevation to the peerage in 1900. He carried numerous enactments in parliament, including the Bank Holidays Act (1871), and bills dealing with absconding debtors, shop hours regulations, public libraries, open spaces, and the preservation of ancient monuments. He was elected the first president of the Institute of Bankers in 1879; in 1881 he was president of the British Association, and from 1881 to 1886 president of the Linnæan Society. He has received honorary degrees from the Universities of Oxford, Cambridge (where he was Rede lecturer in 1886), Edinburgh, Dublin, and Wurzburg; and in 1878 was appointed a trustee of the British Museum. From 1888 to 1892 he was president of the London Chamber of Commerce; from 1889 to 1890 vice-chairman, and from 1890 to 1892 chairman, of the London County Council. During the same period he served on royal commissions on education and on gold and silver. In 1890 he was appointed privy councillor; and was chairman of the committee of design on the new coinage in 1891. In January 1900 he was raised to the peerage, under the title of Baron Avebury. As a thoughtful popularizer of natural history and philosophy he has had few rivals in his day, as is evidenced by the number of editions issued of many of his writings, among which the most widely-read have been: *The Origin and Metamorphoses of Insects* (1873), *British Wild Flowers* (1875), *Ants, Bees, and Wasps* (1882), *Flowers, Fruit, and Leaves* (1886), *The Pleasures of Life* (1887), *The Senses, Instincts, and Intelligence of Animals* (1888), *The Beauties of Nature* (1892), *The Uses of Life* (1894).

Aveiro, a seaport town and episcopal see of Portugal, capital of the district of Aveiro, on a lagoon of the same

name and the principal arm of the Vouga. The industries embrace the preparation of salt, the catching and curing of fish, and the gathering of aquatic plants (*moliço*). It was the birthplace of João Affonso, the discoverer, one of the first navigators to visit the fishing grounds of Newfoundland. The channel through the bar, which connects the lagoon with the sea, has a maximum depth of 33 ft. Population, 8860. The *district* of Aveiro is 48 miles long by 30 miles wide, with an area of 1146 sq. miles, and population of 291,526, giving a density of 255 inhabitants to the sq. mile. It contains part of the fine wine district of Bairrada, and is a good grazing region. There are copper and lead mines.

Avellino, capital of the province of Avellino, Campania, Italy, 59 miles by rail E.N.E. from Naples. On Monte Vergine, at the foot of which the town stands, is the monastery (1119) of Monte Vergine, which is visited at Whitsuntide and every 7th and 8th September by nearly 80,000 pilgrims, the attraction being a wonder-working image of the Virgin. At Avellino an ancient necropolis was discovered in 1898. There are schools of viticulture and the industrial arts. Population of town (1901), 23,790; of province (1901), 402,898.

Average.—Some considerable changes in relation to *General Average* have to be noted since the appearance of the article on this subject in the ninth edition of this work. The difficulty, which then seemed nearly insuperable, of bringing together the rules in force in the several maritime countries has been to a large extent overcome—not by legislation, but by framing a set of rules covering the principal points of difference in such a manner as to satisfy, on the whole, those who are practically concerned, and to lead them to adopt these rules in their contracts of affreightment and contracts of insurance. The honour of the achievement belongs to a small number of men who recognized the need of uniformity. The work began in May 1860 at a congress held at Glasgow, under the presidency of Lord Brougham, assisted by Lord Neaves. Further congresses were held in London (1862), and at York (1864), when a body of rules known as the "York Rules" was agreed to. There the matter stood, until it was taken up by the "Association for the Reform and Codification of the Law of Nations" at conferences held at the Hague (1875), Bremen (1876), and Antwerp (1877). Some changes were made in the "York Rules"; and so altered, the body of rules was adopted at the last-named conference, and was styled the "York and Antwerp (or York-Antwerp) Rules." The value of these rules was quickly perceived, and practical use of them followed. But they proved to be insufficient, or unsatisfactory, on some points; and again, in the autumn of 1890, a conference on the subject was held, this time at Liverpool, by the same Association, under the able presidency of Dr F. Sieveking, president of the Hanseatic High Court of Appeal at Hamburg. Important changes were then made, carrying further certain departures from English law, already apparent in the earlier rules, in favour of views prevailing upon the continent of Europe and in the United States. The new rules were styled the York-Antwerp Rules, 1890. In practice they quickly displaced those of 1877; and in 1892, at a conference of the same Association held at Genoa, it was formally declared that the only International Rules of General Average having the sanction and authority of the Association were the York-Antwerp Rules as revised in 1890, and that the original rules were rescinded. It is this later body of rules which is now known as the York-Antwerp Rules. Reference is now to be found in most English contracts of carriage, and contracts of insurance, to these rules, as intended to govern the adjustment of G. A. between the parties; with the result that (so far as the rules cover the ground) adjustments do not depend upon the law of the place of destination, and so do not vary according to the destination, or the place at which the voyage may happen to be broken up, as used formerly to be the case.

History of the York-Antwerp Rules.

The rules are as follows:—

RULE I.—JETTISON OF DECK CARGO.

No jettison of deck cargo shall be made good as G. A.

Every structure not built in with the frame of the vessel shall be considered to be a part of the deck of the vessel.

RULE II.—DAMAGE BY JETTISON AND SACRIFICE FOR THE COMMON SAFETY.

Damage done to a ship and cargo, or either of them, by or in consequence of a sacrifice made for the common safety, and by water which goes down a ship's hatches opened, or other opening made for the purpose of making a jettison for the common safety shall be made good as G. A.

RULE III.—EXTINGUISHING FIRE ON SHIPBOARD.

Damage done to a ship and cargo, or either of them, by water or otherwise, including damage by beaching or scuttling a burning ship, in extinguishing a fire on board the ship, shall be made good as G. A.; except that no compensation shall be made for damage to such portions of the ship and bulk cargo, or to such separate packages of cargo, as have been on fire.

RULE IV.—CUTTING AWAY WRECK.

Loss or damage caused by cutting away the wreck or remains of spars, or of other things which have previously been carried away by sea-peril, shall not be made good as G. A.

RULE V.—VOLUNTARY STRANDING.

When a ship is intentionally run on shore, and the circumstances are such that if that course were not adopted she would inevitably sink, or drive on shore or on rocks, no loss or damage caused to the ship, cargo, and freight, or any of them, by such intentional running on shore, shall be made good as G. A. But in all other cases where a ship is intentionally run on shore for the common safety, the consequent loss or damage shall be allowed as G. A.

RULE VI.—CARRYING PRESS OF SAIL—DAMAGE TO OR LOSS OF SAILS.

Damage to or loss of sails and spars, or either of them, caused by forcing a ship off the ground or by driving her higher up the ground, for the common safety, shall be made good as G. A.; but where a ship is afloat, no loss or damage caused to the ship, cargo, and freight, or any of them, by carrying a press of sail, shall be made good as G. A.

RULE VII.—DAMAGE TO ENGINES IN REFLOATING A SHIP.

Damage caused to machinery and boilers of a ship which is ashore and in a position of peril, in endeavouring to refloat, shall be allowed in G. A., when shown to have arisen from an actual intention to float the ship for the common safety at the risk of such damage.

RULE VIII.—EXPENSES OF LIGHTENING A SHIP WHEN ASHORE, AND CONSEQUENT DAMAGE.

When a ship is ashore, and, in order to float her, cargo, bunker coals, and ship's stores, or any of them, are discharged, the extra cost of lightening, lighter hire, and reshipping (if incurred), and the loss or damage sustained thereby, shall be admitted as G. A.

RULE IX.—CARGO, SHIP'S MATERIALS, AND STORES BURNT FOR FUEL.

Cargo, ship's materials, and stores, or any of them, necessarily burnt for fuel for the common safety at a time of peril, shall be admitted as G. A., when and only when an ample supply of fuel had been provided; but the estimated quantity of coals that would have been consumed, calculated at the price current at the ship's last port of departure at the date of her leaving, shall be charged to the shipowner and credited to the G. A.

RULE X.—EXPENSES AT PORT OF REFUGE, &c.

(*a*) When a ship shall have entered a port or place of refuge, or shall have returned to her port or place of loading, in consequence of accident, sacrifice, or other extraordinary circumstances, which render that necessary for the common safety, the expenses of entering such port or place shall be admitted as G. A.; and when she shall have sailed thence with her original cargo, or a part of it, the corresponding expenses of leaving such port or place, consequent upon such entry or return, shall likewise be admitted as G. A.

(*b*) The cost of discharging cargo from a ship, whether at a port or place of loading, call, or refuge, shall be admitted as G. A., when the discharge was necessary for the common safety or to enable damage to the ship, caused by sacrifice or accident during the voyage, to be repaired, if the repairs were necessary for the safe prosecution of the voyage.

(*c*) Whenever the cost of discharging cargo from a ship is admissible as G. A., the cost of reloading and storing such cargo on board the said ship, together with all storage charges on such cargo, shall likewise be so admitted. But when the ship is condemned or does not proceed on her original voyage, no storage expenses incurred after the date of the ship's condemnation or of the abandonment of the voyage shall be admitted as G. A.

(*d*) If a ship under average be in a port or place at which it is practicable to repair her, so as to enable her to carry on the whole cargo, and if, in order to save expenses, either she is towed thence to some other port or place of repair or to her destination, or the cargo or a portion of it is transhipped by another ship, or otherwise forwarded, then the extra cost of such towage, transhipment, and forwarding, or any of them (up to the amount of the extra expense saved), shall be payable by the several parties to the adventure in proportion to the extraordinary expense saved.

RULE XI.—WAGES AND MAINTENANCE OF CREW IN PORT OF REFUGE, &c.

When a ship shall have entered or shall have been detained in any port or place under the circumstances, or for the purposes of the repairs, mentioned in Rule X., the wages payable to the master, officers, and crew, together with the cost of maintenance of the same, during the extra period of detention in such port or place until the ship shall or should have been made ready to proceed upon her voyage, shall be admitted as G. A. But when the ship is condemned or does not proceed on her original voyage, the wages and maintenance of the master, officers, and crew, incurred after the date of the ship's condemnation or of the abandonment of the voyage, shall not be admitted as G. A.

RULE XII.—DAMAGE TO CARGO IN DISCHARGING, &c.

Damage done to or loss of cargo necessarily caused in the act of discharging, storing, reloading, and stowing, shall be made good as G. A. when and only when the cost of those measures respectively is admitted as G. A.

RULE XIII.—DEDUCTIONS FROM COST OF REPAIRS.

In adjusting claims for G. A., repairs to be allowed in G. A. shall be subject to the following deductions in respect of "new for old," viz. :—

In the case of *iron or steel ships*, from date of original register to the date of accident :—

Up to 1 year old (*A.*)	All repairs to be allowed in full, except painting or coating of bottom, from which one-third is to be deducted.
Between 1 and 3 years (*B.*)	One-third to be deducted off repairs to and renewal of woodwork of hull, masts, and spars, furniture, upholstery, crockery, metal and glassware, also sails, rigging, ropes, sheets, and hawsers (other than wire and chain), awnings, covers, and painting. One-sixth to be deducted off wire rigging, wire ropes and wire hawsers, chain cables and chains, donkey engines, steam winches and connexions, steam cranes and connexions ; other repairs in full.
Between 3 and 6 years (*C.*)	Deductions as above under clause *B*, except that one-sixth be deducted off ironwork of masts and spars, and machinery (inclusive of boilers and their mountings).
Between 6 and 10 years (*D.*)	Deductions as above under clause *C*, except that one-third be deducted off ironwork of masts and spars, repairs to and renewal of all machinery (inclusive of boilers and their mountings), and all hawsers, ropes, sheets, and rigging.
Between 10 & 15 years (*E.*)	One-third to be deducted off all repairs and renewals, except ironwork of hull and cementing and chain cables, from which one-sixth to be deducted. Anchors to be allowed in full.
Over 15 years (*F.*)	One-third to be deducted off all repairs and renewals. Anchors to be allowed in full. One-sixth to be deducted off chain cables.
Generally (*G.*)	The deductions (except as to provisions and stores, machinery, and boilers) to be regulated by the age of the ship, and not the age of the particular part of her to which they apply. No painting bottom to be allowed if the bottom has not been painted within six months previous to the date of accident. No deduction to be made in respect of old material which is repaired without being replaced by new, and provisions and stores which have not been in use.

In the case of *wooden* or *composite ships* :—

When a ship is under one year old from date of original register, at the time of accident, no deduction "new for old" shall be made. After that period a deduction of one-third shall be made, with the following exceptions :—

Anchors shall be allowed in full. Chain cables shall be subject to a deduction of one-sixth only.

No deduction shall be made in respect of provisions and stores which had not been in use.

Metal sheathing shall be dealt with, by allowing in full the cost of a weight equal to the gross weight of metal sheathing stripped off, minus the proceeds of the old metal. Nails, felt, and labour metalling are subject to a deduction of one-third.

In the case of *ships generally* :—

In the case of all ships, the expense of straightening bent ironwork, including labour of taking out and replacing it, shall be allowed in full.

Graving dock dues, including expenses of removals, cartages, use of shears, stages, and graving dock materials, shall be allowed in full.

RULE XIV.—TEMPORARY REPAIRS.

No deductions "new for old" shall be made from the cost of temporary repairs of damage allowable as G. A.

RULE XV.—LOSS OF FREIGHT.

Loss of freight arising from damage to or loss of cargo shall be made good as G. A., either when caused by a G. A. act or when the damage to or loss of cargo is so made good.

RULE XVI.—AMOUNT TO BE MADE GOOD FOR CARGO LOST OR DAMAGED BY SACRIFICE.

The amount to be made good as G. A. for damage or loss of goods sacrificed shall be the loss which the owner of the goods has sustained thereby, based on the market values at the date of the arrival of the vessel or at the termination of the adventure.

RULE XVII.—CONTRIBUTORY VALUES.

The contribution to a G. A. shall be made upon the actual values of the property at the termination of the adventure, to which shall be added the amount made good as G. A. for property sacrificed ; deduction being made from the shipowner's freight and passage-money at risk, of such port charges and crew's wages as would not have been incurred had the ship and cargo been totally lost at the date of the G. A. act or sacrifice, and have not been allowed as G. A. ; deduction being also made from the value of the property of all charges incurred in respect thereof subsequently to the G. A. act, except such charges as are allowed in G. A.

Passengers' luggage and personal effects, not shipped under bill of lading, shall not contribute to G. A.

RULE XVIII.—ADJUSTMENT.

Except as provided in the foregoing rules, the adjustment shall be drawn up in accordance with the law and practice that would have governed the adjustment had the contract of affreightment not contained a clause to pay G. A. according to these rules.

The above rules differ in some important respects from English common law, and from former English practice. They follow ideas upon the subject of G. A. which have prevailed in practice in foreign countries (though often in apparent opposition to the language of the codes), in preference to the more strict principle of the common law applied by English courts. That principle requires that, in order to have the character of G. A., a sacrifice or expenditure must be made for the common *safety* of the several interests in the adventure, and under the pressure of a common risk. It is not enough that the sacrifice or expenditure is prudent, or even necessary to enable the common adventure to be completed. G. A., on the English view, only arises where the *safety* of the several interests is at stake. "The idea of a common commercial adventure, as distinguished from the common safety from the sea," is not recognized. It is not sufficient "that an expenditure should have been made to benefit both cargo owner and shipowner."[1]

Port of refuge expenses.

Thus expenses incurred after ship and cargo are in safety, say at a port of refuge, are not generally, by English law, to be treated as G. A. ; although the putting into port may have been for safety, and therefore a G. A. act. If the putting into port has been necessitated by a G. A. sacrifice, as by cutting away the ship's masts, the case is different ; the port expenses, the expenses of repairing the G. A.

[1] Per Bowen, L.J., in *Svensden* v. *Wallace*, 13 Q.B.D. at p. 84.

damage, and the incidental expenses of unloading, storing, and reloading the cargo are, in such a case, treated as consequences of the original sacrifice, and therefore subjects for contribution. But where the reason for putting in is to avoid some danger, such as a storm or hostile cruiser, or to effect repairs necessitated by some *accidental* damage to the ship, the G. A. sacrifice is considered to be at an end when the port has been reached, if the ship and cargo are then in physical safety. The subsequent expenditure in the port is said not to flow from that sacrifice, but from the necessity of completing the voyage, and is incurred in performance of the shipowner's obligation under his contract. The practice of English average adjusters has indeed modified this strict view by treating the expenses of *unloading* as G. A.; but it may well be doubted whether that practice can be legally supported. Moreover, expenditure in the port which is incurred in protecting the cargo as in warehousing it, is by English practice treated as a charge to be borne by the cargo for whose benefit it was incurred.

If we turn now to York-Antwerp, Rule X., it will be seen that a much broader view is adopted. Whatever the reason for putting into the port of refuge, provided it was necessary for the common safety, the expenses of going in, and the consequent expenses of getting out (if she sails again with all or part of her original cargo), are allowed as G. A., Rule X. (*a*). Further, the cost of discharging the cargo to enable damage to the ship to be repaired, whether caused by sacrifice or by accident during the voyage, is to be allowed as G. A., "if the repairs were necessary for the safe prosecution of the voyage," Rule X. (*b*). And that is to be so even where such repairs are done at a port of *call*, as well as where done at a port of *refuge*. Again, when the cost of discharging is treated as G. A., so also are to be the expenses of storing the cargo on shore, and of reloading and stowing it on board, after the repairs have been done, (Rule X. (c)), together with any damage or loss incidental to those operations (Rule XII.).

Further, by Rule XI. the wages of the master, officers, and crew, and the cost of their maintenance, during the detention of a ship under the circumstances, or for the purpose of the repairs mentioned in Rule X., are to be allowed in G. A. It is questionable whether English law allows the wages and maintenance of the crew at a port of refuge in any case. Where the detention is to repair *accidental* damage it seems clear that they are not allowed. And in practice, under common law, the allowance is never made; so that Rule XI. is an important concession to the shipowner. Like the changes introduced by Rule X., it is a change towards the practice in foreign countries.

It may be noted that the rules do not afford equal protection to a shipper in the comparatively infrequent case of his being put to expense by the delay at a port of refuge. Thus a shipper of cattle is not entitled to have the extra wages and provisions of his cattlemen on board, nor the extra fodder consumed by the cattle during the stay at a repairing port, made good as G. A. under Rules XI. and X. (*Anglo-Argentine, &c., Agency* v. *Temperley Co.*, 1899, 2 Q.B. 403).

General average sacrifices.

As to the acts which amount to G. A. sacrifices, as distinguished from expenditures, the York-Antwerp Rules do not much alter English common law. They do, however, make definite provisions upon some points on which authority was scanty or doubtful. (See Rules I.-IX.). And in Rule I., as to jettison of deck cargo, a change is made from the common law rule, for the jettison is not allowed as G. A. even though the cargo be carried on deck in accordance with an established custom of the particular trade.

Rule III. deals with damage done in extinguishing fire on board a ship. Modern decisions have cleared away the old doubts whether such damage to ship or cargo should, at law, be allowed in G. A. But recent cases in the United States have raised the question whether the allowance should be made where the fire occurs in port, and is extinguished, not by the master, but by a public authority acting in the interests of the public. The Supreme Court of the United States decided against the allowance in 1894, in a case of *Ralli* v. *Troup* (157 U.S. 386). The ship had there been scuttled to put out a fire on board, by the port authority, acting upon their own judgment, but with the assent of the master. It was held that the damage suffered by ship and cargo ought not to be made good by G. A. contributions; for the sacrifice had not been made "by some one specially charged with the control and safety of that adventure," but was the compulsory act of a public authority. On the other hand, in the English case of *Papayanni* v. *Grampian S.S. Co.* (I. Com. Ca. 448), Mathew, J., held that the scuttling of a ship at a port of refuge in Algeria, by orders of the captain of the port, was a G. A. act. It had been done in the interest of ship and cargo, and there was no evidence of any other motive.

Rule V. deals with the question whether, and under what conditions, a voluntary stranding of the ship is a G. A. act, in a manner which will probably be held to express the law in England when the matter comes up for decision.

Rules VI. and VII. deal with the damage sustained by the ship, or her appliances, in efforts to force her off the ground when she has stranded. Such efforts involve an abnormal use which is likely to cause damage to sails and spars, or to engines and boilers; and they are treated as acts of sacrifice. A recent case (*The Bona*, 1895, P. 125), in the court of appeal, shows that the rules are in accord with English law upon the point. The court held that both the damage sustained by the engines while worked to get the ship off, and the coal and stores consumed, were subjects for G. A. contribution at common law.

Rule VIII. allows as G. A. any damage sustained by cargo when discharged and, say, lightered for the purpose of getting the ship off a strand. And the corresponding damage in the case of cargo discharged at a port of refuge to enable repairs to be done to the ship is allowed by Rule XII. But in the latter case the allowance does not expressly extend to damage sustained while stored on land. Whether the law would require contribution to a loss of goods, say, by thieves or by fire, while landed for repairs, is not clear. Where the landing has been necessitated by a G. A. act, as cutting away masts, it would seem that the loss ought to be made good, as being a result of the special risks to which those goods have thereby been exposed. The risks which they would have run if they had remained on board throughout are taken into account, as will presently appear, in estimating *how much* of the damage is to be made good.

Where cattle were taken into a port of refuge in Brazil, owing to accidental damage to the ship, with the result that they could not legally be landed at their destination (Deptford), and had to be taken to another port (Antwerp), at which they were of much less value, this loss of value was allowed in G. A. (*Anglo-Argentine, &c., Agency* v. *Temperley Co.*, 1899, 2 Q.B. 403).

The case of a stranded ship and cargo often gives rise to difficulty as to whether the cost of operations to lighten the ship, and afterwards to get her floated, should be treated as G. A. expenditure, or as expenses separately incurred in saving the separate interests. The true conclusion seems to be that either the whole operation should be treated as one for the common safety, and the whole expense be contributed to by all the interests saved, or else the several parts of the operation should be kept distinct, debiting the cost of each to the interests thereby saved. Which of these two views should be adopted in any case seems to depend upon the motives with which the earlier operations (usually the discharge of the cargo) were presumably undertaken. It may, however, happen that this test cannot be applied once for all. Take the case of a stranded ship carrying a bulky cargo of hemp and grain, but carrying also some bullion. Suppose this last to be rescued and taken to a place of safety at small expense in comparison with its value. It may well be that that operation must be regarded as done in the interest simply of the bullion itself, but that the subsequent operations of lightening the ship and floating her can only be properly regarded as undertaken in the common interest of ship, hemp, grain, and freight. In such a case there will be a G. A. contribution towards those later operations by those interests. But the bullion will not contribute; it will merely bear the expense of its own rescue (*Royal Mail S. P. Co.* v. *English Bank of Rio*, 19 Q.B.D. 362).

The York-Antwerp Rules have not only had the valuable result of introducing uniformity where there had been great variety, and corresponding certainty as to the principles which will be acted upon in adjusting any G. A. loss, but also they have introduced greater clearness and definiteness on points where there had been a want of definition. Thus Rule XIII. has laid down a careful and definite scale to regulate the deductions from the cost of repairs, in respect of "new for old," in place of the former somewhat uncertain customary rules which varied according to the place of adjustment; while at the same time the opportunity has been taken of adapting the scale of deductions to modern conditions of shipbuilding. And Rule XVII. lays down a rule as to contributory values in place of the widely varying rules of different countries as to the amounts upon which ship and freight shall contribute (cf. Gow, *Marine Insurance*, 305).

Adjustment of General Average.

The *adjustment* of G. A., that is to say, the calculation of the amounts to be made good to and paid by the several interests, is a complicated matter. It involves much detail and arithmetic, and requires a full and accurate knowledge of the principles of the subject. Such adjustments are made by men who make the subject their profession. In Great Britain they are for the most part members of the Average Adjusters' Association, a body which has done and is doing much careful work with a view to making and keeping the practice uniform and in accord with right principles. This association has gradually formulated, at their annual meetings, a body of practical rules which the individual members undertake to observe. They will be found in the annual reports of the society (and see Gow, *Marine Insurance*, 330).

It may be of interest to refer briefly to one or two main principles which govern an adjustment. The fundamental idea is that the several interests at risk shall contribute in proportion to the benefits they have severally received by the completion of the adventure. Contributions are not made in proportion to the amounts at stake when the sacrifice was made, but in proportion to the results when the adventure has come to an end. An interest which has become lost after the sacrifice, during the subsequent course of the voyage, will pay nothing; an interest which has become depreciated will pay in proportion to the diminished value. The liability to contribute is inchoate only when the sacrifice has been made. It becomes complete when the adventure has come to an end, either by arrival at the destination, or by having been broken up at some intermediate point, while the interest in question still survives. To this there is one exception, in the case of G. A. *expenditure*. Where such expenditure has been incurred by the owner of one interest, generally by the shipowner, the repayment to him by the other interests ought not to be wholly dependent upon the subsequent safety of those interests at the ultimate destination. If those other interests or some of them arrive, or are realized, as by being landed at an intermediate port, the rule (as in the case of G. A. sacrifices) is that the contributions are to be in proportion to the arrived or realized values. But if all are lost the burden of the expenditure ought not to remain upon the interest which at first bore it; and the proper rule seems to be that contributions must be made by all the interests which were at stake when it was made, in proportion to their *then* values.

Again, the object of the law of G. A. is to put one whose property is sacrificed upon an equal footing with the rest, not upon a better footing. Thus, if goods to the value of £100 have been thrown overboard for the general safety, the owner of those goods must not receive the full £100 in contribution. He himself must bear a part of it, for those goods formed part of the adventure for whose safety the jettison was made; and it is owing to the partial safety of the adventure that any contribution at all is received by him. He therefore is made to contribute with the other saved interests towards his own loss, in respect of the amount "made good" to him for that. The full £100 is treated as the amount to be made good, but the owner of the goods is made to contribute towards that upon the sum of £100 thus saved to him.

The same principle has a further consequence. The amount to be made good will not necessarily be the value of the goods or other property in their condition at the time they were sacrificed; so to calculate it would in effect be to withdraw those goods from the subsequent risks of the voyage, and thus to put them in a better position than those which were not sacrificed. Hence, in estimating the amount to be made good, the value of the goods or property sacrificed must be estimated *as on arrival*, with reference to the condition in which they would probably have arrived had they remained on board throughout the voyage.

The liability to pay G. A. contributions falls primarily upon the owner of the contributing interest, ship, goods, or freight. But in practice the contributions are paid by the insurers of the several interests. Merchants seldom have to concern themselves with the subject. And yet in an ordinary policy of insurance there is no express provision requiring the underwriter to indemnify the assured against this liability. The policy commonly contains clauses which recognize such an obligation, *e.g.*, a warranty against average "unless general," or an agreement that G. A. shall be payable "as per foreign statement," or "according to York-Antwerp Rules"; but it does not directly state the obligation. It assumes that. The explanation seems to be that the practice of the underwriter to pay the contribution has been so uniform, and his liability has been so fully recognized, that express provisions were needless. But one result has been that very differing views of the ground of the obligation have been held. One view has been that it is covered by the sue and labour clause of an ordinary policy, by which the insurer agrees to bear his proportion of expenses voluntarily incurred "in and about the defence, safeguard, and recovery" of the insured subject. But that has been held to be mistaken by the House of Lords (*Aitchison* v. *Lohre*, 4 A.C. 755). Another view is that the underwriter impliedly undertakes to repay sums which the law may require the assured to pay towards averting losses which would, by the contract, fall upon the underwriter. Expenses voluntarily incurred by the assured with that object are expressly made repayable by the sue and labour clause of the policy. It might well be implied that payments compulsorily required from the assured by law for contributions to G. A., or as salvage for services by salvors, will be undertaken or repaid by the underwriter, the service being for his benefit. But the decision in *Aitchison* v. *Lohre* negatives this ground also. The claim was against underwriters on a ship which had been so damaged that the cost of repairs had exceeded her insured value. A claim for the ship's contribution to certain salvage and G. A. expenses which had been incurred, over and above the cost of repairs, was disallowed. The view seems to have been that the insurer is liable for salvage and G. A. payments as losses of the subject insured, and therefore included in the sum insured, not as collateral payments made on his behalf. This bases the claim against the insurer upon a fiction, for there has been no loss of the subject insured; in fact, the payment has been for averting such a loss. And it suggests that the insurer is not liable for salvage where the policy is free of particular average, which does not accord with practice.

An important question as to an insurer's liability for G. A. arose recently in the case of the *Brigella* (1893, P. 189), where a shipowner had incurred expenses which would have been the subject of G. A. contributions, but that he alone was interested in the voyage. There were no contributories. He claimed from the insurers of the ship what would have been the ship's G. A. contribution had there been other persons to contribute in respect of freight or cargo. The claim was disallowed on the ground that there could be no G. A. in such circumstances, and therefore no basis for a claim against the insurer. The liability of the insurer was thus made to depend, not upon the character of the loss, but upon the fact of contribution or possibility of contribution. But this was not followed in *Montgomery* v. *Idemnity Co.* (1900, 6 Com., Ca. 19). There ship, freight, and cargo all belonged to the same person. He had insured the cargo but not the ship. The cargo underwriters were held liable to pay a contribution to damage done to the ship by cutting away masts for the general safety. The loss was in theory spread over all the interests at risk, and they had undertaken to bear the cargo's share of such losses. Their liability did not depend upon the accident of whether the interests all belonged to one person or not. This agrees with the view taken in the United States.

As to *Particular Average*, see under INSURANCE (Marine).

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Aversa, a garrison town and episcopal see of the province of Caserta, Campania, Italy, 13 miles N. from Naples by rail. A good wine is made in the neighbourhood. There are manufactures of hemp, cotton, and furniture, and a technical school. Population (1881), 21,176; (1901), 23,477.

Aveyron, a French department on the rim of the Central Plateau.

Area, 3386 square miles, with 43 cantons and 302 communes. The population, 415,826 in 1886, had fallen to 382,074 in 1901. The births (1899) were 8893, of which 277 were illegitimate; deaths, 8811; marriages, 2816. The people of Aveyron emigrate in large numbers to South America. In 1896 there were 1457 primary schools, with 70,000 pupils. One and a half per cent. of the population was illiterate. The chief towns are Rodez (16,000 inhabitants in 1896; the capital), Espalion, Millau, St Affrique, Villefranche, and Decazeville. The area under cultivation in 1896 comprised 1,469,650 acres, of which 904,020 acres were ploughland, 46,930 acres vineyard, and 29,640 acres grass. In 1899, wheat yielded a revenue of £598,225, and the production of rye, oats, and potatoes in the same year amounted to 2,220,000 cwt. It takes the seventh rank for the production of hemp. Vine productions were valued at £111,000, and it grows a great abundance of walnuts and chestnuts. The live stock in 1899 numbered 921,250 head, 722,000 of which were sheep. Mining in 1898 produced 1,020,000 tons of coal, 9000 tons of iron, and 600 tons of other minerals, especially argentiferous lead in the basin of Decazeville. The production in metals in 1898 did not, however, exceed 34,000 tons of iron, cast-iron, and steel, and its value, including that of the other metals, was not more than £380,000. The other industries are leather-dressing and glove-making (Millau), the making of cheese, for which Roquefort is especially noted, and the weaving of coarse wool.

Avignon, chief town of department Vaucluse, France, 453 miles S.S.E. of Paris, on railway from Lyons to Marseilles. The library contains about 117,000 volumes and 3300 manuscripts. The north and oldest part of the Papal palace, restored in the 19th century, is now the depository of the public archives. The 15th-century Benedictine church of St Martial, partly in ruins, contains a magnificent tomb of Urban V. The ancient city gates have been in part destroyed, including the Porte d'Imbert (1896). Modern monuments are the Centenaire, erected in 1891, to commemorate the union of the Comtat Venaissin with France, and the statue of the Persian, Jean Althen, who in 1765 introduced the culture of the madder plant, which long formed the staple, and still forms an important branch, of local trade. John Stuart Mill died here in 1873, and is buried in the cemetery to the east of the town. Population (1881), 26,919; (1901), 46,896.

Avila, a province of Central Spain, with an area of 2570 square miles. It is divided into 6 districts and 270 parishes. There are valuable forests of oak, beech, and many varieties of firs. The ducal house of Medina Sidonia has turned vast extents of old pasture-lands and mountains into productive pine-woods. More than a million and a half of acres are cultivated, only about 2 per cent. of which are well irrigated. The official statistics show 133,200 acres producing wheat, 94,250 acres producing other cereals, 58,750 pod fruit, 32,377 vines, and 14,582 olive. The live stock includes 9125 horses, 9300 mules, 20,348 donkeys, 60,329 cattle, 479,254 sheep, 94,356 goats, and 37,930 pigs. The means of communication are not abundant, especially in the mountainous districts. The Great Northern Railway places the province in communication with Madrid and France; there are about 155 miles of fairly good roads. The exports are chiefly cereals and live stock; imports—manufactured goods, colonial products, machinery, and cod-fish. In 1887 the population was 132,000; in 1897, 197,636. The average of births is 4·08 per cent., of deaths 3·63 per cent., and the proportion of illegitimates is 0·13 per cent. The proportion of illiterates is 37 per cent.

Avila, a town of Spain, capital of the modern province of Avila, on the river Adaja, with a station on the line from Madrid to Valladolid. The climate is temperate in summer and very cold in winter, snow often then lying more than a foot deep. There is a considerable trade in agricultural products, live stock, leather, pottery, and manufactures of hats, linen, and cotton goods. The institute, the normal schools for teachers of both sexes, and several primary schools are well attended. Here is situated the royal school of cadets for the army commissariat corps. In the convent of the Encarnacion is the cell of Santa Theresa de Jesus, and there are remains of the old alcazar, now turned into barracks. The bishop of Avila is now a suffragan of the archbishop of Valladolid. Population (1897), 11,712.

Aviles, or SAN NICOLAS DE AVILES, a port in the province of Oviedo, Spain. Population, 11,749. The trade, especially along the coast, has much increased of late years, the means of communication having been improved in the surrounding districts.

Avintes, a town of Portugal, district of Oporto, on the left bank of the Douro, 4 miles above Villa Nova de Gaia, one of the handsomest suburbs of Oporto, which it supplies with vegetables, &c. Population, 5100.

Avlona, or VALONA (Albanian *Vlora*), a kaimakamlik of the vilayet of Janina, Turkey, and the nearest seaport to Italy on the Albanian coast. Its population is officially stated to be 6000. The surrounding district is agricultural and pastoral, producing oats, maize, cotton, olive oil, valonea, cattle, sheep, skins, hides, and butter. All these articles are exported in considerable quantities, besides bitumen, which is obtained from a mine worked by a French company. The imports are woollen and cotton piece-goods, metals, and petroleum.

Avon, the name of several rivers of England, of which the most important are the following:—(1) The LOWER AVON. Rising in the south of Gloucestershire, it describes a big eastward curve through Wiltshire, and enters Somersetshire a few miles S.E. of Bath; from this city it flows W.N.W. through Bristol to the estuary of the Severn, which it enters about 5 miles S. of the Severn Tunnel. The total length is about 70 miles. The chief importance of the river lies in its lower course, especially in the 7 miles below Bristol, though it is navigable for small vessels as far up as Bath, a distance of 12 miles. One of the causes of the decline in the trade of Bristol was the tortuous channel of the Avon between that city and the Severn. Something was done to remedy this in 1809, when a new channel was cut for the river through the city, the river itself converted into a "floating harbour" (3 miles long), and two dock basins dug beside it, covering an area of 85 acres and giving a depth of 22 feet. But owing to the increasing size of ocean-going vessels, this accommodation proved insufficient, and in 1884 the corporation of Bristol bought, as an out-port at the mouth of the Avon, the two docks of AVONMOUTH and PORTISHEAD. The former, situated on the Gloucester side of the Avon, has an area of 19 acres, with a depth on sills of 28 to 38 feet, and is equipped with large granaries, cattle quarters, chill rooms, and provision stores. The dock can be entered at any time by vessels of 2000 tons; and there is anchorage for vessels drawing up to 30 feet at one mile distance from the dock gates. The Portishead dock, which is situated about 3 miles S.W. of the mouth of the Avon, has an area of 12 acres, with a depth on sill of 24 to 34 feet. It is easily entered and cleared in all weathers, being under the shelter

of the Portishead Hills. Both docks are connected with Bristol by rail, and so with the Midland and Great Western railway systems. In February 1901 the Imperial Direct West India Mail Service began running fortnightly vessels between Bristol and Jamaica, carrying passengers, and bringing West Indian fruit (chiefly bananas) to England. This led in March 1902 to the opening of a still larger dock (King Edward VII. Dock) at Avonmouth, designed to accommodate vessels of 20,000 tons, equipped with the newest American machinery for dealing with heavy freight, with colossal grain elevators on the transatlantic model, and with cold storage accommodation of the most scientific description, the estimated cost being two millions sterling. The Avon is noted, like the Severn, for its high tides, the rise generally varying from 24 to nearly 40 feet even at Bristol. (2) The UPPER AVON, nearly 100 miles long, rising in the west of Northamptonshire near Naseby, flowing through Warwickshire and across the southern extremity of Worcestershire, and entering the Severn immediately below Tewkesbury. It is navigable for small craft up to a point about 5 miles above Evesham. (3) The EAST AVON, rising in the middle of Wiltshire, flowing south through Amesbury and Salisbury and along the western border of the New Forest, and eventually entering the English Channel below Christchurch in Dorsetshire. Its length is about 50 miles, and it is not navigable.

Avranches, chief town of arrondissement, department of Manche, France, 34 miles S.W. of St Lô by rail. There are a communal college, botanic gardens, and a library, the last containing valuable manuscripts. The principal church, that of Notre Dame des Champs, has been rebuilt. Trade is now carried on in cider, cattle, butter, flowers, and fruit, and there are salmon and other fisheries. Population (1881), 7677; (1901), 7384.

Awaji, an island belonging to Japan, situated at the eastern entrance of the Inland Sea, having a circumference of 94 miles, an area of 218 square miles, and a population of 188,908. It is celebrated for its exquisite scenery, and also for the fact that it is traditionally reputed to have been the first of the Japanese islands created by the deities Izanagi and Izanami. The loftiest peak is Yuruuba-yama (1998 feet), the most picturesque Sen-zan (1519 feet).

Awellimiden. See SAHARA.

Axim. See GOLD COAST.

Axminster, a market-town and railway station in the Honiton parliamentary division of Devonshire, England, 24 miles E. by N. of Exeter. There are tooth- and nail-brush works and an iron foundry. A cottage hospital has been opened. Area of parish, 6833 acres. Population (1881), 2872; (1901), 2906.

Axum. See ABYSSINIA.

Ayacucho, an interior department of central Peru. It has an area of 18,185 square miles, and its population was officially estimated at 302,469 in 1896. It contains six provinces — Huanta, La Mar, Ayacucho, Cangallo, Lucanas, and Parina-cochas. The capital, Ayacucho, has a population of 20,000.

Ayala y Herrera, Adelardo López de (1828-1879), Spanish writer and politician, was born at Guadalcanal on 1st May 1828, and at a very early age began writing for the theatre of his native town. The titles of these juvenile performances, which were played by amateurs, were "Salga por donde saliere," "Me voy á Sevilla," and "La Corona y el Puñal." As travelling companies never visited Guadalcanal, and as ladies took no part in the representations, these three plays were written for men only. Ayala persuaded his sister to appear as the heroine of his comedy, "La primera Dama," and the innovation, if it scandalized some of his townsmen, permitted him to develop his talent more freely. In his twentieth year he matriculated at the university of Seville; but it is not certain whether he joined the faculty of law or that of philosophy, and his career as a student was undistinguished. In Seville he made acquaintance with García Gutiérrez, who is reported to have encouraged his dramatic ambitions and to have given him the benefit of his own experience as a playwright. Early in 1850 Ayala removed his name from the university books, and settled in Madrid with the purpose of becoming a professional dramatist. Though he had no friends and no influence, he speedily found an opening. A four-act play in verse, "Un Hombre de Estado," was accepted by the managers of the Teatro Español, was given on 25th January 1851, and proved a very remarkable success. Henceforward Ayala's position and popularity were secure. Within a twelvemonth he became more widely known by his "Castigo y Perdón," and by a more humorous effort, "Los dos Guzmanes"; and shortly afterwards he was appointed by the *Moderado* Government to a post in the Home Office, which he lost in 1854 on the accession to power of the Liberal party. In 1854 he produced "Rioja," perhaps the most admired and the most admirable of all his works, and from 1854 to 1856 he took an active part in the political campaign carried on in the journal *El Padre Cobos*. A *zarzuela*, entitled "Guerra á muerte," for which Emilio Arrieta composed the music, belongs to 1855, and to the same collaboration is due "El Agente de Matrimonios." At about this date Ayala passed over from the Moderate to the Progressive party, and this political manœuvre had its effect upon the fate of his plays. The performances of "Los Comuneros" were attended by members of both political parties; the utterances of the different characters were taken to represent the author's personal opinions, and every speech which could be wrenched into connexion with current politics was applauded by one half of the house and derided by the other half. A *zarzuela*, named "El Conde de Castralla," was given amid much uproar on 20th February 1856, and, as the piece seemed likely to cause serious disorder in the theatre, it was suppressed by the Government after the third performance. Ayala's rupture with the Moderates was now complete, and in 1857, through the interest of O'Donnell, he was elected as Liberal deputy for Badajoz. His political changes are difficult to follow, or to explain, and they have been unsparingly censured. So far as can be judged, Ayala had no strong political views, and drifted with the current of the moment. He took part in the revolution of 1868, wrote the "Manifesto of Cadiz," took office as colonial minister, favoured the candidature of the duc de Montpensier, resigned in 1871, returned to his early Conservative principles, and was a member of Alfonso XII.'s first Cabinet. Meanwhile, however divided in opinion as to his political conduct, his countrymen were practically unanimous in admiring his dramatic work; and his reputation, if it gained little by "El nuevo Don Juan," was greatly increased by "El Tanto por Ciento" and "El Tejado de Vidrio." His last play, "Consuelo," was given on 30th March 1878. Ayala was nominated to the dignified post of president of Congress shortly before his death, which occurred unexpectedly on 30th January 1879. The best of his lyrical work, excellent for finish and intense sincerity, is his "Epístola" to Emilio Arrieta, and, had he chosen to dedicate himself to lyric poetry, he might possibly have ranked with the best of Spain's modern singers; as it is, he is a very considerable poet who affects the dramatic form. In his later writings he deals with modern society, its vices, ideals, and perils; yet in many

essentials he is a manifest disciple of Calderon. He has the familiar Calderonian limitations: the substitution of types for characters, of eloquence for vital dialogue. Nor can he equal the sublime lyrism of his model; but he is little inferior in poetic conception, in dignified idealization, and in picturesque imagery. And it may be fairly claimed for him that in "El Tejado de Vidrio" and "El Tanto por Ciento" he displays a very exceptional combination of satiric intention with romantic inspiration. By these plays, and by "Rioja" and "Consuelo," he is entitled to be judged. They will at least ensure for him an honourable place in the history of the modern Spanish theatre. (J. F.-K.)

Aylesbury, a market town in the Aylesbury parliamentary division (since 1885) of Buckinghamshire, England, 48 miles N.W. of London by rail. Modern erections are a church, a clergy house, two Methodist chapels, a literary institute, a club for working men, and public swimming baths. An improved drainage system has cost £25,000. There are printing works and works for condensing milk, but the manufacture of pillow-lace is almost extinct. Area of parish (an urban district), 3302 acres. Population (1881), 7795; (1901), 9244.

Ayr, a royal and parliamentary burgh (Ayr group) and the county town of Ayrshire, a seaport and manufacturing town, situated at the influx of the Ayr river into the bay of the same name, 40½ miles S.W. by S. of Glasgow by rail. The New Bridge was injured by floods in 1877, and rebuilt in 1879. Another bridge was erected in 1898, and a footbridge in 1900. A town hall and corporation offices, built in 1883, were destroyed by fire in 1897. Recent structures are two Established, Trinity Episcopal (rebuilt), and United Free churches, new railway station, free library, cattle market, post office, and academy (rebuilt). A statue of Burns was erected in 1891. The harbour has been improved at a cost of £153,500. An esplanade leading from the harbour has been made, and another was laid out on the north side in 1898. Vessels on the port register numbered 22 of 3689 tons at the end of 1898, and the traffic, mostly coasting, was: 1898, entered 2467 vessels of 399,233 tons, cleared 2451 vessels of 386,634 tons. Exports were valued at £13,397 in 1888, and £14,536 in 1898; imports at £79,668 in 1888, and £207,495 in 1898. The academy is under the School Board. Population (1881), 20,812; (1901), 28,624.

Ayrshire, a maritime county of S.W. Scotland, bounded on the N. by Renfrewshire, on the N.E. by Renfrew and Lanark shires, on the E. by Lanark and Dumfries shires, on the S.E. by Kircudbrightshire, on the S. by Wigtownshire, and on the W. by the Irish Sea and the Firth of Clyde.

Area and Population.—In 1891 the Renfrewshire portions of the parishes of Beith and Dunlop (543 and 1101 acres respectively) were transferred to the county of Ayr. According to the latest official estimate, the area of the county (foreshore excluded) is 730,947 acres, or 1142 square miles. The population was in 1881, 217,519; in 1891, 226,283, or, on the above area, 226,386, of whom 111,037 were males and 115,349 females; in 1901, 254,436, an increase of 28,050. On the old area, taking land only (722,229 acres, or 1128·5 square miles), the number of persons to the square mile in 1891 was 201, and the number of acres to the person 3·2. In the registration county the increase of population between 1881 and 1891 was 4 per cent. Between 1881 and 1891 the excess of births over deaths was 34,250, and the increase of the resident population 8779. The following table gives particulars of births, deaths, and marriages in 1880, 1890, and 1899:—

Year.	Deaths.	Marriages.	Births.	Percentage of Illegitimate Births.
1880	4414	1456	7766	7·8
1890	4241	1670	7299	7·03
1899	4404	1843	7838	5·6

The birth-rate and marriage-rate were above and the death-rate was below those of Scotland. The following table gives the birth-rate, death-rate, and marriage-rate per thousand of the population for a series of years:—

	1880.	1881-90.	1890.	1891-98.	1899.
Birth-rate . .	35·90	34·12	32·82	33·31	33·63
Death-rate . .	20·41	18·70	18·78	18·05	18·94
Marriage-rate .	6·73	6·82	7·39	7·18	7·91

In 1891 there were 1827 Gaelic-speaking persons in the county, of whom 14 spoke Gaelic only, and 154 foreigners. Valuation in 1889-90, £1,059,056; 1899-1900, £1,229,844.

Constitution and Government.—The county returns two members to parliament, who represent North and South Ayrshire respectively. Ayr, the county town (28,624 inhabitants in 1901), and Irvine (9603) are royal burghs and belong to the Ayr group of parliamentary burghs, and Kilmarnock (34,161) is a parliamentary burgh of the Kilmarnock group. Police burghs are: Ardrossan (5933), Cumnock (3087), Darvel (3070), Galston (4876), Girvan (4019), Kilwinning (4439), Largs (3243), Maybole (5892), Newmilns (4466), Saltcoats (8121), Stewarton (2858), Troon (4696). Other towns are: Beith (7523), Catrine (2340), Dalry (5314), Hurlford (5246), Kilbirnie (7207), Muirkirk (5670), Stevenston (6797). Under the county council 32 special water districts have been formed, 26 drainage districts, and 19 lighting and scavenging districts. There are 44 civil parishes, which are divided among the three combinations of Kyle (in the centre), Cunningham (in the N.), and Carrick (in the S.), with poorhouses at Ayr, Irvine, and Maybole; the number of paupers and dependants in September 1899 was 5408. The county forms a sheriffdom, and there are resident sheriffs-substitute at Ayr and Kilmarnock, who sit also at Irvine, Beith, Cumnock, and Girvan.

Education.—Fifty-one school boards manage 149 schools, which had in 1898-99 an average attendance of 37,956, and there are 28 voluntary schools in the county, of which 17 are Roman Catholic and one Episcopal, with an average attendance of 39,009. There are secondary schools at Ayr, Irvine, Kilmarnock, and Beith, and Kilmarnock Dairy School is now a constituent part of the West of Scotland Agricultural College established in 1899. Six other board schools earned grants in 1898 for giving higher education. For the year ending March 1899 the county council expended £5176 on secondary and technical education, including £2317 contributed by the county council and some of the burgh councils from the "residue" grant; contributions were made to the Glasgow and West of Scotland Technical College and the Kilmarnock Dairy School, and the technical classes subsidized at various local centres embraced instruction in agriculture, mining, engineering, plumbing, gardening, and various science and art subjects.

Agriculture.—The fertility of the soil has been enormously developed by high farming. Potato-growing is an important industry; the coast lands supply the early markets of Scotland and the north of England, and the potato acreage actually exceeded that under turnips in 1898. There is a very large production of milk, butter, and cheese. A fair quantity of wheat is grown—about 2000 acres on an average—and the barley acreage is rather less. Oats form the bulk of the corn crop. The following table gives the principal acreages at intervals of five years from 1880:—

Year.	Area under Crops.	Corn Crops.	Green Crops.	Clover.	Permanent Pasture.	Fallow.
1880	317,387	59,061	19,049	99,055	138,510	1712
1885	317,484	57,645	16,439	123,712	119,532	156
1890	319,856	52,493	17,114	138,511	111,184	235
1895	321,902	49,343	17,472	97,986	156,779	172
1899	321,172	49,232	16,503	102,644	152,503	147

The following table gives particulars of the live stock during the same years:—

Year.	Total Horses.	Total Cattle.	Cows or Heifers in Milk or Calf.	Sheep.	Pigs.
1880	8787	88,932	43,558	362,190	12,164
1885	8585	95,095	46,126	335,050	14,566
1890	8931	100,943	49,718	356,385	16,285
1895	9974	98,842	50,373	361,057	16,768
1899	9329	101,885	51,031	386,098	13,920

The percentage of cultivated area was 43·8 in 1898. The acreage under wood in 1895 was 25,725. Farms are, as a rule,

of moderate size. At the date of the last return, 1895, there were 3333 holdings in the county of an average size of 97 acres; 9·93 did not exceed 5 acres; 27·12 were between 5 and 50, and 62·95 were above 50 acres. Farms between 50 and 100 acres numbered 763; between 100 and 300, 1240; between 300 and 500, 83; and above 500, 13. According to the census of 1891 there were 9201 men and 1672 women engaged in pursuits connected with agriculture.

Industries and Trade.—Ayrshire is the principal mining county in Scotland, and has the second largest coalfield. The following table gives particulars of the mineral industry:—

Year.	Coal.		Iron Ore.		Pig Iron.	Fire Clay.	
	Tons.	Value.	Tons.	Value.	Tons.	Tons.	Value.
1890	3,159,727	£1,105,904	446,246	£245,435	240,848	87,175	£18,888
1899	3,809,313	£1,412,620	354,333	£177,166	345,488	113,127	£18,622

In 1890 there were 21 blast furnaces; in 1899, 26 on an average. Of sandstone, 120,268 tons, valued at £31,341, were obtained in 1895, and 151,955, valued at £47,481, in 1899. Of limestone 21,228 tons were raised in 1895, and 14,369 tons in 1899.

Industries have spread throughout the towns generally. There are now large lace curtain factories at Galston, Newmilns, and Darvel; shoemaking is engaged in on an extensive scale at Maybole, and also at Ayr, Kilmaurs, and Kilmarnock; cabinetmaking at Beith, shipbuilding at Troon, Ayr, Irvine, and Fairlie; while calico-printing, bleaching, silk-weaving, bonnet-making, tanning, and freestone-quarrying are all carried on.

The seaports are Girvan, Ayr, Troon, Irvine, Saltcoats, Ardrossan, and Largs. Fishing is carried on from twelve harbours or creeks, which are divided between the two fishery districts of Ballantrae and Greenock, and statistics for the two districts conjointly may most conveniently be given here.

Year.	Boats in Districts.			Value of Gear.	Resident Fishermen and Boys.	Total Value of all Fish.
	No.	Tons.	Value.			
1890	757	2403	£15,770	£13,244	1333	£44,138
1898	787	1698	£29,768	£13,862	1429	£37,138
1899	744	1852	£15,097	£12,810	1304	£38,493

£13,010 of the total value of fish in 1899 was the value of shell-fish only. The number of persons connected with the various branches of the sea fisheries in 1899 in the two districts was 5956. To Ayrshire harbours alone there belonged in 1899, 322 boats of 877 tons; there were 474 fishermen and boys resident in the county, and the value of the fish landed was £14,500.

At the census of 1891 the number of persons engaged in industrial pursuits was 47,252 men and 14,011 women, of whom 2269 men were concerned in the production of machines and implements, 4136 men and 6056 women of textiles, and 18,992 men of minerals. Commerce occupied 7875 men and 326 women. A large number of short railway lines have been built since 1875 by the Caledonian and Glasgow and South-Western Railway Companies, the total new mileage being about 60 miles, and there are about 35 miles under construction by the Glasgow and South-Western Railway Company.

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Ayub Khan, Afghan prince, son of Sher Ali, formerly Amir of Afghanistan, and cousin of the Amir Abdurrahman, was born about 1855. During his father's reign little is recorded of him, but after Sher Ali's expulsion from Kabul by the English, and his death in January 1879, Ayub took possession of Herat, and maintained himself there until June 1881, when he invaded Afghanistan with the view of asserting his claims to the sovereignty, and in particular of gaining possession of Kandahar, still in the occupation of the British. He encountered the British force commanded by General Burrows at Maiwand, on 27th July, and was able to gain one of the very few pitched battles that have been won by Asiatic leaders over an army under European direction. His triumph, however, was short-lived; while he hesitated to assault Kandahar he was attacked by Sir Frederick (afterwards Lord) Roberts, at the close of the latter's memorable march from Kabul, and utterly discomfited, 20th September 1880. He made his way back to Herat, where he remained for some time unmolested. In the summer of 1881 he again invaded Afghanistan, and on the anniversary of the battle of Maiwand obtained a signal victory over Abdurrahman's lieutenants, mainly through the defection of a Durani regiment. Kandahar fell into his hands, but Abdurrahman now took the field in person, totally defeated Ayub, and expelled him from Herat. He took refuge in Persia, and for some time lived quietly in receipt of an allowance from the Persian Government. In 1887 internal troubles in Afghanistan tempted him to make another endeavour to seize the throne. Defeated and driven into exile, he wandered for some time about Persia, and in November gave himself up to the British agent at Meshed. He was sent to India to live as a state prisoner.

Azamgarh or AZIMGARH, a town and district of British India, in the Gorakhpur division of the North-West Provinces. The town is situated on the river Tons, and has a railway station. The population is 19,000; the municipal income in 1897-98 was Rs.13,107; the registered death-rate in 1897 was 39 per thousand. There are two printing-presses. The district of AZAMGARH has an area of 2148 square miles. In 1891 its population was 1,728,625, being 805 persons per square mile. In 1901 it was 1,530,555, showing a decrease of 11 per cent. The land revenue and rates were Rs.17,48,488, the incidence of assessment per acre being R.1:0:7 on the temporarily settled land, and Rs.0:0:4 on the permanently settled; the cultivated area in 1896-97 was 593,067 acres, of which 417,932 were irrigated from wells, &c.; the number of police was 2845; there are 160 vernacular schools with 5724 pupils; the registered death-rate in 1897 was 38·7 per thousand. There are 364 indigo factories, with an out-turn valued at Rs.4,65,000. A branch of the Bengal and North-Western Railway to Azamgarh town was opened in 1898.

Azerbáiján (Azerbiján, Azerbádegán of mediæval writers, Athropátakán and Atropatene of the ancients), the north-western and most important province of Persia, with an estimated area of 32,000 square miles and a population of about two millions. It is divided into a number of administrative sub-provinces and districts, each with a *hákim*, governor, or *zábit*, sub-governor, under the governor-general, who, under the present dynasty—that of the Kajárs—has been the heir-apparent to the throne of Persia, assisted by a responsible minister appointed by the Shah. The administrative divisions of the province are as follows: Tabríz and environs, Uskúh, Deh Kháregán, Marághа, Miándoáb, Saújbulagh, Suldúz, Urmia, Selmas, Khoï, Maku, Gerger, Merend (Mehrand in ninth edition), Karadagh, Arvanek, Talish, Ardebil, Mishkin, Khalkhal, Hashtrúd, Garmrúd, Afshár, Saïn Kaleh, Ujáп, Saráb (Siral in ninth edition). The revenue of the province derived from land taxation and other maliat is said to amount to about £200,000 per annum in cash and kind, and nearly all of it is expended in the province for the maintenance of the court of the heir-

apparent, salaries and pay to Government officials and troops, pensions, &c. The revenue from customs, most of it remitted to Tehran, was reported to have been £94,000 in 1887 and £90,333 in 1889, and is now about £80,000. The value of the imports and exports exceeded £2,000,000 in 1898. A concession for working some copper ore in the Karadágh district was granted in 1898 to a Russian company.

A-zhe-ho, or ASHEKHE (Manch. *Alchuku*), a town of China, Manchuria, 125 miles N.E. of Kirin, and 30 miles S. of the Sungari. Population, about 30,000.

Azjer. See SAHARA.

Azores, an archipelago of islands belonging to Portugal, and lying in the Atlantic W. of that country, with an area of 922 sq. miles, and a population of 255,594. The vineyards cover about 9450 acres, and produce 972,850 gallons of wine (the greater part in Pico), valued at £89,350. On St Michael tea is grown, the produce being consumed in Lisbon. The fish caught in 1898 were valued at an aggregate of £33,100, the number of fishermen being 5860, and their vessels 1092. In 1897 the ports of the archipelago were entered and cleared by a total of 1062 vessels of 2,052,792 tons; and the imports and exports together were valued at £210,000. The district of Ponta Delgada, embracing the islands St Mary and St Michael, has a population of 124,000, and manufactures pottery, cottons, spirits, straw hats, and tea. The capital, and also capital of the islands, is Ponta Delgada, in St Michael (population, 16,767). The district of Angra de Heroismo, embracing the islands Terceira, St George, and Graciosa, has a population of about 72,000, and manufactures linen, woollens, cheese, butter, soap, bricks, and tiles. Its capital, Angra (population, 11,012), in Terceira, is an episcopal see. The district of Horta, embracing the islands Fayal, Pico, Flores, and Corvo, with a population of about 58,000, makes baskets, mats, &c., of straw and osiers, and articles of the pith of the fig. Some 7250 acres are annually planted with vines, which yield 496,000 gallons of wine, valued at £42,250. Its capital is Horta (population, 6879), in Fayal. Meteorological stations are situated at Ponta Delgada and Angra de Heroismo.

Azrek, Bahr el. See ABYSSINIA.

Azuay, a province of Ecuador, bounded on the N. by the province of Cañar, on the S. by that of Loja, on the E. by Oriente, and on the W. by the province of the Oro. Its area covers 3870 sq. miles, and the population numbers 132,400. The capital, Cuenca, has about 25,000 inhabitants. Amongst the principal towns are Gualacco (3000), Paute, Jiron, Sigsig. The province is divided into 44 parishes.

Baálbek, ancient *Heliopolis*, altitude 3850 feet, situated on the east side of the fertile valley of the Lítání, not far from the water-parting between that river and the Orontes. The remarkable ruins of the temples are described in the ninth edition of this work. In the centre of the main court of the Great Temple are the remains of a basilica, possibly built by Theodosius, with its apse at the west end. The ruins suffered severely from an earthquake in 1759, and in 1870 it became necessary to support the keystone of the portal of the Temple of the Sun with a wall. In the quarries near the town is a stone 68 feet long and 14 feet high, weighing about 1500 tons, which is still attached to its quarry bed, and was evidently intended for the temple wall. Important excavations have been made in the temple enclosure by Germany.

A good description of the ruins will be found in BAEDEKER'S *Palestine and Syria*, Leipzig, 1898.

Bábíism is the religion founded in Persia in A.D. 1844-45 by Mírzá ʿAlí Muhammad of Shíráz, a young Sayyid who was at that time not twenty-five years of age. Before his "manifestation" (*zuhúr*), of which he gives in the Persian *Bayán* a date corresponding to 23rd May 1844, he was a disciple of Sayyid Kázim of Rasht, the leader of the Shaykhís, a sect of extreme Shíʿites characterized by the doctrine (called by them *Rukn-i-rábi*, "the fourth support") that at all times there must exist an intermediary between the twelfth Imám and his faithful followers. This intermediary they called "the perfect Shíʿite," and his prototype is to be found in the four successive *Báb*s or "gates" through whom alone the twelfth Imám, during the period of his "minor occultation" (*Ghaybat-i-sughrá*, A.D. 874-940), held communication with his partisans. It was in this sense, and not, as has been often asserted, in the sense of "Gate of God" or "Gate of Religion," that the title *Báb* was understood and assumed by Mírzá Alí Muhammad; but, though still generally thus styled by non-Bábís, he soon assumed the higher title of *Nuqta* ("Point"), and the title *Báb*, thus left vacant, was conferred on his ardent disciple, Mullá Husayn of Bushrawayh.

The history of the Bábí movement down to the execution of the Báb at Tabríz (8th July 1850) and the great persecution which followed the attempt of three or four Bábís to assassinate the late Shah, Násiru'd-Dín, in the summer of 1852, is best told by Gobineau, and is summarized in vols. iii., xviii., and xxii. of the ninth edition of the *Encyclopædia Britannica*, s.v. "Bâbi or Bâby," "Persia: Modern History," and "Sunnites and Shíʿites." The Báb was succeeded on his death by Mírzá Yahyá of Núr (at that time only about twenty years of age), who escaped to Baghdad, and, under the title of *Subh-i-Ezel* ("the Morning of Eternity"), became the pontiff of the sect. He lived, however, in great seclusion, leaving the direction of affairs almost entirely in the hands of his elder half-brother (born 12th November 1817), Mírzá Husayn ʿAlí, entitled *Bahá'u'lláh* ("the Splendour of God"), who thus gradually became the most conspicuous and most influential member of the sect, though in the *Iqán*, one of the most important polemical works of the Bábís, composed in 1858-59, he still implicitly recognized the supremacy of *Subh-i-Ezel*. In 1863, however, Bahá declared himself to be "He whom God shall manifest" (*Man Yuz-hiruhu'lláh*, with prophecies of whose advent the works of the Báb are filled), and called on all the Bábís to recognize his claim. The majority responded, but *Subh-i-Ezel* and some of his faithful adherents refused. Since that date the Bábís have been divided into two sects, Ezelís and Bahá'ís, of which the former have steadily lost and the latter gained ground, so that at the present day there are probably from half a million to a million of the latter, and at most only a hundred or two of the former. In 1863 the Bábís were, at the instance of the Persian Government, removed from Baghdad to Constantinople, whence they were shortly afterwards transferred to Adrianople. In 1868 Bahá and his followers were exiled to Acre in Syria, and *Subh-i-Ezel* with his few adherents to Famagusta in Cyprus, where he

still lived in 1901. Bahá died at Acre on 16th May 1892, and was succeeded by his son 'Abbás Efendi, whose claims, however, were contested by another son named Muhammad 'Alí. The followers of the latter do not appear to be numerous, but in Acre itself they are said to have succeeded in retaining the custody of Bahá's tomb. Full particulars of this latest schism are still lacking. During the last five or six years the doctrine of Bahá has been preached with considerable success by a certain Ibráhím Khayru'lláh in the United States, where there are now some 3000 American converts.

The tenets of the older Bábís (now represented by the Ezelís) included, besides a belief in the divine mission of the Báb and the plenary inspiration of all his numerous writings, a denial of the finality of any revelation, and of the resurrection of the body. Great importance was attached to the mystical values of letters and numbers, especially the numbers 18 and 19 ("the number of the unity") and $19^2=361$ ("the number of all things"). In general, the Báb's doctrines most closely resembled those of the Isma'ílís and Hurúfís. In the hands of Bahá the aims of the sect became much more practical and ethical, and the wilder pantheistic tendencies and metaphysical hair-splittings of the early Bábís almost disappeared. The intelligence, integrity and morality of the present Bábís (whose numbers appear to be rapidly increasing) are high, but their efforts to improve the social position of woman have been much exaggerated. They were in no way concerned (as was at the time falsely alleged) in the assassination of Násiru'd-Dín Sháh in May 1896. Since the persecution at Yezd in May 1891 they have been comparatively unmolested.

LITERATURE.—The literature of the sect is very voluminous, but mostly in manuscript. The most valuable public collections in Europe are at St Petersburg, London (British Museum), and Paris (Bibliothèque Nationale), where two or three very rare MSS. collected by Gobineau, including the precious history of the Báb's contemporary, Hájí Mírzá Jání of Káshán, are preserved. For the bibliography up to 1889, see vol. ii. pp. 173-211 of the *Traveller's Narrative, written to illustrate the Episode of the Báb*, a Persian work composed by Bahá's son, 'ABBÁS EFENDÍ, edited, translated and annotated by E. G. BROWNE (Cambridge, 1891). More recent works are:—BROWNE. *The New History of the Báb.* Cambridge, 1893; and "Catalogue and Description of the 27 Bábí Manuscripts," *Journal of R. Asiat. Soc.*, July and October 1892.—ANDREAS. *Die Babi's in Persien.* 1896.—BARON VICTOR ROSEN. *Collections Scientifiques de l'Institut des Langues Orientales*, vol. i. (1877), pp. 179-212; vol. iii. (1886), pp. 1-51; vol. vi. (1891), pp. 141-255. "Manuscrits Bâbys"; and other important articles in Russian by the same scholar, and by Captain A. G. TOUMANSKY, in the *Zapiski vostochnava otdyeleniya Imperatorskava Russkava Archeologicheskava Obshchestva* (St Petersburg, 1890-1900, vols. iv.-xii.).—Also an excellent edition by TOUMANSKY, with Russian translation, notes and introduction, of the *Kitáb-i-Aqdas* (the most important of Bahá's works), &c. (St. Petersburg, 1899).—Of the works composed in English for the American converts the most important is entitled *Behá'u'lláh* (*The Glory of God*), by Ibráhím Khayru'lláh, assisted by Howard MacNutt (Chicago, 1900).

(E. G. B.)

BABYLONIA AND ASSYRIA.

SINCE the publication of the article on BABYLONIA in the ninth edition of the *Encyclopædia Britannica*, excavations in that country have been carried on so actively, while so largely increasing a number of Assyrian students has been engaged in deciphering the thousands of inscribed tablets which have been brought to Europe and America, that the account given of its history and culture requires to be considerably supplemented and revised. Though little has been done towards the excavation of Assyrian sites, Babylonia has been explored by expedition after expedition, and some of the earliest records of civilization have been brought to light. After the death, however, of Mr George Smith at Aleppo in 1876, the first expedition—that sent out by the British Government in 1877-79 under the conduct of Mr Hormuzd Rassam—confined its operations to Assyria. Excavations in the mounds of Balawât (called Imgur-Bel by the Assyrians), 15 miles east of Mosul, resulted in the discovery of a small temple dedicated to the god of dreams by Assur-nazir-pal II. (885 B.C.), and containing a stone coffer or ark, in which were two inscribed tables of alabaster of rectangular shape, as well as of a palace which had been destroyed by the Babylonians, but rebuilt by Shalmaneser II. From the latter came the bronze gates with hammered reliefs which are now in the British Museum. The remains of a palace of Assur-nazir-pal II. at Nimroud (Calah) were also excavated by Mr Rassam, and hundreds of enamelled tiles were disinterred. Two years later (1880-81) Mr Rassam was sent to Babylonia, where he discovered the site of the temple of the Sun-god of Sippara at Abu-Habba, and so fixed the position of the two Sipparas or Sepharvaim. Abu-Habba lies south of Baghdad, midway between the Euphrates and Tigris, on the south side of an ancient canal, on the opposite bank of which was Sippara of the goddess Anunit, now Dêr.

Recent explorations and discoveries.

Meanwhile (1877-81) the French consul, de Sarzec, had been excavating at Tello, the ancient Lagas, in Southern Babylonia, and bringing to light monuments of the Sumerian or pre-Semitic age, which included the diorite statues of the High-priest Gudea, now in the Louvre, the stone of which, according to the inscriptions upon them, had been fetched from Magan, the Sinaitic peninsula. The subsequent excavations of M. de Sarzec in Tello and its neighbourhood have carried the history of the city back to at least 4000 B.C., and a library of more than 30,000 tablets has been found, which were arranged on shelves in the time of Gudea (in 2700 B.C.). In 1886-87 a German expedition under Koldewey explored the cemetery of El-Hibba (immediately to the south of Tello), and for the first time made us accurately acquainted with the burial customs of ancient Babylonia. Another German expedition, on a large scale, has been despatched in 1899 with the object of thoroughly exploring the site of Babylon, the palaces and temples of which still remain for the most part unidentified. Its first result has been the identification of the mound called El-Qasr with the palace of Nebuchadrezzar, and that of Amran with the temple of Bel. But thus far the most important and most systematic work done in Babylonia has been that of the American expedition of the university of Pennsylvania, which has been (since 1889) patiently and scientifically excavating the great temple of El-lil or Bel at Niffer, the ancient Nippur, in Northern Babylonia. Here Mr Haynes has been working winter and summer, steadily removing stratum after stratum of debris and cutting sections in the ruins down to the virgin soil. Midway in the mound is a platform of huge bricks stamped with the names of Sargon of Akkad and his son Naram-Sin (3800 B.C.); and as the debris above them is eleven metres thick, the topmost layer being not later than the Christian era (Hilprecht, *The Babylonian Expedition*, i. 2. p. 23), it is calculated that the debris underneath the pavement, 9·25 metres thick, must represent a period of about 3000 years, more especially as older constructions had to be levelled before the pavement was laid. In the deepest part of the excavations, however, inscribed clay tablets and fragments of stone vases are still found, though the cuneiform characters upon them are of a very archaic type, and sometimes even retain their primitive pictorial forms.

The temple of Nippur was one of the oldest sanctuaries in Babylonia, and one of the two centres from which the early culture of the country radiated. The other centre was Eridu, now represented by Abu-Shahrein (or Nowâ-

wis), which, though now 130 miles inland, was once the seaport of primeval Chaldæa. As about 46 miles of land have been formed by the silting up of the shore since the foundation of Spasinus Charax (Mohammerah) in the time of Alexander the Great, or about 115 feet a year, the foundation of Eridu must go back to at least 6000 B.C. Babylon seems to have been a colony of Eridu, since its patron-god, Merodach, was a son of Ea of Eridu, while Ur, now Muqayyar, on the western bank of the Euphrates, must have owed its foundation to Nippur, El-lil, the god of Nippur, being accounted the father of the Moon-god of Ur.

Nippur and Eridu.

The two streams of culture which flowed from Nippur and Eridu afforded a strong contrast. Ea of Eridu was a god of light and beneficence, who employed his divine wisdom in healing the sick and restoring the dead to life. Rising each morning from his palace in the deep, he had given man the arts and sciences, the industries and manners of civilization. El-lil of Nippur, on the contrary, was the lord of the ghost-land, and his gifts to mankind were the spells and incantations which the spirits of good or evil were compelled to obey. But both Ea and El-lil were the gods of the early Sumerian population of Babylonia, who spoke an agglutinative language, and to whom the invention of the cuneiform system of writing, or rather the pictorial hieroglyphs out of which it developed, was due, as well as all the other elements of Babylonian civilization. All the older inscriptions are in the Sumerian language, and the princes of the older epoch all bear Sumerian names. The precise linguistic position of this language is still a matter of dispute. Professor Hommel has advanced strong reasons for believing it to be related to the Turko-Tatar family; Professor de la Couperie and Mr Ball have endeavoured to connect it with Chinese. The present writer has long since given up the belief that it was a primitive form of Ural-Finnic. All that can be said positively about it is that it is an early representative of the agglutinative languages. There were two dialects of it, one spoken in Sumer or Southern Babylonia, and called by the native grammarians "the pure language" (*eme-lakhkha*), the other in Akkad or Northern Babylonia, and termed "the woman's language" (*eme-sal*). The latter was much affected by phonetic decay and the influence of a Semitic population, which was more numerous in Akkad than in Sumer, and its native appellation was probably derived from its being spoken imperfectly by the Semitic wives of Sumerian husbands. At an early period the Sumerians came into contact with Semitic tribes on the Arabian side of the Euphrates, and after their engineering works had regulated the water-supply of Babylonia and rendered it one of the most fertile of agricultural countries Semitic settlers established themselves in it, and before 3800 B.C. became the predominant population in Akkad or Northern Babylonia. The languages spoken by the two races were naturally affected by the intercourse between them; Sumerian was influenced by Semitic Babylonian, and still more Semitic Babylonian by Sumerian. Indeed, the Semitic Babylonian of literature may be described as a mixed language, though not to the same extent as modern English. It was many centuries, however, before it succeeded in superseding the older language of the country; in fact, it is questionable whether Sumerian did not survive in some of the country districts of Sumer as late as the Greek period, and even under the dynasty of Khammurabi official texts were still published in the two languages, the older language of Sumer taking the first place. Long after the establishment of Semitic supremacy Sumerian continued to be the language of law, and it remained the language of the official religion to the very last.

Origin of Babylonian culture.

The alluvial plain of Babylonia, after its reclamation from swamp and jungle, was called by the Sumerians the Edin or "Plain," a word which was borrowed by Semitic Babylonian under the form of Edinnu, the Eden of Gen. ii. 8. A Sumerian hymn describes a magical tree—the tree of life—which "grew in Eridu," in "the centre of the earth," where the god Ea walks in his garden, forbidden to man, and Tammuz dwells beneath its shade, while the Tigris and Euphrates flow on either side. In this description it is difficult not to see a parallel to that of the Biblical Garden of Eden.[1]

The land of Eden.

Hardly any addition has been made to our knowledge of Assyrian chronology, no further copies of the eponym canon having been found since 1889. The first lists of *limmi*, or eponymous archons who gave their names to their years of office, were brought to light by Sir H. Rawlinson (*Athenæum*, 1862). They are twofold in character, one version containing merely a list of the eponyms in their chronological order, while in the other their titles are added as well as the chief event which marked each term of office. They furnish a continuous and accurate chronology from 893 B.C. (or 911, if George Smith was right in the position he assigned to a fragment of one of them) down to 666 B.C., fixed dates being given within this period by the capture of Samaria in 722 B.C. and the solar eclipse of 15th June 763 B.C., which took place in the ninth year of the reign of Assurdan III.

Chronology.

Babylonian chronology, however, which a few years ago was almost a blank, has now been to a considerable extent recovered. George Smith had already discovered a fragment of what must have been a complete list of the Chaldean dynasties with their respective dates (*Trans. S.B.A.* iii. 2, 1874), and portions had been published of a so-called *Synchronous History of Assyria and Babylonia*, consisting of brief notices of the occasions on which the kings of the two countries had entered into relation, hostile or otherwise, with one another (Sayce, *Records of the Past*, first series, iv. pp. 24-35). In 1880 Mr. Pinches discovered a tablet, which seems to have been a schoolboy's exercise, containing a list of the kings of the first two dynasties of Babylon, and in 1884 a chronological list of the dynasties that reigned in Babylonia from the time that Babylon became the capital of the whole kingdom. In the same year "The Babylonian Chronicle" was also discovered by the same scholar. This is a compilation from older records made in the time of Darius, from a Babylonian point of view, and when perfect must have given a very complete synopsis of Babylonian history, with dates and synchronisms. The portions of it thus far known relate to the Kassite dynasty and the conquest of Babylon by the Assyrian king Tiglath-Ninip, in the 13th century B.C., and more especially to the period beginning with the third year of Nabonassar in Babylonia and the accession of Tiglath-pileser III. in Assyria (745 B.C.), and ending with the accession of Samas-sum-yukin (668 B.C.). In Babylonia time was registered, not by eponyms, but by the chief event that distinguished each year of a king's reign, the accession and death of the king being of course noted. At the end of a reign a list of the dates belonging to it was drawn up, and from time to time these were combined into a longer record. In a commercial community, such as Babylonia was from the first, accurate dating was a matter of vital importance; the validity of contracts and other legal documents often depended upon

[1] Kar-Duniyas, once miswritten Gan-Duniyas, has nothing to do with the Garden of Eden. It means "the Wall" or "Fortification of the god Duniyas," and was the name applied to Northern Babylonia, probably after the rise of the Kassite dynasty, from a line of fortifications which defended the frontier, and may be "the Median Wall" mentioned by Xenophon (*Anab.* ii. 4. 12).

it, and it was necessary that there should be easy access to an official chronological record. Among the tablets recently acquired by the British Museum is one which was compiled on the 2nd day of the month Iyyar in the accession year of Ammi-zadok (2190 B.C.), and which contains a complete chronological register of the earlier reigns of the first dynasty of Babylon. Similar tablets which give the chronology of the reigns of Dungi and Bur-Sin II. (of the dynasty of Ur) have been found at Niffer (Sayce, *Proceedings S.B.A.* xxi. 1), while the annals of Sargon of Akkad and of the first three years of his son Naram-Sin (3800 B.C.) have long been known. The events recorded in these latter have been recently verified by the dates found attached to contemporaneous contracts. To these chronological materials must be added the references to past history which occur in later inscriptions. Nabonidos especially, who was more of an antiquary than a politician, and who spent a good deal of his time in excavating for the monuments of his predecessors, has left us valuable notices. Thus he states that Naram-Sin, the son of Sargon, lived 3200 years before himself, and that a Kassite king, Burna-buryas, reigned 700 years after Khammurabi.

Earliest history of Babylonia.

In the earliest period of which we have any knowledge Babylonia was divided into several independent states. Their frontiers were defined by canals and boundary-stones, and the infringement of these frequently led to war. Many of the states were ruled by a *patesi* or high-priest, the god of its chief sanctuary being nominally the ruler, and the human *patesi* his minister. But in course of time many of the high-priests assumed the functions and title of king; while retaining their priestly office they claimed at the same time to be supreme in the state in all secular concerns. The god remained nominally at its head; but even this position was lost to him when Babylonia was unified under Semitic princes, and the earthly king became an incarnate god. It was only at Babylon that Bel-Merodach continued to hold his own and compel the deified kings to acknowledge themselves his sons, who derived from him their right to rule.

When the monumental evidence first becomes distinct we find a kingdom of Kengi or Sumer in the south of Babylonia, and a kingdom of Kis in the north. Kis is represented by El-Hymer, a little to the east of Babylon, and in later ages was known chiefly on account of its temple of Zamama. In its wars with the south Kis was often assisted by another northern kingdom, the reading of the name of which, and consequently its precise situation, are still uncertain. The name has been read as "the land of the Bow," and supposed to represent Harran in Mesopotamia; this, however, was certainly not the case, and the ideograph by which the name is expressed is probably to be identified with that which in later Babylonian denoted Upê or Opis on the Tigris. Dr Scheil would make it Ukh and identify it with the modern Jokha between the Shatt el-Hai and the Shatt el-Nil, but Jokha is more probably the ancient Isin. On a seal cylinder two of the rulers of the place are called kings of Tê. Perhaps the first king of Upê (?) was a certain Lugal-zaggisi, as he gives his father U-kus the title merely of *patesi* or high-priest.[1] He founded the earliest empire in Western Asia of which we know. He not only conquered Kengi, but also claims to have made Erech his capital, and to have ruled "from the lower sea of the Tigris and Euphrates" or Persian Gulf to the "Upper Sea" or Mediterranean. The long inscription which he caused to be engraved on the hundreds of stone vases dedicated to El-lil of Nippur has been edited and translated by Professor Hilprecht. The predominance of Kengi in the south was succeeded by that of Lagas, now Tello, on the east side of the Shatt el-Hai. Lagas was at one time dependent on Kis, and we hear of Me-salim, king of Kis, overthrowing Us, the high-priest of Upê, in the *edin* or plain of Lagas, which he had invaded.[2] Lugal-sug-gur was at the time the high-priest of Lagas. Subsequently Lagas recovered its independence, and its high-priests became kings. One of these, Ur-Nina, was the builder of an edifice attached to the temple of Nina, in the ruins of which terra-cotta bas-reliefs of the king and his sons have been found, as well as lions' heads of onyx, which remind us of Egyptian work, and fragments of onyx plates. These were "booty" dedicated to the goddess Bau. The grandson of Ur-Nina, E-ana-gin or E-anna-du, made himself master of the whole of Southern Babylonia, including "the district of Sumer," together with the cities of Erech, Ur, and Larsa (?). He also annexed the kingdom of Kis, and drove the king of Upê from a part of the territory of Lagas which he had occupied. Upê was made tributary, a certain amount of grain being levied upon each person in it, which had to be paid into the treasury of the goddess Nina and the god Ingurisa. The so-called Stela of the Vultures, now in the Louvre, was erected as a monument of the victory. On this various incidents in the war are represented. In one scene the king stands in his chariot, with a curved weapon in his right hand formed of three bars of metal bound together by rings,[3] while his kilted followers with helmets on their heads and lances in their hands march behind him. In another a flock of vultures is feeding on the bodies of the fallen enemy; in a third a tumulus is being heaped up over those who had been slain on the side of Lagas. Elsewhere we see the victorious prince beating down a vanquished chief and superintending the execution of other prisoners who are being sacrificed to the gods, while in one curious scene he is striking with his mace a sort of wicker-work cage filled with naked men. In his hand he holds the crest of Lagas and its god, a lion-headed eagle with outstretched wings and supported by two lions which are set heraldically back to back. The sculptures belong to a primitive period of art.

Rise of Lagas.

The vulture stela.

E-anna-du's campaigns extended beyond the confines of Babylonia. He overran a part of Elam, and took the city of Az, on the Persian Gulf. At home he was a great builder. Temples and palaces were repaired or erected at Lagas and elsewhere, the town of Ninâ—which probably gave its name to the later Ninâ or Nineveh—was rebuilt, and canals and reservoirs were dug. He was succeeded by his brother, En-anna-dun, under whom Upê once more became the dominant power. The sanctuaries of Lagas were destroyed and part of its territory was annexed to Upê. As En-anna-dun has the title only of high-priest, and not of king, it is probable that he acknowledged Urlumma of Upê as his suzerain. His son and successor, Entemena, restored the prestige of Lagas. Upê was subdued and a certain Illi appointed to govern it as high-priest. A tripod of hammered silver dedicated by him to his god is now in the Louvre. A frieze of lions devouring ibexes and deer, and incised with great artistic skill, runs round the neck, while

[1] It must be remembered that the readings of these early non-Semitic names are only provisional, as the pronunciation of the ideographs by which they are expressed is uncertain. On palæographical grounds Lugal-zaggisi has been placed after the two kings of Tê, En-akalli and his son Urlumma, the latter of whom was a contemporary of Entemena of Lagas. Tê may be Tewa, a suburb of Babylon, since a contract tablet speaks of "Tê in Babylon."

[2] According to Dr Scheil, a monument recently discovered by Mr de Morgan at Susa makes Me-salim the son of Manistusu.

[3] As M. Heuzey has noticed, it resembles a weapon carried by the chief of an Asiatic tribe in a tomb of the twelfth dynasty at Beni Hassan (see *Beni-Hassan*, I. Pl. xxviii.; Egypt Exploration Fund).

the eagle crest of Lagas adorns the globular part. The vase is a proof of the high degree of excellence to which the goldsmith's art had already attained. A vase of calcite, also dedicated by Entemena, has been found at Nippur.

While the Sumerian princes of Lagas were fighting and building, the Semitic element in Northern Babylonia was growing in numbers and strength. Manistusu, "king of Kis," a long inscription of whom has been discovered by de Morgan on a monument in the ruins of Susa, probably belonged to the Semitic race. He was a contemporary of Uru-duggina, the vassal king of Lagas, in whom M. Heuzey sees one of the successors of Entemena, though Hilprecht would refer him to a much earlier period. Another Semitic ruler of Kis of the same period was Alusarsid (or Uru-mus), who "subdued Elam and Barahse." But the fame of these early establishers of Semitic supremacy was eclipsed by that of Sargon of Akkad and his son Naram-Sin, the founders of an empire which extended from Elam to the Mediterranean and the Sinaitic peninsula. The date of Sargon is placed by Nabonidos at 3800 B.C. He was the son of Itti-Bel, and a legend related how he had been born in concealment and set adrift in an ark of bulrushes on the waters of the Euphrates. Here he had been rescued and brought up by "Akki the husbandman"; but the day arrived at length when his true origin became known, the crown of Babylonia was set upon his head, and he entered upon a career of foreign conquest. Four times he invaded Syria and Palestine, and spent three years in thoroughly subduing the countries of "the west," and in uniting them with Babylonia "into a single empire." Images of himself were erected on the shores of the Mediterranean in token of his victories, and cities and palaces were built at home out of the spoils of the conquered lands. Elam and the northern part of Mesopotamia were also subjugated, and rebellions were put down both in Kazalla and in Babylonia itself. Contract tablets have been found dated in the years of the campaigns against Palestine and Sarlak, king of Gutium or Kurdistan, and copper is mentioned as being brought from Magan or the Sinaitic peninsula.

Sargon of Akkad.

Sargon's son and successor, Naram-Sin, followed up the successes of his father by marching into Magan, whose king he took captive. He assumed the imperial title of "king of the four zones," and, like his father, was addressed as a "god." He is even called "the god of Agadê" (Akkad), reminding us of the divine honours claimed by the Pharaohs of Egypt, whose territory now adjoined that of Babylonia. A finely-executed bas-relief, representing Naram-Sin, and bearing a striking resemblance to early Egyptian art in many of its features, has been found at Diarbekir. Babylonian art, however, had already attained a high degree of excellence; two seal cylinders of the time of Sargon are among the most beautiful specimens of the gem-cutter's art ever discovered. The empire was bound together by roads, along which there was a regular postal service, and clay seals, which took the place of stamps, are now in the Louvre bearing the names of Sargon and his son. A cadastral survey seems also to have been instituted, and one of the documents relating to it states that a certain Uru-Malik, whose name appears to indicate his Canaanitish origin, was governor of the land of the Amorites, as Syria and Palestine were called by the Babylonians. It is probable that the first collection of astronomical observations and terrestrial omens was made for a library established by Sargon.

Bingani-sar-ali was the son of Naram-Sin, but we do not yet know whether he followed his father on the throne. Another son was high-priest of the city of Tutu, and in the name of his daughter, Lipus-Eaum, a priestess of Sin, some scholars have seen that of the Hebrew deity Yahveh. The Babylonian god Ea, however, is more likely to be meant. The fall of Sargon's empire seems to have been as sudden as its rise. The seat of supreme power in Babylonia was shifted southwards to Erech, Isin, and Ur. At least three dynasties appear to have reigned at Ur and claimed suzerainty over the other Babylonian states. One of these, under Gungunu, succeeded in transferring the capital of Babylonia from Isin to Ur. It is still uncertain whether Gungunu belonged to the second or third dynasty of Ur; if to the second, among his successors would have been Ur-Gur, a great builder, who built or restored the temples of the Moon-god at Ur, of the Sun-god at Larsa, of Istar at Erech, and of Bel at Nippur. His son and successor was Dungi I., one of whose vassals was Gudea, the *patesi* or high-priest of Lagas (Tello). Gudea was also a great builder, and the materials for his buildings and statues were brought from all parts of Western Asia, cedar wood from the Amanus mountains, quarried stones from Lebanon, copper from Northern Arabia, gold and precious stones from the desert between Palestine and Egypt, dolerite from Magan (the Sinaitic peninsula), and timber from Dilmun in the Persian Gulf. Some of his statues, now in the Louvre, are carved out of Sinaitic dolerite, and on the lap of one of them (statue E) is the plan of his palace, with the scale of measurement attached. Six of the statues bore special names, and offerings were made to them as to the statues of the gods. Gudea claims to have conquered Ansan in Elam, and was succeeded by his son Ur-Ningirsu. His date may be provisionally fixed at 2700 B.C.

The kings of Ur.

The high-priests of Lagas still owned allegiance to Ur, when the last dynasty of Ur was dominant in Babylonia. The dynasty was Semitic, not Sumerian, though one of its kings was Dungi II. He was followed by Bur-Sin II., Gimil-Sin, and Inê-Sin, whose power extended to the Mediterranean, and of whose reigns we possess a large number of contemporaneous monuments in the shape of contracts and similar business documents, as well as chronological tables. After the fall of the dynasty, Babylonia passed under foreign influence. Sumu-abi ("Shem is my father"), from Southern Arabia (or perhaps Canaan), made himself master of Northern Babylonia, while Elamite invaders occupied the south. After a reign of fourteen years Sumu-abi was succeeded by his son Sumu-la-ilu, in the fifth year of whose reign the fortress of Babylon was built, and the city became for the first time a capital. Rival kings, Pungun-ila and Immerum, are mentioned in the contract tablets as reigning at the same time as Sumu-la-ilu (or Samu-la-ilu); and under Sin-muballidh, the great-grandson of Sumu-la-ilu, the Elamites laid the whole of the country under tribute, and made Eri-Aku or Arioch, called Rim-Sin by his Semitic subjects, king of Larsa. Eri-Aku was the son of Kudar-Mabug, who was prince of Yamudbal, on the eastern border of Babylonia, and also "governor of Syria." The Elamite supremacy was at last shaken off by the son and successor of Sin-muballidh, Khammurabi, whose name is also written Ammurapi and Khammuram, and who was the Amraphel of Gen. xiv. 1. The Elamites, under their king Kudur-Lagamar or Chedor-laomer, seem to have taken Babylon and destroyed the temple of Bel-Merodach; but Khammurabi retrieved his fortunes, and in the thirtieth year of his reign (in 2340 B.C.) he overthrew the Elamite forces in a decisive battle and drove them out of Babylonia. The next two years were occupied in adding Larsa and Yamudbal to his dominion, and in forming Babylonia into a single monarchy, the head of which was Babylon. A great literary revival followed the recovery

Accession of a South Arabian dynasty.

Khammurabi or Amraphel.

of Babylonian independence, and the rule of Babylon was obeyed as far as the shores of the Mediterranean. Vast numbers of contract tablets, dated in the reigns of Khammurabi and other kings of the dynasty, have been discovered, as well as autograph letters of the kings themselves, more especially of Khammurabi. Among the latter is one ordering the despatch of 240 soldiers from Assyria and Situllum, a proof that Assyria was at the time a Baylonian dependency. Constant intercourse was kept up between Babylonia and the west, Babylonian officials and troops passing to Syria and Canaan, while "Amorite" colonists were established in Babylonia for the purposes of trade. One of these Amorites, Abi-ramu or Abram by name, is the father of a witness to a deed dated in the reign of Khammurabi's grandfather. Ammi-ditana, the great-grandson of Khammurabi, still entitles himself "king of the land of the Amorites," and both his father and son bear the Canaanitish (and South Arabian) names of Abêsukh or Abishua, and Ammi-zadok.

Samsu-ditana, the son of Ammi-zadok, was the last king of the first dynasty of Babylon, which was followed by a dynasty of eleven Sumerian kings for 368 years. We know but little of them; their capital has not yet been discovered, and no trading documents dated in their reigns have been found. They were overthrown and Babylonia was conquered by Kassites or Kossæans from the mountains of Elam, under Kandis or Gaddas (in 1800 B.C.), who established a dynasty which lasted for 576 years and nine months. Under this foreign domination, Babylonia lost its empire over Western Asia. Syria and Palestine became independent, and the high-priests of Assur made themselves kings of Assyria. The divine attributes with which the Semitic kings of Babylonia had been invested disappeared at the same time; the title of "god" is never given to a Kassite sovereign. Babylon, however, remained the capital of the kingdom and the holy city of Western Asia. Like the sovereigns of the Holy Roman Empire, it was necessary for the prince, who claimed rule in Western Asia, to go to Babylon and there be acknowledged as the adopted son of Bel before his claim to legitimacy could be admitted. Babylon became more and more a priestly city, living on its ancient prestige and merging its ruler into a pontiff. From henceforth, down to the Persian era, it was the religious head of the civilized east.

The Kassite dynasty.

One of the earlier Kassite kings was Agum-kakrime, who recovered the images of Merodach and his consort, which had been carried away to Khani. At a later date Kadasman-Bel and Burna-buryas I. corresponded with the Egyptian Pharaohs Amon-hotep III. and Amon-hotep IV. (1400 B.C.). The Assyrian king Assur-yuballidh still owned allegiance to his Babylonian suzerain, and intermarriages took place between the royal families of Assyria and Babylonia. Babylonia, moreover, still sought opportunities of recovering its old supremacy in Palestine, which the conquests of the eighteenth dynasty had made an Egyptian province, and along with Mitanni or Aram-Naharaim and the Hittites intrigued against the Egyptian Government with disaffected conspirators in the west. After the death of Burna-buryas, however, civil war in Babylonia led to Assyrian interference in the affairs of the country, and from this time forward even the nominal obedience of Assyria to its old suzerain was at an end. Frequent wars broke out between the two nations, and eventually (about 1280 B.C.) Tiglath-Ninip of Assyria, in the fifth year of his reign, captured Babylon and sent the treasures of Ê-Saggil, the temple of Bel-Merodach, to Assur. For seven years the Assyrian monarch reigned over Babylonia, then a revolt obliged him to retire; Hadad-nadin-sumi of the native dynasty was placed on the Babylonian throne; and Tiglath-Ninip was shortly afterwards murdered by his son, Assur-nazir-pal I. Assyria steadily increased in power, while Babylonia fell more and more into decay. Shalmaneser I., the builder of Calah (now Nimroud) in 1300 B.C., carried his victorious arms in all directions, and Tiglath-pileser I. extended the Assyrian empire as far as the Mediterranean (1100 B.C.). The Kassite dynasty had fallen about 1230 B.C., in consequence of an attack on the part of the Elamites, and a new dynasty which sprang from Isin took its place, and lasted for 132½ years. Then came a series of short-lived dynasties, ending with that of Nebo-nazir, the Nabonassar of classical writers, who ascended the throne of Babylon in 747 B.C. Assyria was at the time in the throes of a revolution. Civil war and pestilence were devastating the kingdom, and its northern provinces had been wrested from it by Ararat (or Van). In 746 B.C. Calah rebelled, and on the 13th of Iyyar (April), in the following year, Pulu or Pul, who took the name of Tiglath-pileser III., seized the throne, and inaugurated a new and vigorous policy.

Assyrian conquest of Babylon.

Under him and his successors arose the second Assyrian empire, which finally included the whole civilized world of the day. In 729 B.C. Babylonia was conquered, and the Assyrian king, under his original name of Pulu, was invested with the sovereignty of Asia in the holy city of Babylon. Two years later, in Tebet (or December) 727 B.C., he died, but his successor Ululâ, who took the name of Shalmaneser IV., continued the policy he had begun. Shalmaneser died suddenly in Tebet 722 B.C., and the seizure of the throne by Sargon on the 12th of the month gave the Babylonians an opportunity to revolt. In Nisan (or March) the Kaldâ prince, Merodach-baladan, entered Babylon, and was there crowned legitimate king. For twelve years he successfully resisted the Assyrians; but the failure of his allies in the West to act in concert with him, and the overthrow of the Elamites, eventually compelled him to fly to his ancestral domains in the marshes of Southern Babylonia. Even here his enemies pursued him, and along with his followers he sought refuge in Elam. Sargon was accepted as king by the Babylonian priests, and the legitimacy of his rule was acknowledged up to the time of his murder in 705 B.C. Sennacherib, who followed him as king of Assyria, was never crowned at Babylon, the result being revolt after revolt on the part of the Babylonians, who found supporters in the Elamites. At length (in 691 B.C.) a decisive battle was fought at Khalulê. Both sides claimed the victory, but the Elamites retired from the struggle, and the Babylonians were too exhausted to face their invaders again in the open field. Two years, however, were still required for the complete subjugation of the country, and it was not till 689 B.C. that Babylon was taken, its houses and temples razed to the ground, the images of its gods broken in pieces, and the ruins of the city thrown into the canal Arakhtu. The catastrophe aroused a feeling of horror and indignation throughout Western Asia, and the murder of its perpetrator nine years afterwards was regarded by the Babylonians as the punishment inflicted on him by heaven. The murder took place on the 20th of Tebet (681 B.C.), and for forty-two days the conspirators held the capital; then they were forced to fly to Ararat, against which an Assyrian army, under the command of Esar-haddon, was carrying on hostilities. A battle was fought with the Armenian and rebel Assyrian forces near Malatiyeh on the 12th of Iyyar; the veterans of Assyria won the day, and at the close of it saluted Esar-haddon as king. He thereupon returned to Nineveh, and on the 8th of Sivan (May) formally ascended the throne.

The second Assyrian empire.

Destruction of Babylon.

One of his first acts was to restore Babylon, to send back the image of Bel-Merodach to its old home, and to repeople the city with such of the priests and the former population as had survived massacre. Then he was solemnly declared king in the temple of Bel-Merodach, which had again risen from its ruins, and Babylon became the second capital of the empire. Esar-haddon's policy was successful, and Babylonia remained contentedly quiet throughout his reign. In February (674 B.C.) the Assyrians entered upon their invasion of Egypt. But two more campaigns were needed before its conquest could be completed. At last in Nisan (or March) 670 B.C., an expedition on an unusually large scale set out from Nineveh. The Egyptian frontier was crossed on the 3rd of Tammuz (June), and Tirhakah, at the head of the Egyptian forces, was driven to Memphis after fifteen days of continuous fighting, during which the Egyptians were thrice defeated with heavy loss and Tirhakah himself was wounded. On the 22nd of the month Memphis was entered by the victorious army, and Tirhakah fled to the south. A stele commemorating the victory and representing Tirhakah with the features of a negro was set up at Sinjirli (north of the Gulf of Antioch), and is now in the Berlin Museum. Two years later (668 B.C.) Egypt revolted, and while on the march to reduce it Esar-haddon fell ill and died (on the 10th of Marchesvan or October). Assur-bani-pal succeeded him as king of Assyria and its empire, while his brother, Samas-sum-yukin, was made viceroy of Babylonia. The arrangement was evidently intended to flatter the Babylonians by giving them once more the semblance of independence. But it failed to work. Samas-sum-yukin became more Babylonian than his subjects; the viceroy claimed to be the successor of the monarchs whose empire had once stretched to the Mediterranean; even the Sumerian language was revived as the official tongue, and a revolt broke out which shook the Assyrian empire to its foundations. After several years of struggle, during which Egypt recovered its independence, Babylon was starved into surrender, and the rebel viceroy and his supporters were put to death. Then followed the contest with Elam, in spite of the efforts of Assur-bani-pal to ward it off. Assyria, however, was aided by civil war in Elam itself; the country was wasted with fire and sword, and its capital Shushan levelled with the ground. But the long struggle left Assyria maimed and exhausted. It had been drained of both wealth and fighting population; the devastated provinces of Elam and Babylonia could yield nothing with which to supply the needs of the imperial exchequer, and it was difficult to find sufficient troops even to garrison the conquered populations. Assyria, therefore, was ill prepared to face the hordes of Scythians—or Manda, as they were called by the Babylonians—who now began to harass the frontiers. A Scythian power had grown up in the old kingdom of Ellip, to the east of Assyria, where Ekbatana was built by a "Manda" prince; Asia Minor was infested by the Scythian tribe of Kimmerians, and the death of the Scythian leader Dugdammê (the Lygdamis of Strabo, i. 3. 16) was regarded by Assur-bani-pal as a special mark of divine favour. When Assur-bani-pal died, his empire was fast breaking up. Under his successor, Assur-etil-ilani, the Scythians penetrated into Assyria and made their way as far as the borders of Egypt. Calah was burned, though the strong walls of Nineveh protected the relics of the Assyrian army which had taken refuge behind them; and when the raiders had passed on to other fields of booty, a new palace was erected among the ruins of the neighbouring city. But its architectural poverty and small size show that the resources of Assyria were at a low ebb. A contract has been found at Sippara, dated in the fourth year of Assur-etil-ilani, though it is possible that his rule in Babylonia was disputed by his Rab-shakeh or vizier, Assur-sum-lisir, whose accession year as king of Assyria has been found on a contract from Niffer. The last king of Assyria was probably the brother of Assur-etil-ilani, Sin-sar-iskun, who seems to have been the Sarakos of Berossos. He was still reigning in Babylonia in his seventh year, as a contract dated in that year has been discovered at Erech, and an inscription of his, in which he speaks of restoring the ruined temples and their priests, couples Merodach of Babylon with Assur of Nineveh. Babylonia, however, was again restless. After the overthrow of Samas-sum-yukin, Kandalanu, the Chineladanos of Ptolemy's canon, had been appointed viceroy. His successor was Nabopolassar, between whom and the last king of Assyria war broke out. The Scythian king of Ekbatana, the Kyaxares of the Greeks, came to the help of the Babylonians. Nineveh was captured and destroyed by the Scythian army, along with those cities of Northern Babylonia which had sided with Babylonia, and the Assyrian empire was at an end.

Conquest of Egypt.

Scythian invasion.

But little addition has been made to our knowledge of the political events that marked the reign of Nebuchadrezzar. Only a small fragment of his annals has been discovered relating to his invasion of Egypt in 567 B.C., and referring to "Phut of the Ionians." Of the reign of the last Babylonian king, Nabonidos, however, and the conquest of Babylonia by Cyrus, we now have a fair amount of information. This is chiefly derived from a chronological tablet containing the annals of Nabonidos, which is supplemented by an inscription of Nabonidos in which he recounts his restoration of the temple of the Moon-god at Harran, as well as by a proclamation of Cyrus issued shortly after his formal recognition as king of Babylonia. It was in the sixth year of Nabonidos (549 B.C.) that Cyrus, "king of Anzan" in Elam, revolted against his suzerain Astyages, king of "the Manda" or Scythians at Ekbatana. The army of Astyages betrayed him to his enemy, and Cyrus established himself at Ekbatana, thus putting an end to the empire of the Scythians, which the Greek writers called that of the Medes, through a confusion of Madâ or "Medes" with Manda. Three years later we find that Cyrus has become king of Persia and is engaged in a campaign in the north of Mesopotamia. Meanwhile Nabonidos has established a camp at Sippara, near the northern frontier of his kingdom, his son—probably the Belshazzar of other inscriptions—being in command of the army. In 538 B.C. Cyrus invaded Babylonia. A battle was fought at Opis in the month of June, in which the Babylonians were defeated, and immediately afterwards Sippara surrendered to the invader. Nabonidos fled to Babylon, whither he was pursued by Gobryas, the governor of Kurdistan, and on the 16th of Tammuz, two days after the capture of Sippara, "the soldiers of Cyrus entered Babylon without fighting." Nabonidos was dragged out of his hiding-place, and Kurdish guards were placed at the gates of the great temple of Bel, where the services continued without intermission. Cyrus did not arrive till the 3rd of Marchesvan (October), Gobryas having acted for him in his absence. Gobryas was now made governor of the province of Babylon, and a few days afterwards the wife or son of Nabonidos—the reading is unfortunately uncertain—died. A public mourning followed, which lasted six days, and Cambyses accompanied the corpse to the tomb. Cyrus now claimed to be the legitimate successor of the ancient Babylonian kings and the avenger of Bel-Merodach, who was wrathful at the impiety of Nabonidos in removing the images of the local gods from their ancestral shrines to his capital Babylon. Nabonidos, in fact, had excited a strong feeling against himself by

Conquest of Babylonia by Cyrus.

attempting to centralize the religion of Babylonia in the temple of Merodach at Babylon, and while he had thus alienated the local priesthoods the military party despised him on account of his antiquarian tastes. He seems to have left the defence of his kingdom to others, occupying himself with the more congenial work of excavating the foundation records of the temples and determining the dates of their builders. The invasion of Babylonia by Cyrus was doubtless facilitated by the existence of a disaffected party in the state, as well as by the presence of foreign exiles like the Jews, who had been planted in the midst of the country. One of the first acts of Cyrus accordingly was to allow these exiles to return to their own homes, carrying with them the images of their gods and their sacred vessels. The permission to do so was embodied in a proclamation, in which the conqueror endeavoured to justify his claim to the Babylonian throne. The feeling was still strong that none had a right to rule over Western Asia until he had been consecrated to the office by Bel and his priests; and from henceforth, accordingly, Cyrus assumed the imperial title of "king of Babylon." A year before his death, in 529 B.C., he associated his son Cambyses in the government, making him king of Babylon, while he reserved for himself the fuller title of "king of the (other) provinces" of the empire. It was only when Darius Hystaspis, the representative of the Aryan race and the Zoroastrian religion, had re-conquered the empire of Cyrus, that the old tradition was broken and the claim of Babylon to confer legitimacy on the rulers of Western Asia ceased to be acknowledged. Darius, in fact, entered Babylon as a conqueror; after the murder of the Magian it had recovered its independence under Nidinta-Bel, who took the name of Nebuchadrezzar III., and reigned from October 521 B.C. to August 520 B.C., when the Persians took it by storm. A few years later, probably 514 B.C., Babylon again revolted under the Armenian Arakha; on this occasion, after its capture by the Persians, the walls were partly destroyed. É-Sagila, the great temple of Bel, however, still continued to be kept in repair, and to be a centre of Babylonian patriotism, until at last the foundation of Seleucia diverted the population to the new capital of Babylonia, and the ruins of the old city became a quarry for the builders of the new seat of government.[1]

Restoration of Jewish exiles.

Babylonian religion and culture emanated from two centres—Nippur, with its temple of El-lil or Bel, in the north; and Eridu, with its cult of Ea, the god of the water, on the shore of the Persian Gulf. But the nature of the religious influence exercised by the two cities differed greatly. From Nippur came a belief in the powers of night and darkness, exorcisms

Sources of Babylonian religion.

[1] The following is a list of the dynasties and kings of Babylonia and Assyria so far as they are known at present:—

The Babylonian Dynasties from cir. 2700 B.C.:—

Second Dynasty of Ur:—

Ur-Gur, cir. 2700 B.C.
Dungi I. (suzerain of Gudea of Lagas).
Kirgal-daramas, 50 years.
Â-dara-kalama, 28 years.
Akurduana, 26 years.
Melamma-kurkurra, 8 years.
Ea-ga[mil], 20 years.

Third Dynasty of Ur:—

Dungi II., more than 51 years.
Bur-Sin II., more than 12 years.
Gimil-Sin, more than 9 years.
Inê-Sin.

First Dynasty of Babylon.

2460 B.C.

Sumu-abi, 14 years.
Sumu-la-ilu, 36 years.
Zabium, 14 years.
Abil-Sin, 18 years.
Sin-muballidh, 20 years.
Khammurabi, 43 years.
Samsu-iluna, 38 years.
Abesukh, 25 years.
Ammi-ditana, 25 years.
Ammi-zadoq, 21 years.
Samsu-ditana, 31 years.

Dynasty of Sisku (?) for 368 *years.*

2174 B.C.

Anman, 60 years.
Ki-Nigas, 56 years.
Damki-ilisu, 26 years.
Iskipal, 15 years.
Sussi, 24 years.
Gul-ki[sar], 55 years.

Kassite Dynasty of 36 *kings for* 576 *years* 9 *months.*

1806 B.C.

Gandis, 16 years.
Agum-sipak, 22 years.
Bitilyasi I., 22 years.
Ussi (?), 9 years.
Adu-metas.
Tazzi-gurumas.
Agum-kakrime.
. . . . . .
Kara-indas.
Kadasman-Bel (corresponded with Amon-hotep III. of Egypt, 1430 B.C.).
Kuri-galzu I.
Burna-buryas, his son.
Kuri-galzu II., his son (?).
Kara-khardas.
Kadasman-kharbe, his son
Nazi-bugas, a usurper.
Kuri-galzu III., son of Kadasman-kharbe, 35 (?) years.
Nazi-Maruttas, his son, 26 years.
Kadasman-Turgu, his son, 17 years.
Kadasman-buryas, 14 years.
Kudur-Bel, 6 years.
Sagarakti-buryas, his son, 13 years.
Bitilyasu II., 8 years.
Bel-sum-iddin, 1½ years.
Hadad-sum-iddin, 6 years.
Hadad-sum-uzur, 30 years (including the 7 years during which the Assyrian king Tiglath-Ninip occupied Babylon).
Meli-sipak, 15 years.
Merodach-baladan I., his son, 13 years.
Zamama-sum-iddin, 1 year.
Bel-sum-iddin, 3 years.

Dynasty of Isin of 11 *kings for* 132½ *years.*

1229 B.C.

Merodach- . . . . 18 years.
. . . . . .
Nebuchadrezzar I.
Bel-nadin-pal.
Merodach-nadin-akhi, 22 years.
Merodach- . . . 1½ years.
Hadad-baladan, an usurper.
Merodach-sapik-zer-mati, 12 years.
Nabu-nadin, 8 years.

Dynasty of the Sea-coast.

1096 B.C.

Simbar-sipak, 18 years.
Ea-mukin-zeri, 5 months.
Kassu-nadin-akhi, 3 years.

Dynasty of Bit-Bazi.

1075 B.C.

Ê-Ulmas-sakin-sumi, 17 years.
Ninip-kudur-uzur I., 3 years.
Silanim-Suqamuna, 3 months.

Dynasty of Elam.

1055 B.C.

An Elamite, 6 years.

Second Dynasty of Babylon.

1049 B.C.

Nebo-kin-abli, 36 years.
Ninip-kudur-uzur II. (?) 8 months 12 days.
Probably four names missing.
Samas-mudammiq . *cir.* 920
Nebo-sum-iskun . *cir.* 900
Nebo-baladan . . *cir.* 880
Merodach-nadin-sumi *cir.* 860
Merodach-baladhsu-iqbi *cir.* 830
Bau-akhi-iddin . *cir.* 810
Probably two names missing.
Nebo-sum-iskun, son of Dakuri . . . *cir.* 760
Nabonassar, 14 years . 747
Nebo-nadin-suma, his son, 2 years . . . 733
Nebo-sum-yukin, his son, 1 month 12 days . . 731
End of "the 22nd dynasty."

Dynasty of Sapê.

B.C.

Yukin-zera or Chinziros, 3 years 730
Pulu (Pul or Poros), called Tiglath-pileser III. in Assyria, 2 years . . 727
Ululâ, called Shalmaneser IV. in Assyria . . 725
Merodach-baladan II. the Chaldæan . . . 721
Sargon of Assyria . . 709
Sennacherib, his son . . 705
Merodach-zakir-sumi, 1 month 702
Merodach-baladan III., 6 months 702
Bel-ebus of Babylon . . 702
Assur-nadin-sumi, son of Sennacherib . . . 700
Nergal-yusezib . . . 694
Musezib-Merodach . . 693
Sennacherib destroys Babylon . . . 689
Esar-haddon, his son . . 681
Samas-sum-yukin, his son . 668
Kandalanu (Kineladanos) . 648
Nabopolassar . . . 626
Nabu-kudur-uzur (Nebuchadrezzar II.) . . 605
Amil-Marduk (Evil-Merodach), his son . . 562
Nergal-sarra-uzur (Nergal-sharezer) . . . 560
Labasi-Marduk, his son, 3 months 556
Nabu-nahid (Nabonidos) . 556
Cyrus conquers Babylon . 538
Cambyses, his son . . 529
Gomates, the Magian, 7 months . . . 521
Nebuchadrezzar III., native king . . . 521
Darius, son of Hystaspes . 520
Nebuchadrezzar IV., rebel king 514
Darius restored . . . 513

Kings of Assyria.

Bel-kap-kapu, "founder of the monarchy."
. . . . . .
Assur-sum-esir.
Ninip-tuklat-Assur, his son (contemporary with Kharbe-sipak of Babylonia).
. . . . . .
Erba-Hadad.
Assur-nadin-akhe I., his son.
. . . . . .

B.C.

Assur-bil-nisi-su . *cir.* 1450
Buzur-Assur . . . 1440
Assur-nadin-akhe II. . 1420
Assur-yuballidh, his son . 1400
Bel-nirari, his son . . 1380
Pudilu (Pedael), his son . 1360
Hadad-nirari I., his son . 1340
Shalmaneser I., his son (built Calah) . . 1320
Tiglath-Ninip I., his son . 1300

and spells, and a sorcerer-priesthood. From Eridu came, on the contrary, the elements of art and science, and a belief in divine beings who worked for the good of man. Ea was the culture-god of Babylonia, who communicated to his son "Asari, the benefactor of mankind," the various charms whereby diseases could be cured and the dead raised again to life. Asari, whose resemblance to the Egyptian Osiris is striking, was identified with the Semitic Merodach, the patron-god of Babylon, while El-lil of Nippur became "the older Bel" of Semitic faith. In the primitive Sumerian age of Babylonia, however, neither El-lil nor Ea was as yet a god in the Semitic sense of the term. According to Sumerian ideas every object and force in nature had its *zi*, or "spirit," which manifested itself in life and motion. The *zi* was sometimes beneficent, sometimes malignant, but it could be controlled by the incantations and spells which were known to the sorcerer-priests. Gradually real gods emerged from among the multitude of *zis* with which the universe was filled, perhaps as a result of contact with Semitic tribes. Among these gods Ea, the spirit of the water, El-lil, the spirit of the earth and air, and Ana of Erech, the spirit of heaven, occupied a foremost place. Under Semitic influence they finally became a trinity, while other spirits which had also become gods were ranged below them. A state religion grew up in which the Sumerian elements were modified and transformed in accordance with Semitic conceptions, the sorcerer passed into the priest, and an elaborate ritual was compiled. The female divinities fell into the background, with the exception of Istar, originally the evening-star, who managed to preserve her independence; but the other goddesses became merely the pale reflexions of the god, in many cases owing their existence to the exigencies of Semitic grammar, which attached a feminine form to a masculine noun. Thus Anu, the Semitic equivalent of Ana, was provided with his feminine counterpart, Anatu. The systematizing of the state theology occupied many centuries, and included the formation of an astro-theology in which the planets and principal stars were identified with certain deities in the official pantheon. Between this state religion and the religion of the people there was a wide gulf, though a considerable part of the popular superstitions was incorporated by the priests into their theology, and there modified or explained away. Up to the last, however, a sort of organized popular faith, or "black magic," existed by the side of the official theology, tolerated, though hardly recognized, by it. In this the witch and wizard took the place of the priesthood, malevolent demons were adored instead of the gods of light, and the ritual consisted of spells and incantations addressed to them under the cover of night. The central object of worship was an Istar who differed essentially from the Istar of the official cult, and was little more than a mistress of witchcraft and evil.

Closely connected with the religious cult were the poems and epics in which the ancient myths and stories of the gods were embodied, or attempts were made to explain the origin of the universe. The most famous of these was the *Epic of Gilgames*, in twelve books, composed by a certain Sin-liqi-unninni, and arranged upon an astronomical principle. The eleventh book, corresponding to the zodiacal sign Aquarius, contains the episode of the Deluge. Gilgames is described as the friend and ally of the satyr Ea-bani, who had originally been created to destroy him. Together they overthrow the tyrant Khumbaba, who dwelt within the enchanted cedar forest of Elam, as well as the "divine" bull which Anu had made to avenge the slight put by Gilgames on the goddess Istar. But the destruction of the bull led to the death of Ea-bani and the infliction of a mortal sickness on Gilgames himself. To find a means of cure he determined to make his way to Xisuthros, the hero of the Deluge, who had been translated beyond the river of death. So he travelled through the desert of Mas, or Northern Arabia, to the Twin Mountains behind which the sun sets, and which are guarded by "scorpion-men." Then he plunged into the darkness beyond, and finally emerged on the shore of the ocean which encircles the earth, where a tree grew whose fruit was precious stones. With the help of the boatman, Nis-Ea, Gilgames built a boat, and voyaged for forty-five days until at last the waters of death were reached. There on the islands of the blest he beheld Xisuthros "afar off," and heard from him the story of the Deluge. His disease, moreover, was cured, and a twig of the tree of life was allowed him to carry back to Babylonia. On the way, however, while he stopped to drink of a spring, a serpent came out of the water and stole the precious plant. Gilgames wept in vain. He had to return to his city of Erech without the divine herb and there make lamentation over the dead Ea-bani, whose spirit rose from the earth, like that of Samuel, to tell the hero of the fate that awaited him in the world beyond the grave.

Religious legends.

Another epic was that of the Creation, the object of which was to glorify Bel-Merodach by describing his contest with Tiamat, the dragon of chaos. In the first book an account is given of the creation of the world out of the primeval deep and the birth of the gods of light. Then comes the story of the struggle between the gods of light and the powers of darkness, and the final victory of Merodach, who clove Tiamat asunder, forming the heaven out of one half of her body and the earth out of the other. Merodach next arranged the stars in order, along with the sun and moon, and gave them laws which they were never to transgress. After this the plants and animals were created, and finally man. Merodach here takes the place of Ea, who appears as the creator in the older legends, and is said to have fashioned man out of the clay.

The legend of Adapa, the first man, a portion of which was found in the record-office of the Egyptian king Khu-n-Aten at Tel el-Amarna, explains the origin of death. Adapa while fishing had broken the wings of the south wind, and was accordingly summoned before the tribunal of Anu in heaven. Ea counselled him not to eat or drink there. He followed the advice, and thus refused the food which would have made him and his descendants immortal.

Among the other legends of Babylonia may be mentioned those of Namtar, the plague-demon, of Urra, the pestilence,

	B.C.		B.C.
Conquers Babylon	1290	Assur-nazir-pal III., his son	883
Assur-nazir-pal I., his son, 6 years	1280	Shalmaneser II., his son	858
Tiglath-Assur-Bel	1275	Assur-danin-pal (Sardanapallos), rebel king	825
Assur-narara	1260	Samsi-Hadad II., his brother	823
Nebo-dan, his son	1250	Hadad-nirari III., his son	810
Bel-kudur-uzur	1230	Shalmaneser III.	781
Ninip-pileser	1215	Assur-dan III.	771
Assur-dan I., his son	1185	Assur-nirari	753
Mutaggil-Nebo, his son	1160	Pulu, usurper, takes the name of Tiglath-pileser III.	745
Assur-ris-isi, his son	1140	Ululâi, usurper, takes the name of Shalmaneser IV.	727
Tiglath-pileser I., his son	1120	Sargon, usurper	722
Assur-bil-kala, his son	1090	Sennacherib, his son	705
Samsi-Hadad I., his brother	*cir.* 1070	Esar-haddon, his son	681
Assur-nazir-pal II., his son	*cir.* 1050	Assur-bani-pal, his son	668
Assur-irbi	—	Assur-etil-ilani-yukin, his son	?
Tiglath-pileser II.	*cir.* 950	Assur-sum-lisir	?
Assur-dan II., his son	*cir.* 930	Sin-sarra-uzur (Sarakos)	?
Hadad-nirari II., his son	911	Destruction of Nineveh	606
Tiglath-Ninip II., his son	889		

of Etanna, and of Zu. Hades, the abode of Nin-erisgal, or Allat, had been entered by Nergal, who, angered by a message sent to her by the gods of the upper world, ordered Namtar to strike off her head. She, however, declared that she would submit to any conditions imposed on her and would give Nergal the sovereignty of the earth. Nergal accordingly relented, and Allat became the queen of the infernal world. Etanna conspired with the eagle to fly to the highest heaven. The first gate, that of Anu, was successfully reached; but in ascending still farther to the gate of Istar the strength of the eagle gave way, and Etanna was dashed to the ground. As for the storm-god Zu, we are told that he stole the tablets of destiny, and therewith the prerogatives of Bel. God after god was ordered to pursue him and recover them, but it would seem that it was only by a stratagem that they were finally regained.

Social life.

The contract-tablets have thrown a flood of light on the social life and customs of Babylonia, and have shown that the woman was on a footing of equality with the man. She could carry on business on her own account, could inherit and bequeath property, could hold civil offices, and plead in a court of justice. Polygamy seems to have been rare; and we even hear of a case in which it is stipulated that if the husband marries a second wife the dowry of the first wife shall be returned to her, and she shall be free to go where she chooses. Slaves were protected by law, and they too could acquire property of their own under certain conditions, and appear as witnesses in court. The use of torture for extorting confessions was unknown. The judges, who were appointed by the crown, decided according to the evidence brought before them. There were pleadings and counter-pleadings, and we hear of punishment for perjury. Babylonia was pre-eminently an industrial and commercial state, carrying on commerce with all parts of the known world, and there was therefore a highly elaborate commercial code of law. The decisions of the judges were largely ruled by precedents, which necessitated a careful registration of former verdicts, as well as an accurate system of dating. Education was widespread, and involved a study of the extinct language of Sumer. Women, as well as men, could read and write, and letters passed to and fro between all classes of the community. Mathematics were fairly advanced; eclipses of the sun and moon could be foretold, and the zodiac was a Babylonian invention. There were various holidays, that of the New Year (*Zagmuku*, or *Akîtu*) being the most sacred. It was then that Bel entered the Holy of Holies, and seating himself above the mercy-seat (*parakku*) determined the destinies of mankind. There were no castes. Each man was free to follow what profession he chose. The priesthood, however, was divided into many different classes. Among these we may name the *barûtu*, *asipû*, and *zammarû*, or "seers," "prophets," and "singers." The ordinary priests were termed *kalû* (*galli*) and *sangûtu*, the high-priest being *sanga-makhkhu*. Other classes of priests attended to the *sattukku*, or daily sacrifice, and received the *nindabu* or freewill offering from the worshipper. The sacrifices were bloody (*zibû*) and unbloody, among the latter being the *niqu*, or libation, the *qutrinnu*, or incense-offering, and the *sirqu*, or drink-offering. Nor must we forget the *qurbannu*, the *korban* of the Jewish ritual. The temples were supported by the *esrâ* or tithe. By the side of the priests there does not appear to have been any privileged class of nobility. As might have been expected in a commercial community, no stigma attached to trade. All members of the state took part in it, and we find even the crown-prince, Belshazzar, acting through his agent as a wool-merchant. Money-lending, however, appears to have been one of the most profitable professions. The ordinary rate of interest was 20 per cent., paid in monthly instalments; but at Babylon in the time of Nebuchadrezzar it tended to be lower, and there are instances of loans in which it is put at 13½ per cent. Payment was either in kind, or, more usually, in specie, the money consisting of stamped rings or bars of gold, silver, and copper. The standard was the maneh, divided into 60 shekels, the standard maneh which was still in use up to the age of Nabonidos being that which had been originally fixed by Dungi, king of Ur. One of these standard-weights, made of stone and from the mint of Nebuchadrezzar, is now in the British Museum.

The Babylonian cemetery adjoined the city of the living, and was built on the same plan as the latter. It was laid out in streets through which trickled rivulets of "pure" water. Many of the tombs, which were made of crude bricks, were provided with gardens, and there were shelves or altars on which were placed the offerings to the dead. After a burial brushwood was usually heaped round the wall of the tomb, and set on fire, so that the corpse within was partially cremated along with the objects that had been buried with it. As the older tombs decayed a new city of tombs arose above them, the city of the dead thus growing in height in the course of centuries, like the cities of the living. The city and the cemetery of ancient Babylonia are alike marked by a "tel."

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(A. H. S.)

Bacau, a town in Rumania, capital of the district of the same name, situated near the river Bistritza. The town, which is of modern growth, owes its commercial importance to the fact of its being the point of convergence of the two great highways, one from Bacau to Gyergyö-Szent-Miklós in Transylvania, *viâ* Piatra and the pass of Tölgyes, the other from Bacau to Kézdi-Vásárhely in Transylvania, *viâ* Onesci, Soosmezö, and the pass of Ojtoz. The population in 1895 numbered 16,000; in 1900, 16,187, of whom 7850 were Jews.

Baccarat, a town of France, in the department of Meurthe-et-Moselle, arrondissement of Lunéville, 30 miles S.E. of Nancy; connected with Paris by rail. Its glass-works continue to grow in importance, and now give employment to about 2300 persons. The products include ornamental articles of great variety and beauty. Population (1881), 4902; (1896), 5425; (1901), 7014.

Bacchylides, the only lyric poet of Greece, except Pindar, of whose work we possess large remains, was born at Iulis, in the island of Ceos. His father's name was probably Meidon; his mother was a sister of Simonides, himself a native of Iulis. Eusebius says that Bacchylides "flourished" (ἤκμαζεν) in Ol. 78. 2 (467 B.C.). As the term ἤκμαζεν refers to the physical prime, and was commonly placed at about the fortieth year, we may suppose that Bacchylides was born *circa* 507 B.C., a date

which agrees sufficiently well with the few facts which can be gleaned concerning his life. Among his odes found in 1896 the earliest that can be approximately dated is xiii. (ed. Kenyon), which may belong to 479 or 477 B.C.; the latest is vi., of which the date is fixed by the recently-found fragment of the Olympic register to Ol. 82. 1 (452 B.C.). He would thus have been some thirty-nine years younger than his uncle Simonides, and some fifteen years younger than Pindar.

Elsewhere Eusebius states that Bacchylides "was of repute" (ἐγνωρίζετο) in Ol. 87. 2 (431 B.C.); and Georgius Syncellus, using the same word, gives Ol. 88 (428-25 B.C.). The phrase would mean that he was then in the fulness of years and of fame. We have no other evidence; but there is nothing improbable in the supposition that he survived the beginning of the Peloponnesian war.

Bacchylides, like Simonides and Pindar, visited the court of Hieron, who ruled Syracuse from 478 to his death in 467. In his fifth ode (476 B.C.), the word ξένος (v. 11) has been taken to mean that he had already been the guest of the prince; and, as Simonides went to Sicily in or about 477 B.C., that is not unlikely. Ode iii. (468 B.C.) was possibly written at Syracuse, as verses 15 and 16 suggest. He there pays a high compliment to Hieron's taste in poetry (ver. 3 ff.). A scholium on *Pyth.* i. 166 avers that Hieron preferred the odes of Bacchylides to those of Pindar. The Alexandrian scholars interpreted a number of passages in Pindar as hostile allusions to Bacchylides or Simonides. If the scholiasts are right, it would appear that Pindar regarded the younger of the two Cean poets as a jealous rival, who disparaged him to their common patron (schol. *Pyth.* ii. 52 f.), and as one whose poetical skill was due to study rather than to genius (*Ol.* 2. 91-110). In *Olymp.* ii. 96 the dual γαρύετον, if it does not refer to the uncle and nephew, remains mysterious; nor does it admit of probable emendation. One would gladly reject this tradition, to which the scholia so frequently refer; yet it would be rash to assume that it rested merely on surmise. The Alexandrians may have possessed evidence on the subject which is now lost. It is tolerably certain that the three poets were visitors at Hieron's court at about the same time: Pindar and Bacchylides wrote odes of the same kind in his honour; and there was a tradition that he preferred the younger poet. There is thus no intrinsic improbability in the hypothesis that Pindar's haughty spirit had suffered, or imagined, some mortification. It is noteworthy that, whereas in 476 and 470 both he and Bacchylides celebrated Hieron's victories, in 468 (the most important occasion of all) Bacchylides alone was commissioned to do so; although in that year Pindar composed an ode (*Olymp.* vi.) for another Syracusan victor at the same festival. Nor is it difficult to conceive that a despot such as Hieron, whose constitutional position was ill-defined, and who was perhaps all the more exigent of deference on that account, may have found the genial Ionian a more agreeable courtier than Pindar, an aristocrat of the Boeoto-Aeolic type, not unmindful of "his fathers the Aegeidae," and rather prone to link the praises of his patron with a lofty intimation of his own claims (see, *e.g.*, *Olymp.* i. *ad fin.*). But, whatever may have been the true bearing of Pindar's occasional innuendoes, it is at any rate pleasant to find that in the extant work of Bacchylides there is not the faintest semblance of hostile allusion to any rival. Nay, one might almost imagine a compliment to Pindar, when, in mentioning Hesiod, he calls him Βοιωτὸς ἀνήρ.

Plutarch (*de Exilio*, p. 605 c) names our poet in a list of writers who, after they had been banished from their native cities, were active and successful in literature. It was Peloponnesus that afforded a new home to the exiled Bacchylides. The passage gives no clue to date or circumstance; but it implies that Peloponnesus was the region where the poet's genius ripened, and where he did the work which established his fame. This points to a residence of considerable length; and it may be noted that some of the poems illustrate their author's intimate knowledge of Peloponnesus. Thus in Ode ix., for Automedes of Phlius, he draws on the legends connected with the Phliasian river Asopus. In Ode x., starting from the Argive legend of Proetus and Acrisius, he tells how the Arcadian cult of Artemis Ἥμερα was founded. In one of his dithyrambs (xx.) he treated the legend of Idas (a Messenian hero) and Marpessa in the form of a *hymenaeus* sung by maidens of Sparta.

The Alexandrian scholars, who drew up select lists of the best writers in each kind, included Bacchylides in their "canon" of the nine lyric poets, along with Alcman, Sappho, Alcaeus, Stesichorus, Ibycus, Anacreon, Simonides, and Pindar. The Alexandrian grammarian Didymus (*circ.* 30 B.C.) wrote a commentary (ὑπόμνημα) on the epinikian odes of Bacchylides. Horace, a poet in some respects of kindred genius, was a student of his works, and imitated him (according to Porphyrion) in Ode i. 15, where Proteus predicts the destruction of Troy. Quotations from Bacchylides, or references to him, occur in Dionysius of Halicarnassus, Strabo, Plutarch, Stobaeus, Athenaeus, Aulus Gellius, Zenobius, Hephaestion, Clement of Alexandria, and various grammarians or scholiasts. Ammianus Marcellinus (xxv. 4) says that the Emperor Julian enjoyed reading Bacchylides. It is clear, then, that this poet continued to be popular during at least the first four centuries of our era. No inference adverse to his repute can fairly be drawn from the fact that no mention of him occurs in the extant work of any Attic writer. The only definite estimate of him by an ancient critic occurs in the treatise Περὶ ὕψους, commonly translated "On the Sublime," but meaning rather, "On the sources of elevation in style"; a work ambiguously ascribed to Cassius Longinus (*circ.* A.D. 260), but more probably due to some writer of the first century. In chapter xxxiii. of that treatise, the author asks whether we ought to prefer "greatness" in literature, with some attendant faults, to flawless merit on a lower level, and of course replies in the affirmative. In tragedy, he asks, who would be Ion of Chios rather than Sophocles; or in lyric poetry, Bacchylides rather than Pindar? Yet Bacchylides and Ion are "faultless, with a style of perfect elegance and finish." In short, the essayist regards Bacchylides as a thoroughly finished poet of the second class, who never commits glaring faults, but never reaches the loftier heights.

The first and most general quality of style in Bacchylides is his perfect simplicity and clearness. Where the text is not corrupt, there are few sentences which are not lucid in meaning and simple in structure. This lucidity is partly due, no doubt, to the fact that he seldom attempts imagery of the bolder kind, and never has thoughts of a subtle or complex order. Yet it would be very unjust to regard such clearness as merely a compensatory merit of lyric mediocrity, or to ignore its intimate connexion with the man's native grace of mind, with the artist's feeling for expression, with the poet's delicate skill. How many readers, who could enjoy and appreciate Pindar if he were less difficult, are stopped on the threshold by the aspect of his style, and are fain to save their self-esteem by concluding that he is at once turgid and shallow! A pellucid style must always have been a source of wide, though modest, popularity for Bacchylides. If it be true that Hieron preferred him to Pindar, and that he was a favourite with Julian, those instances suggest the charm which he must always have had for cultivated readers to

whom affairs did not leave much leisure for study, and who rejoiced in a poet with whom they could live on such easy terms.

Another prominent trait in the style of Bacchylides is his love of picturesque detail. This characteristic marks the fragment by which, before the discovery of the new MS., he was best known,—a passage, from one of his paeans, on the blessings of peace (fr. 13, Bergk); and it frequently appears in the odes, especially in the mythical narratives. Greater poets can make an image flash upon the mind, as Pindar sometimes does, by a magic phrase, or by throwing one or two salient points into strong relief. The method of Bacchylides is usually quieter; he paints cabinet pictures. Observation and elegance do more for him than grasp or piercing insight; but his work is often of very high excellence in its own kind. His treatment of simile is only a special phase of this general tendency. It is exemplified by the touches with which he elaborates the simile of the eagle in ode v., and that of the storm-tossed mariners in ode xii. This full development of simile is Homeric in manner, but not Homeric in motive: Homer's aim is vividness; Bacchylides is rather intent on the decorative value of the details themselves. There are occasional flashes of brilliancy in his imagery, when it is lit up by his keen sense of beauty or splendour in external nature. A radiance, "as of fire," streams from the forms of the Nereids (xvi. 103 ff.). An athlete shines out among his fellows like "the bright moon of the mid-month night" among the stars (viii. 27 ff.) The sudden gleam of hope which comes to the Trojans by the withdrawal of Achilles is like a ray of sunshine "from beneath the edge of a storm-cloud" (xii. 105 ff.). The shades of the departed, as seen by Heracles on the banks of the Cocytus, are compared to the countless leaves fluttering in the wind on "the gleaming headlands of Ida" (vv. 65 ff.),—an image not unworthy of Dante or of Milton.

Among the minor features of this poet's style the most remarkable is his use of epithets. A god or goddess nearly always receives some ornamental epithet; sometimes, indeed, two, or even three (*e.g.*, καλυκοστεφάνου σεμνᾶς . . . Ἀρτεμίδος λευκωλένου, v. 98 f.). Such a trait is in unison with the epic manner, the straightforward narrative, which we find in some of the larger poems (as in v., x., and xvi.). On the other hand, the copious use of such ornament has the disadvantage that it sometimes gives a tinge of conventionality to his work. This impression is somewhat strengthened by the fact that many of the epithets are long compound words, not found elsewhere, and (in some cases at least) probably invented by the poet; words which suggest a deliberate effort to vary the stock repertory.

The poems contained in the new MS. are of two classes: I. *Odes of Victory;* II. *Dithyrambs.* The Ode of Victory, ἐπινίκιον (μέλος) or ἐπίνικος (ὕμνος), is a form derived from the ὕμνος, which was properly a song in praise of a deity. Stesichorus (*circ.* 610 B.C.) seems to have been the first who composed hymns in honour, not of gods, but of heroes; the next step was to write hymns in celebration of victories by living men. This custom arose in the second half of the sixth century B.C., the age in which the games at the four great festivals reached the fulness of their popularity. Simonides (born *c.* 556 B.C.) was the earliest recorded writer of *epinikia.* His odes of this class are now represented only by a few very small fragments, some twenty lines in all. Two of these fragments, belonging to the description of a chariot-race, warrant the belief that Simonides, in his epinikia, differed from Pindar in dwelling more on the incidents of the particular victory. The same characteristic is found in the epinikia of Bacchylides. His fifth ode, and Pindar's first *Olympian*, alike celebrate the victory of the horse Pherenicus; but, while Pindar's reference to the race itself is slight and general (vv. 20-22), Bacchylides describes the running of the winner much more vividly and fully (vv. 37-49).

The MS. contains fourteen epinikia, or thirteen if Blass be right in supposing that odes vi. and vii., as numbered by Kenyon in the *editio princeps*, are parts of a single ode (for Lachon of Ceos). Four (or on the view just stated, three) of the odes relate to the Olympian festival; two to the Pythian; three to the Isthmian; three to the Nemean; and one to a Thessalian festival called the Πετραῖα. This comes last. The order in which the MS. arranges the other epinikia seems to be casual; at least it does not follow (1) the alphabetical sequence of the victors' names, or of the names of their cities; nor (2) chronological sequence; nor (3) classification by contests; nor (4) classification by festivals—except that the four great festivals precede the *Petraea.* The first ode, celebrating a victory of the Cean Argeios at the Isthmus, may possibly have been placed there for a biographical reason, viz., because the poet treated in it the early legends of his native island.

A mythical narrative, connected in some way with the victor or his city, usually occupies the central part of a Pindaric ode. It serves to lift the poem into an ideal region, and to invest it with more than a local or temporary significance. The method of Bacchylides in this department of the epinikion is best illustrated by the myth of Croesus in ode iii., that of Heracles and Meleager in ode v., and that of the Proetides in ode x. Pindar's habit is to select certain moments or scenes of a legend, which he depicts with great force and vividness. Bacchylides, on the other hand, has a gentle flow of simple epic narrative; he relies on the interest of the story as a whole, rather than on his power of presenting situations. Another element, always present in the longer odes of victory, is that which may be called the "gnomic." Here, again, there is a contrast between the two poets. Pindar packs his γνῶμαι, his maxims or moral sentiments, into terse and sometimes obscure epigrams; he utters them in a didactic tone, as of one who can speak with the commanding voice of Delphic wisdom. The moralizing of Bacchylides is rather an utterance of quiet meditation, sometimes recalling the strain of Ionian gnomic elegy.

The epinikia of Bacchylides are followed in the MS. by six compositions which the Alexandrians classed under the general name of διθύραμβοι, and which we, too, must be content to describe collectively as *Dithyrambs.* The derivation of δι-θύραμβος is uncertain: δι may be the root seen in δίος (cp. διπόλια), and θύραμβος another form of θρίαμβος, a word by which Cratinus (*c.* 448 B.C.) denotes some kind of hymn to the wine-god. The "dithyramb," first mentioned by Archilochus (*c.* 670 B.C.), received a finished and choral form from Arion of Lesbos (*c.* 600 B.C.). His dithyrambs, produced at Corinth, belonged to the cult of Dionysus, and the members of his chorus (τραγικὸς χορός) personated satyrs. Originally concerned with the birth of the god, the dithyramb came to deal with all his fortunes: then its scope became still larger; it might celebrate, not Dionysus alone, but any god or hero. This last development had taken place before the close of the 6th century B.C. Simonides wrote a dithyramb on Memnon and Tithonus; Pindar, on Orion and on Heracles. Hence the Alexandrian scholars used διθύραμβος in a wide sense, as denoting simply a lyric poem occupied with a mythical narrative. Thus ode xvii. of Bacchylides (relating the voyage of Theseus to Crete), though it was clearly a παιάν for the Delian Apollo, was classed by the Alexandrians among his "dithyrambs"—as appears not only from its place in our MS., but also from the allusion of Servius (on *Aen.* vi. 21). The six dithyrambs of Bacchylides are arranged in (approximately) alphabetical order: Ἀντηνορίδαι, Ἡρακλῆς, Ἢ ἴθεοι ἢ Θησεύς,

Θησεύς, Ἰώ, Ἴδας. The principal feature, best exemplified by the first and third, is necessarily epic narrative,—often adorned with touches of picturesque detail, and animated by short speeches in the epic manner.

Several other classes of composition are represented by those fragments of Bacchylides, preserved in ancient literature, which were known before the discovery of the new MS. (1) *ὕμνοι*. Among these we hear of the *ἀποπεμπτικοί*, hymns of pious farewell, speeding some god on his way at the season when he passed from one haunt to another. (2) *παιᾶνες*, represented by the well-known fragment on the blessings of peace. (3) *προσόδια*, choral odes sung during processions to temples. (4) *ὑπορχήματα*, lively dance-songs for religious festivals. (5) *ἐρωτικά*, represented by five fragments of a class akin to *σκόλια*, drinking-songs. Under this head come some lively and humorous verses on the power of wine, imitated by Horace (*C.* iii. 21. 13-20). It may be conjectured that the facile grace and bright fancy of Bacchylides were seen to especial advantage in light compositions of this kind. (6) The elegiacs of Bacchylides are represented by two *ἐπιγράμματα ἀναθηματικά*, each of four lines, in the Palatine Anthology. The first (*Anth.* vi. 313) is an inscription for an offering commemorative of a victory gained by a chorus with a poem written by Bacchylides. The second (*Anth.* vi. 53) is an inscription for a shrine dedicated to Zephyrus. Its authenticity has been questioned, but not disproved.

The papyrus containing the odes of Bacchylides was found in Egypt by natives, and reached the British Museum in the autumn of 1896. It was then in about 200 pieces. By the skill and industry of Mr F. G. Kenyon, the editor of the *editio princeps* (1897), the MS. was reconstructed from these lacerated members. As now arranged, the MS. consists of three sections. (1) The first section contains 22 columns of writing. It breaks off after the 8 opening verses of ode xii. (2) The second section contains columns 23-29. Of these, column 23 is represented only by the last letters of two words. This section comprises what remains of odes xiii. and xiv. It breaks off before the end of xiv., which is the last of the epinikia. (3) The third section comprises columns 30-39. It begins with the mutilated opening verses of ode xv. (Ἀντηνορίδαι, the first of the dithyrambs), and breaks off after verse 11 of the last dithyramb, Ἴδας. The number of lines in a column varies from 32 to 36, the usual number being 35, or (though less often) 34.

It is impossible to say how much has been lost between the end of column 29 and the beginning of column 30. Probably, however, ode xiv., if not the last, was nearly the last, of the epinikia. It concerns a festival of a merely local character, the Thessalian Πετραῖα, and was therefore placed after the thirteen other epinikia, which are connected with the four great festivals. The same lacuna leaves it doubtful whether any collective title was prefixed to the *διθύραμβοι*. After the last column (39) of the MS., a good deal has probably been lost. Bacchylides seems to have written at least three other poems of this class (on Kassandra, Laocoon, and Philoctetes); and these would have come, in alphabetical order, after the last of the extant six (Idas).

The writing of the MS. is a fine uncial. It presents some traits of a distinctly Ptolemaic type, though it lacks some features found in the earlier Ptolemaic MSS. (these of the 3rd or 2nd century B.C.). Among the characteristic forms of letters is the Υ, with a shallow curve on the top of the upright; a form found in MSS. ascribed to the 1st century B.C., and different from the more fully formed upsilon of the Roman period. Another very significant letter is the Ξ, written as ⋿, a form which begins to go out after *circ.* 50 B.C., giving place to one in which the middle stroke is connected with the other two. From these and other indications it is probable that the MS. is not later than the middle of the first century B.C.

The scribe, though he sometimes corrected his own mistakes, was, on the whole, careless of the sense, as of the metre; he seems to have been a mechanical copyist, excellent in penmanship, but intent only on the letters. The MS. has received corrections or small supplements from at least two different persons. One of them (Kenyon's A^2) was contemporary, or nearly so, with the scribe. The other (A^3) was considerably later; he wrote a Roman cursive which might belong to the end of the first century A.D., or to the early part of the second. The correctors seem to be generally trustworthy; though, like the scribe, they were inattentive to metre, passing over many metrical faults which could easily have been removed. They appear to have compared their MS. with another, or others; but they sometimes made a bad use of such aid, intruding a false reading where their text had the true one.

Breathings are generally added, especially rough breathings; the form is usually square, but sometimes partially rounded. Accents are added, not to all words, but only, as a rule, to those which might cause doubt or difficulty to the reader. This was the Alexandrian practice, accents being regarded as aids to correct reading, and more liberally used when the dialect was not Attic. In accordance with the older system, the accent is not written on the last syllable of a word; when the accent falls there, a grave accent is written on the preceding syllable, or on two such syllables (*e.g.*, *βλήχρας*, *πἀνθἀλης*).

As Kenyon observes, no MS. of equal antiquity is so well supplied with accents. The MS. which comes nearest to it in this respect is the Alcman fragment in the Louvre, which is of similar or slightly higher age, belonging perhaps to the early part of the first century A.D.; and in that MS. the comparatively frequent accents were doubtless designed to aid readers unfamiliar with Alcman's Laconian Doric. With regard to other grammatical or metrical signs (*προσῳδίαι*) used in the Bacchylides MS., there is not much that calls for special remark. The punctuation, whether by the scribe or by correctors, is very sparse, and certainly cannot always be regarded as authoritative. The signs denoting the end of a strophe or antistrophe (*paragraphus*), of an epode (*coronis*), or of an ode (*asterisk*), are often omitted by the scribe, and, when employed, are sometimes placed incorrectly, or employed in an irregular manner.

Editions.—F. J. Kenyon. *Ed. princeps.* 1897.—F. Blass. Leipzig, Teubner. 1st ed. 1898; 2nd 1899.—H. Jurenka. Vienna, 1898.—N. Festa. Text, trans. and notes. Florence, 1898). (R. C. J.)

Bache, Francis Edward (1833-1858), English musical composer, was born in Birmingham, 14th September 1833. The pupil of Alfred Mellon for violin, and Sterndale Bennett for composition, he afterwards went to Leipzig in 1853 and studied with Hauptmann and Plaidy. Considering the early age at which he died, his compositions are fairly numerous, and the best, a trio for piano and strings, is still held in high esteem. Two operettas, a piano concerto, and a number of published pianoforte pieces and songs, do little more than show how great was his promise. He died at Birmingham of consumption on the 24th of August 1858. His younger brother, Walter (1842-1888), was born in Birmingham, 19th June 1842, and followed him to the Leipzig Conservatorium, where he became an excellent pianist. From 1862 to 1865 he studied with Liszt in Rome, and for many years devoted himself to the task of winning popularity for his master's works in England. At his annual concerts in London, nearly all Liszt's larger works were heard for the first time in England, and on the occasion of Liszt's last visit to England, in 1886, he was entertained by Bache at a memorable reception at the Grosvenor Gallery. Walter Bache was professor of the pianoforte at the Royal Academy of Music for some years before his death, and the foundation of the Liszt scholarship at that institution was mainly due to his efforts. He died in London on the 26th of March 1888. An interesting memoir of the two brothers, by Miss Constance Bache, appeared in 1901 under the title *Brother Musicians.* (J. A. F. M.)

Bachian (Dutch, *Batjan*), an island (belonging to the residency of Ternate) in the Molucca Sea, in 0° 13′-0° 55′ S. and 127° 22′-128° E. It lies west of the southern peninsula of the island of Halmahera (or Jilolo), and has an area of 2990 square miles. It is the most important island of a group formerly governed by a sultan, but since 1889 by a committee of chiefs under the control of a Dutch *controleur*. Since 1882 the Batjan company has attempted to exploit the island, but unsuccessfully, owing to a deficient knowledge of the soil and its capabilities and a lack of labourers.

Backergunje, or Bakarganj, a district of British India, in the Dacca division of Bengal, forming part of the joint delta of the Ganges and the Brahmaputra. The administrative headquarters are at Barisal, which is the only town in the district. Its area is 3649 square miles. In 1891 the population was 2,153,965, giving an average density of 590 persons per square mile. Classified according to religion, Hindus numbered 680,381; Mahommedans, 1,462,712; Buddhists and Jains, 6080; Christians, 4659, including 60 Europeans; "others," 133.

In 1901 the population was 2,291,812, showing an increase of 6 per cent. The land revenue and rates (1897-98) were Rs.18,72,626; boys at school (1896-97) numbered 76,602, being 46·2 per cent. of the male population of school-going age; the registered death-rate (1897) was 42·46 per 1000. The number of police was 648. Backergunje is essentially a deltaic tract, traversed by numerous navigable water channels, which afford almost the only means of communication. By far the most important crop is rice, which is largely exported. Jute, oilseeds, betel-nuts, and coco-nuts are also grown. The only manufacture is pottery. The islands on the sea front are exposed to devastation by cyclonic storm-waves. On account of an epidemic of murders, disarmament has been enforced with good effect.

Backnang, a town of Würtemberg, Germany, 19 miles by rail N.E. from Stuttgart, with an interesting church (12th century), and notable tanneries and leather factories, also woollen and cloth mills. Population (1885), 6003; (1895), 7380.

Back's River (*Thlewechodyeth*, or Great Fish), a river in Mackenzie and Keewatin districts, Canada, rising in Sussex lake, a small body of water in 108° 20′ W. long. and 64° 25′ N. lat., and flowing north-eastward to the Arctic Ocean, passing through several large lake-expansions—Pelly, Garry, and M'Dougal—in its course. It was discovered and explored by Captain (afterwards Sir George) Back in 1834. Its total length is 560 miles.

BACTERIOLOGY.

I. General.

DURING the last decade of the 19th century enormous strides were made in the study of the ubiquitous and minute organisms known as Schizomycetes (bacteria).

Schizomycetes.

The conviction that Cohn was right in regarding them as plants has gained ground, and is now generally accepted, but evidence has also accumulated to show that the group is a heterogeneous one, and that many forms usually included are not true Schizomycetes at all. That most of the typical bacteria have been derived from Cyanophyceæ, such as *Oscillaria*, *Nostoc*, &c., while *Micrococcus*, *Sarcina*, &c., have their prototypes in Chroococcaceæ, Palmellaceæ, may be regarded as fairly well established, and forms like *Beggiatoa* and *Spirochæta* have their Algal analogues in *Oscillaria* and *Spirulina*; but difficulties arise in several cases, especially since the flagella have become better known. Thaxter's group of Myxobacteriaceæ, if these turn out to be autonomous, points to alliances with the Myxomycetes, and the existence of ciliated Micrococci together with the formation of endospores—structures not known in the Cyanophyceæ—reminds us of the flagellate Protozoa, *e.g.*, *Monas*, *Chromulina*. Resemblances also exist between the endospores and the spore-formations in the Saccharomycetes, and if *Bacillus inflatus*, *B. ventriculus*, &c., really form more than one spore in the cell, these analogies are strengthened. Schizomycetes such as *Clostridium*, *Plectridium*, &c., where the sporiferous cells enlarge, bear out the same argument, and we must not forget that there are extremely minute "yeasts," easily mistaken for Micrococci, and that yeasts occasionally form only one spore in the cell. Further, *Schizo-saccharomyces* is a genus of "yeasts" which combines the peculiarities of the two groups. Nor must we overlook the possibility that the endospore-formation in non-motile bacteria more than merely resembles the development of azygospores in the conjugatæ, and some Ulothricaceæ, if reduced in size, would resemble them. Meyer regards them as chlamydospores, and Klebs as "carpospores" or possibly chlamydospores similar to the endospores of yeast. The former also looks on the ordinary disjointing bacterial cell as an oidium, and it must be admitted that since Brefeld's discovery of the frequency of minute oidia and chlamydospores among the fungi, the probability that some so-called bacteria—and this applies especially to the branching forms accepted by some bacteriologists—are merely reduced fungi is increased. Even the curious one-sided growth of certain species which form sheaths and stalks—*e.g.*, *Bacterium vermiforme*, *B. pediculatum*—can be matched by Algæ such as *Oocardium*, *Hydrurus*, and some Diatoms in this respect; and there are resemblances in other directions between *Phragmidothrix* and *Bangia*.

That bacteria have existed from very early periods is clear from their presence in fossils; and although we cannot accept all the conclusions drawn from the imperfect records of the rocks, and may dismiss as absurd the statements that geologically immured forms have been found still living, the researches

Distribution.

FIG. 1.—Preparations showing the various kinds of cilia and their arrangement. A, *Bacillus subtilis* Cohn, and *Spirillum undula* Ehrenb.; B, *Planococcus citreus* (Menge) Migula; C, *Pseudomonas pyocyanea* (Gessard) Migula; D, *P. macroselmis* Migula; E, *P. syncyanea* (Ehrenb.) Migula; F, *Bacillus typhi* Gaffky; G, *B. vulgaris* (Hauser) Migula; H, *Microspira Comma* (Koch) Schroeter; J, K, *Spirillum rubrum* Esmarsch; L, M, *S. undula* (Müller) Ehrenb. (*All after Migula.*)

of Renault and van Tieghem have shown pretty clearly that large numbers of bacteria existed in Carboniferous and Devonian times, and probably earlier. As regards their distribution in space, little is to be added. Several tropical species, especially the pathogenic forms—*e.g.*, *Vibrio choleræ*, &c.—have been more thoroughly examined, but no geographical distribution of bacteria, in the sense used with

regard to higher plants, can be spoken of. The increasing importance to crowded communities of a knowledge of the bacteriology of sewage, of rivers, soil, dairy farms, &c., has stimulated investigation in several directions, and led to extensions and corrections of previous information on these subjects. It has been found that of the numerous species found in rivers some are nitrifying or de-nitrifying harmless forms, and that pathogenic and other species are apt to degenerate quickly, and even die, a process closely connected with the bactericidal action of light referred to below. That typhoid and other bacilli can be transferred by water is well known, but in clear water even the resistant anthrax bacillus gradually succumbs, and no information of value can be obtained from the mere counting of the colonies developed in cultures from any given water.

The principal recent advances in our knowledge of the *morphology* of bacteria concern the motile organs (cilia), the nature of the cell-contents, the cell-membranes, and the nucleus and spore-formation. The bacterial cell is always clothed by a definite cell-membrane, as was shown by the plasmolysing experiments of Fischer and other observers; but whether this is the same structure as the cell-wall of ordinary plants, or more of the nature of an outer pellicle of the protoplasm, is much disputed. On the one hand it rarely gives clear reactions of cellulose or chitine, but appears to contain nitrogen and has been regarded as proteid in character, while the cilia are traced into it; on the other, it is capable of swelling to relatively enormous dimensions under certain conditions, and is probably always more diffluent at the surface; in some cases dextran and similar carbohydrates are found in the swollen mass. In a few cases, however, *e.g.*, *Sarcina*, *Bacterium xylinum*, *B. tuberculosis*, &c., the cellulose reaction is said to be distinct. Certain forms of iron-bacteria have deposits of oxide of iron (rust) in the membranes. The dense capsules observed in some species on certain media appear to be characteristic (*e.g.*, *Leuconostoc*), but in others they are artificial precipitations. The inflated "involution forms" often found in old cultures of given species appear to be due to changes induced by osmosis.

Cell-membrane.

The improvements in technique, and especially in the methods of fixing and staining devised by Löffler, Fischer, and van Ermengem, have led to important additions to our knowledge of the motile organs of the bacteria, and completely altered our ideas of their frequency and distribution. The principle of all the methods is to fix the living and actively-moving organisms by simple drying in air, and then to add a medium which acts as a mordant and forms a delicate transparent film in which the bodies of the bacteria, with their extended and uninjured cilia, remain imbedded during the further staining operations. The intense heating employed in ordinary fixing operations must be avoided, since it destroys the delicate cilia. After the fixing in the film, which is of tannin and osmic acid, or sulphate of iron, the superfluous fixative is washed off, and the stain—fuchsin, silver nitrate, &c.—is added, and the preparation washed, dried, and mounted, &c., in various ways. Van Ermengem's method, which is very successful in many cases, may be given in detail, in illustration of the care necessary in such preparations.

Cilia.

The bacteria having been carefully dried on the cover-slip, are plunged for from 5 to 30 minutes according to the temperature in a "fixing bath" of 1 vol. 2 per cent. osmic acid, 2 vol. 10-25 per cent. tannin-solution, to which 4-5 drops of acetic acid per 100 c.c. are added, and then carefully washed in water and alcohol. The washed preparation is immersed in a "sensitizing bath" of 0·25-0·50 per cent. silver nitrate solution for a few seconds. From this, without further washing, it is plunged also for a few seconds only into a "reducing bath" of 5 grams gallic acid, 3 grams tannin, 10 grams sodium acetate per 350 grams distilled water, and again without washing brought back into the "sensitizing bath" until it begins to blacken. It is then thoroughly washed, dried, and mounted in the ordinary way. Much care is needed in the details, but the rich brown to nearly black staining in good preparations shows up the cilia very sharply.

Such methods have brought out the facts that cilia may be present during a short period only in the life of a Schizomycete, and that their numbers may vary according to the medium on which the organism is growing. Nevertheless there is more or less constancy in the type of distribution, &c., of the cilia for each species when growing at its best. The chief results may be summed up as follows: some species, *e.g.*, *B. anthracis*, have no cilia; others have only one flagellum at one pole (*Monotrichous*), *e.g.*, *Bacillus pyocyaneus* (Fig. 1, C, D), or one at each pole; others again have a tuft of several cilia at one pole (*Lophotrichous*), *e.g.*, *B. syncyaneus* (Fig. 1, E), or at each pole (*Amphitrichous*) (Fig. 1, J, K, L); and, finally, many actively motile forms have

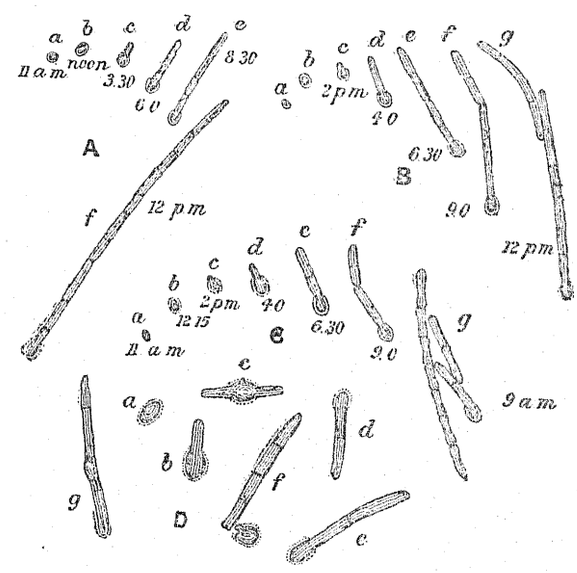

FIG. 2.—The various phases of germination of spores of *Bacillus ramosus* (Fraenkel), as actually observed in hanging drops under very high powers. A, the spore sown at 11 A.M., as shown at *a*, had swollen (*b*) perceptibly by noon, and had germinated by 3.30, as shown at *c*: in *d* at 6 P.M., and *e* at 8.30 P.M.; the resulting filament is segmenting into bacilli as it elongates, and at midnight (*f*) consisted of twelve such segments. B, C, show similar series of phases in the order of the small letters in each case, and with the times of observation attached. At *f* and *g* occurs the breaking up of the filament into rodlets. D, germinating spores in various stages, more highly magnified, and showing the different ways of escape of the filament from the spore-membrane. (*Original.*)

the cilia springing all round (*Peritrichous*), *e.g.*, *B. vulgaris* (Fig. 1, G). It is found, however, that strict reliance cannot be placed on the distinction between the *Monotrichous*, *Lophotrichous*, and *Amphitrichous* conditions, since one and the same species may have one, two, or more cilia at one or both poles; nevertheless some stress may usually be laid on the existence of one or two as opposed to *several*—*e.g.*, five or six or more—at one or each pole.

In spite of their minuteness several cell-contents have been observed, such as sulphur-granules (Cohn), oil or fat-drops (Meyer), and carbohydrates which turn blue (granulose) or red-brown (glycogen or anylo-dextrin) with iodine (Meyer). A red pigment appears in *Chromatium*, *Thiocystis*, &c. The meaning of the so-called chromatin granules observed in many forms, and their possible relations to nuclear substance, have given rise to much discussion. Klebs, Bütschli, and others have regarded the whole of the protoplasmic contents of a bacterium as equivalent to a nucleus, but Meyer's and Wager's preparations suggest that here as in

Cell-contents.

other vegetable cells nuclei, or at least nuclear substance in the form of chromatic bodies, exist, though they are extremely minute; Fischer doubts their being true nuclei, but Migula accepts the view that they represent them in a rudimentary form.

With regard to the essential details in the process of spore-formation and germination, resistance to physical reagents, &c., little advance in knowledge was made in the decade 1890-1900. De Bary's conception of arthrospores, as contrasted with endospores, has been found of little value; an arthrospore is merely an isolated bacterial cell in a resting state, and such occur in endosporous forms, *e.g.*, *B. subtilis*, as well as in species not known to form endospores. In a few cases, *e.g.*, *B. Zopfii*, arthrospores appear to be well formed, but even in this typical case it is evident that we must regard these resting vegetative cells as in the same category as the oidia or gemmæ of true fungi, and in no way morphologically specialized as spores. Similar objections have been made to the use of the term arthrospore in the case of *Leuconostoc*, where true endospores appear to be formed. In short, the "arthrospore" is nothing more than any ordinary vegetative cell which separates and passes into a condition of rest—just as do the cells of yeast and the encysted cells of many micro-organisms—and according to the older definition every cell of a *Micrococcus* would be an "arthrospore." The so-called arthrospores of *Cladothrix* and other chlamydo-bacteriaceæ are ciliated motile cells, comparable with the zoospores of Algæ, and germinating forthwith to new filaments.

Spores.

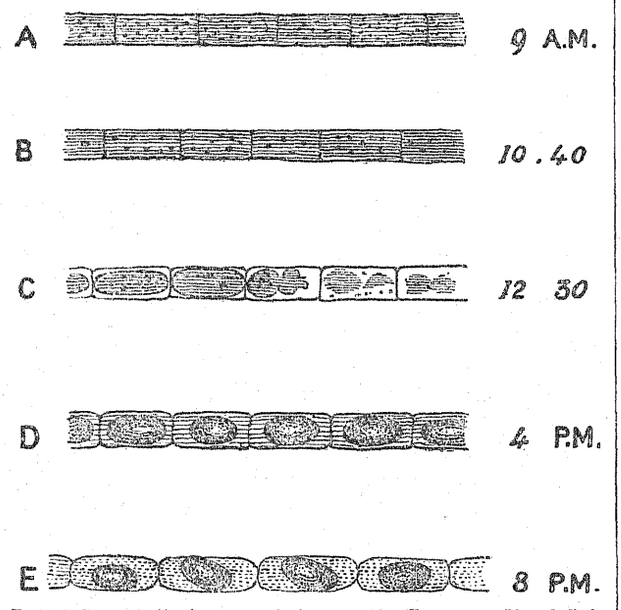

FIG. 3.—Stages in the development of spores of *Bacillus ramosus* (Fraenkel), in the order and at the times given, in a hanging drop culture, under a very high power. The process begins with the formation of brilliant granules (A, B); these increase, and the brilliant substance gradually balls together (C) and forms the spores (D), one in each segment, which soon acquire a membrane and ripen (E). (*Original.*)

The conditions for spore-formation differ. Anaerobic species usually require little oxygen, but aerobic species a free supply. Each species has an optimum temperature, and many are known to require very special food-media. The systematic interference with these conditions has enabled bacteriologists to induce the development of so-called asporogenous races, in which the formation of spores is indefinitely postponed, changes in vigour, virulence, and other properties being also involved, in some cases at any rate. The addition of minute traces of acids, poisons, &c., leads to this change in some forms; high temperatures have also been used successfully. Most spores are ellipsoid, but those of *B. tetani* are spherical, and those of *B. leptosporus* elongated. The spore may be small and cause no deformation of the mother-cell, in which it lies at one end or in the middle; or it may during formation bring about a swelling of the cell or part of it, so that the mature sporogenous cell is drum-stick-shaped (*Plectridium*) as in *B. tetani*, or fusiform (*Clostridium*) as in *C. butyricum*, &c. Only in rare cases are two spores formed in the rod, *e.g.*, *B. inflatus*. Much careful work has been done on the details of the formation, structure, and germination of spores, but little has been added to what has long been known, viz., that the spore results from aggregation of the protoplasmic contents of the rod (Fig. 3), that no definite nucleus can be made clear, that the spore-wall—probably of some altered protoplasmic product—is thin and extremely resistent when ripe, and that germination is preceded by the rupture or dissolution of the latter at the ends or equator, where it is apparently thinner, the contents growing out as the first rodlet (Fig. 2).

Numerous attempts have been made to construct schemes of classification based on the power of growing colonies to liquefy gelatine, to secrete coloured pigments, to ferment certain media with evolution of carbon-dioxide or other gases, or to induce pathological conditions in animals. None of these systems, which are chiefly due to the medical bacteriologists, has maintained its position, owing to the difficulty of applying the characters and to the fact that such properties are physiological and liable to great fluctuations in culture, because a given organism may vary greatly in such respects according to its degree of vitality at the time, its age, the mode of nutrition, and the influence of external factors on its growth. Even when used in conjunction with purely morphological characters, these physiological properties are too variable to aid us in the discrimination of species and genera, and are apt to break down at critical periods. Among the more characteristic of these schemes adopted at various times may be mentioned those of Miquel (1891), Eisenberg (1891), and Lehmann and Neumann (1897). Although much progress was made during the decade 1890 to 1900 in determining the value and constancy of morphological characters, we are still in need of a sufficiently comprehensive and easily applied scheme of classification, partly owing to the existence in the literature of imperfectly described forms, the life-history of which is not yet known, or the microscopic characters of which have not been examined with sufficient accuracy and thoroughness. The principal attempts at morphological classifications recently brought forward are those of de Toni and Trevisan (1889), Fischer (1897), and Migula (1897). Of these systems, which alone are available in any practicable scheme of classification, the two most important and most modern are those of Fischer and Migula. The extended investigations of the former on the number and distribution of cilia (Fig. 1) led him to propose a scheme of classification based on these and other morphological characters, and differing essentially from any preceding one. This scheme may be tabulated as follows:—

Classification.

I. ORDER—**Haplobacterinæ.** Vegetative body unicellular; spheroidal, cylindrical, or spirally twisted; isolated or connected in filamentous or other growth series.

1. *Family*—COCCACEÆ. Vegetative cells spheroidal.

(*a*) Sub-family—ALLOCOCCACEÆ. Division in all or any planes, colonies indefinite in shape and size, of cells in short chains, irregular clumps, pairs, or isolated:—*Micrococcus* (Cohn), cells non-motile; *Planococcus* (Migula), cells motile.

(*b*) Sub-family—HOMOCOCCACEÆ. Division planes regular and definite:—*Sarcina* (Goods.), cells non-motile; growth and division in three successive planes at right angles, resulting in packet-like groups; *Planosarcina* (Migula), as before, but motile; *Pediococcus* (Lindner), division planes at right angles in two successive planes, and cells in tablets of four or more; *Streptococcus* (Billr.), divisions in one plane only, resulting in chains of cells.

2. *Family*—BACILLACEÆ. Vegetative cells cylindric (rodlets), ellipsoid or ovoid, and straight. Division planes always perpendicular to the long axis.

(*a*) Sub-family—BACILLEÆ. Sporogenous rodlets cylindric, not altered in shape:—*Bacillus* (Cohn), non-motile; *Bactrinium* (Fischer), motile, with one polar flagellum (*Monotrichous*); *Bactrillum* (Fischer), motile, with a terminal tuft of cilia (*Lophotrichous*); *Bactridium* (Fischer), motile, with cilia all over the surface (*Peritrichous*).

(*b*) Sub-family—CLOSTRIDIEÆ. Sporogenous rodlets, spindle-shaped:—*Clostridium* (Prazm.), motile, peritrichous.

(*c*) Sub-family—PLECTRIDIEÆ. Sporogenous rodlets, drum-stick-shaped:—*Plectridium* (Fischer), motile, peritrichous.

3. *Family*—SPIRILLACEÆ. Vegetative cells cylindric, but curved more or less spirally. Divisions perpendicular to the long axis:—*Vibrio* (Müller-Löffler), comma-shaped, motile, monotrichous; *Spirillum* (Ehrenb.), more strongly curved in open spirals, motile, lophotrichous; *Spirochæte* (Ehrenb.), spirally coiled in numerous close turns, motile, but apparently owing to flexile movements, as no cilia are found.

II. ORDER—**Trichobacterinæ.** Vegetative body of branched or unbranched cell-filaments, the segments of which separate as swarm-cells (*Gonidia*).

1. *Family*—TRICHOBACTERIACEÆ. Characters those of the Order.

(*a*) Filaments rigid, non-motile, sheathed:—*Crenothrix* (Cohn), filaments unbranched and devoid of sulphur particles; *Thiothrix* (Winogr.), as before, but with sulphur particles; *Cladothrix* (Cohn), filaments branched in a pseudo-dichotomous manner.

(*β*) Filaments showing slow pendulous and creeping movements, and with no distinct sheath:—*Beggiatoa* (Trev.), with sulphur particles.

The principal objections to this system are the following:—(1) The extraordinary difficulty in obtaining satisfactory preparations showing the cilia, and the discovery that these motile organs are not formed on all substrata, or are only developed during short periods of activity while the organism is young and vigorous, render this character almost nugatory. For instance, *B. megatherium* and *B. subtilis* pass in a few hours after commencement of growth from a motile stage with peritrichous cilia, into one of filamentous growth preceded by casting of the cilia. (2) By far the majority of the described species (over 1000) fall into the three genera—*Micrococcus* (about 400), *Bacillus* (about 200), and *Bactridium* (about 150), so that only a quarter or so of the forms are selected out by the other genera. (3) The monotrichous and lophotrichous conditions are by no means constant even in the motile stage; thus *Pseudomonas rosea* (Mig.) may have 1, 2, or 3 cilia at either end, and would be distributed by Fischer's classification between *Bactrinium* and *Bactrillum*, according to which state was observed. In Migula's scheme the attempt is made to avoid some of these difficulties, but others are introduced by his otherwise clever devices for dealing with these puzzling little organisms.

The question, What is an individual? has given rise to much difficulty, and around it many of the speculations regarding pleomorphism have centred without useful result. If a tree fell apart into its constituent cells periodically we should have the same difficulty on a larger and more complex scale. The fact that every bacterial cell in a species in most cases appears equally capable of performing all the physiological functions of the species has led most authorities, however, to regard it as the individual—a view which cannot be consistent in those cases where a simple or branched filamentous series exhibits differences between free apex and fixed base and so forth. It may be doubted whether the discussion is profitable, though it appears necessary in some cases—*e.g.*, concerning pleomorphy—to adopt some definition of individual.

Myxobacteriaceæ.—In 1857 Berkeley figured a curious organism then named *Chondromyces*, and in 1892 this and a number of allied organisms were rediscovered by Thaxter, who showed that they form plasmodium-like aggregations and build themselves up into sporogenous structures quite similar in general features to the cysts of Myxomycetes, except that the plasmodium is filled with —or, according to Thaxter, consists of—swarming bacteria. Several genera and species are described, and if the author's appreciation of the facts is correct, we have here a remarkable group of organisms partaking of the nature of both Schizomycetes and Myxomycetes as his name implies. Until the details of the life-history are better worked out it is, however, impossible to say whether his views are right, or whether we have here—as seems to the present writer to be the case from the only example he has been able to examine—a case of symbiosis, or possibly parasitism, between true Schizomycetes and Myxomycetes.

Functions and life of bacteria.

The discoveries that some species of nitrifying bacteria and pigmented forms are capable of carbon-assimilation, that others can fix free nitrogen, and that a number of decompositions hitherto unsuspected are accomplished by Schizomycetes, have put the questions of nutrition and fermentation in quite new lights. Apart from numerous fermentation

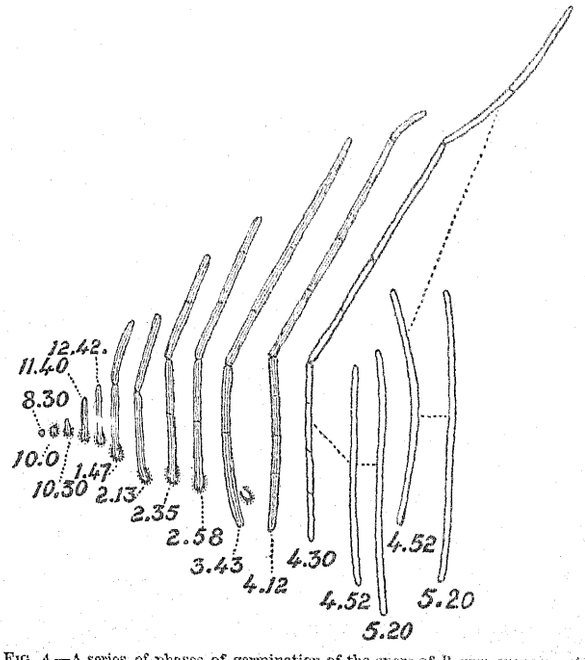

FIG. 4.—A series of phases of germination of the spore of *B. ramosus* sown at 8.30 (to the extreme left), showing how the growth can be measured. If we place the base of the filament in each case on a base line in the order of the successive times of observation recorded, and at distances apart proportional to the intervals of time (8.30, 10.0, 10.30, 11.40, and so on) and erect the straightened-out filaments, the proportional length of each of which is here given for each period, a line joining the tips of the filaments gives the curve of growth. Cf. Fig. 5. (*Original.*)

processes such as rotting, the soaking of skins for tanning, the preparation of indigo and of tobacco, hay, ensilage, &c., in all of which bacterial fermentations are concerned, attention may be especially directed to the following evidence of the supreme importance of Schizomycetes in agriculture and daily life. Indeed, nothing marks the attitude of modern bacteriology more clearly than the increasing attention which is being paid to useful fermentations. The vast majority of these organisms are not pathogenic, most are harmless, and many are indispensable aids in natural operations important to man.

Fischer has proposed that the old division into sapro-

phytes and parasites should be replaced by one which takes into account other peculiarities in the mode of nutrition of bacteria. The nitrifying, nitrogen-fixing, sulphur- and iron-bacteria he regards as monotrophic, *i.e.*, as able to carry on one particular series of fermentations or decompositions only, and since they require no organic food materials, or at least are able to work up nitrogen or carbon from inorganic sources, he regards them as primitive forms in this respect, and terms them *Prototrophic*. They may be looked upon as the nearest existing representatives of the primary forms of life which first obtained the power of working up non-living into living materials, and as playing a correspondingly important *rôle* in the evolution of life on our globe. The vast majority of bacteria, on the other hand, which are ordinarily termed saprophytes, are *saprogenic*, *i.e.*, bring organic material to the putrefactive state—or *saprophilous*, *i.e.*, live best in such putrefying materials—or become *zymogenic*, *i.e.*, their metabolic products may induce blood-poisoning or other toxic effects (facultative parasites) though they are not true parasites. These forms are termed by Fischer *Metatrophic*, because they require various kinds of organic materials obtained from the dead remains of other organisms or from the surfaces of their bodies, and can utilize and decompose them in various ways (*Polytrophic*), or, if monotrophic, are at least unable to work them up. The true parasites—obligate parasites of de Bary—are placed by Fischer in a third biological group, *Paratrophic* bacteria, to mark the importance of their mode of life in the interior of living organisms where they live and multiply in the blood, juices, or tissues.

Growth.

The growth of an ordinary bacterium consists in uniform elongation of the rodlet until its length is doubled, followed by division by a median septum, then by the simultaneous doubling in length of each daughter cell, again followed by median division, and so on (Figs. 4, 6). If the cells remain connected the resulting filament repeats these processes of elongation and subsequent division uniformly so long as the conditions are maintained, and very accurate measurements have been obtained on such a form, *e.g.*, *B. ramosus*. If a rodlet in a hanging drop of nutrient gelatine is fixed under the microscope and kept at constant temperature, a curve of growth can be obtained recording the behaviour during many hours or days. The measured lengths are marked off on ordinates erected on an abscissa, along which the times are noted. The curve obtained on joining the former points then brings out a number of facts, foremost among which are (1) that as long as the conditions remain constant the doubling periods—*i.e.*, the times taken by any portion of the filament to double its length—are constant, because each cell is equally active along the whole length; (2) there are optimum, minimum, and maximum temperatures, other conditions remaining constant, at which growth begins, runs at its best, and is soon exhausted, respectively; (3) that the most rapid cell-division and maximum growth do not necessarily accord with the best conditions for the life of the organism; and (4) that any sudden alteration of temperature brings about a check, though a slow rise may accelerate growth (Fig. 5). It was also shown that exposure to light, dilution or exhaustion of the food-media, the presence of traces of poisons or metabolic products check growth, or even bring it to a standstill; and the death or injury of any single cell in the filamentous series shows its effect on the curve by lengthening the doubling period, because its potential progeny have been put out of play. Hardy has shown that such a destruction of part of the filament may be effected by the attacks of another organism.

Among the most important advances in our knowledge of the bacteria are those having reference to the circulation of nitrogen on the globe. When we reflect that some hundreds of thousands of tons of urea are daily deposited, which ordinary plants are unable to assimilate until considerable changes have been undergone, the question is of importance, What happens in the meantime? In effect the urea first becomes carbonate of ammonia by a simple hydrolysis brought about by bacteria, more and more definitely known since Pasteur, van Tieghem, and Cohn first described them. Lea and Miquel further proved that the hydrolysis is due to an enzyme—urase—separable with difficulty from the bacteria concerned. Many forms in

Nitrogen bacteria.

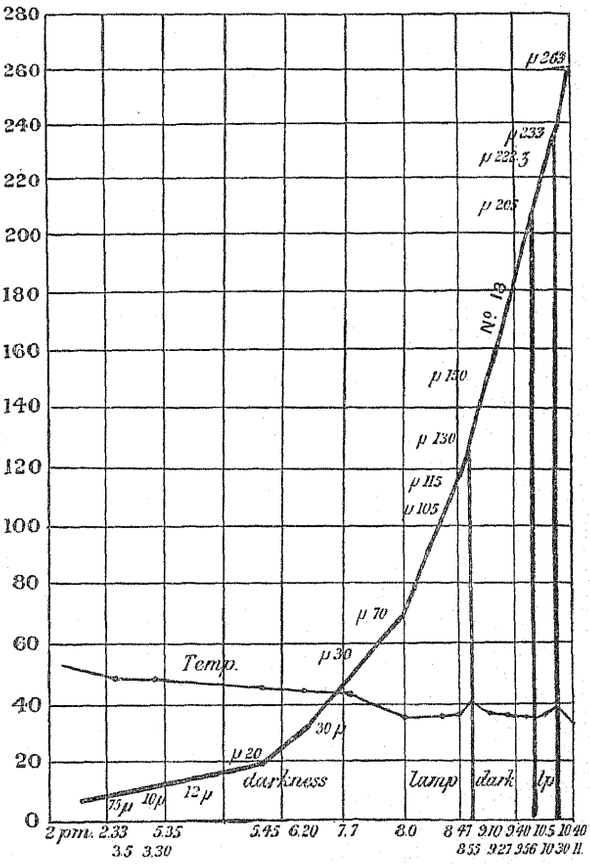

FIG. 5.—Curve of growth of a filament of *Bacillus ramosus* (Fraenkel), constructed from data such as in Fig. 4. The abscissæ represent intervals of time, the ordinates the measured lengths of the growing filament. Thus, at 2.33 P.M. the length of the filament was 6 μ; at 5.45, 20 μ; at 8 P.M., 70 μ, and so on. Such curves show differences of steepness according to the temperature (see temp. curve), and to alterations of light (lamp) and darkness. (*Original.*)

rivers, soil, manure heaps, &c., are capable of bringing about this change to ammonium carbonate, and much of the loss of volatile ammonia on farms is preventible if the facts are apprehended. The excreta of urea alone thus afford to the soil enormous stores of nitrogen combined in a form which can be rendered available by bacteria, and there are in addition the supplies brought down in rain from the atmosphere, and those due to other living debris. The researches of the decade 1890-1900 demonstrated that a still more inexhaustible supply of nitrogen is made available by the nitrogen-fixing bacteria of the soil. There are in all cultivated soils forms of bacteria which are capable of forcing the inert free nitrogen to combine with other elements into compounds assimilable by plants. This was long asserted as probable before Winogradsky showed that the conclusions of Berthelot, Laurent, and others are right, and that *Clostridium pasteurianum*, for

instance, if protected from access of free oxygen by an envelope of aerobic bacteria or fungi, and provided with the carbohydrates and minerals necessary for its growth, fixes nitrogen in proportion to the amount of sugar consumed. This interesting case of symbiosis is equalled by yet another case. The work of recent observers leaves no room for doubt that the free nitrogen of the atmosphere is brought into combination in the soil in the nodules filled with "bacteroids" on the roots of Leguminoseæ, and since these nodules are the morphological expression of a symbiosis between the higher plant and the bacteria-like "bacteroids," there is evidently here also a case similar to the last, though it is as yet impossible to say where and how the nitrogen is fixed.

As regards the ammonium carbonate accumulating in the soil from the conversion of urea and other sources, we know from Winogradsky's researches that it undergoes oxidation in two stages owing to the activity of the so-called "nitrifying" bacteria (an unfortunate term inasmuch as "nitrification" refers merely to a particular phase of the cycle of changes undergone by nitrogen). It had long been known that under certain conditions large

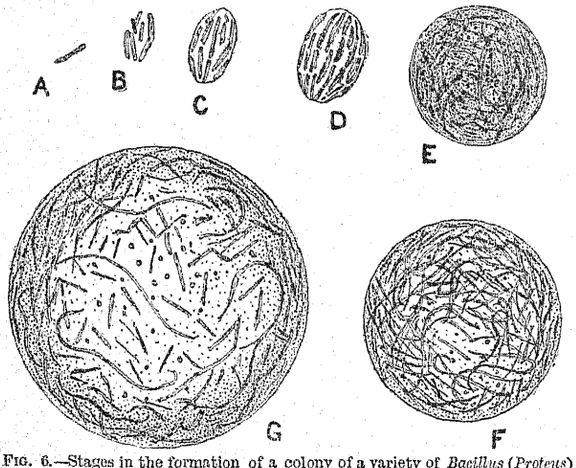

FIG. 6.—Stages in the formation of a colony of a variety of *Bacillus* (*Proteus*) *vulgaris* (Hauser), observed in a hanging drop. At 11 A.M. a rodlet appeared (A); at 4 P.M. it had grown and divided and broken up into eight rodlets (B); C shows further development at 8 P.M., D at 9.30 P.M.—all under a high power. At E, F, and G further stages are drawn, as seen under much lower power. (*Original.*)

quantities of nitrate (saltpetre) are formed on exposed heaps of manure, &c., and it was supposed that direct oxidation of the ammonia, facilitated by the presence of porous bodies, brought this to pass. But research showed that this process of nitrification is dependent on temperature, aeration, and moisture, as is life, and that while nitre-beds can infect one another, the process is stopped by sterilization. Warington, Schloesing, Müntz, and others had proved that nitrification was promoted by some organism, when Winogradsky hit on the happy idea of isolating the organism by using gelatinous silica, and so avoiding the difficulties which Warington had shown to exist with the organism in presence of organic nitrogen, owing to its refusal to nitrify on gelatine or other nitrogenous media. Winogradsky's investigations resulted in the discovery that two kinds of bacteria are concerned in nitrification: one of these, which he terms the *Nitroso-bacteria*, is only capable of bringing about the oxidation of the ammonia to nitrous acid, and the astonishing result was obtained that this can be done, in the dark, by bacteria to which only pure mineral salts—*e.g.*, carbonates, sulphates, and chlorides of ammonium, sodium, and magnesium—were added. In other words these bacteria can build up organic matter from purely mineral sources by assimilating carbon from carbon-dioxide in the dark, and by obtaining their nitrogen from ammonia. The energy liberated during the oxidation of the nitrogen is regarded as splitting the carbon-dioxide molecule,—in green plants it is the energy of the solar rays which does this. Since the supply of free oxygen is dependent on the activity of green plants the process is indirectly dependent on energy derived from the sun, but it is none the less an astounding one and outside the limits of our previous generalizations. It has been suggested that urea is formed by polymerization of ammonium carbonate, and formic aldehyde is synthesized from CO_2 and OH_2. The *Nitro-bacteria* are smaller, finer, and quite different from the nitroso-bacteria, and are incapable of attacking and utilizing ammonium carbonate. When the latter have oxidized ammonia to nitrite, however, the former step in and oxidize it still further to nitric acid. It is probable that important consequences of these actions result from the presence of nitrifying bacteria in rotten stone, decaying bricks, &c., where all the conditions are realized for preparing primitive soil, the breaking up of the mineral constituents being a secondary matter. That "soil" is thus prepared on barren rocks and mountain peaks may be concluded with some certainty.

In addition to the bacterial actions which result in the oxidization of ammonia to nitrous acid, and of the latter to nitric acid, the reversal of such processes is also brought about by numerous bacteria in the soil, rivers, &c. Warington showed some time ago that many species are able to reduce nitrates to nitrites, and such reduction is now known to occur very widely in nature. The researches of Gayon and Dupetit, Giltay and Aberson and others have shown, moreover, that bacteria exist which carry such reduction still further, so that ammonia or even free nitrogen may escape. The importance of these results is evident in explaining an old puzzle in agriculture, viz., that it is a wasteful process to put nitrates and manure together on the land. Fresh manure abounds in denitrifying bacteria, and these organisms not only reduce the nitrates to nitrites, even setting free nitrogen and ammonia, but their effect extends to the undoing of the work of what nitrifying bacteria may be present also, with great loss. The combined nitrogen of dead organisms, broken down to ammonia by putrefactive bacteria, the ammonia of urea, and the results of the fixation of free nitrogen, together with traces of nitrogen salts due to meteoric activity, are thus seen to undergo various vicissitudes in the soil, rivers, and surface of the globe generally. The ammonia may be oxidized to nitrites and nitrates, and then pass into the higher plants and be worked up into proteids, and so be handed on to animals, eventually to be broken down by bacterial action again to ammonia; or the nitrates may be degraded to nitrites and even to free nitrogen or ammonia, which escapes.

Another important advance is in our knowledge of the part played by bacteria in the circulation of carbon in nature. The enormous masses of cellulose deposited annually on the earth's surface are, as we know, principally the result of chlorophyll action on the carbon-dioxide of the atmosphere decomposed by energy derived from the sun; and although we know little as yet concerning the magnitude of other processes of carbon-assimilation—*e.g.*, by nitrifying bacteria—it is probably comparatively small. Such cellulose is gradually reconverted into water and carbon-dioxide, but until recently nothing positive was known as to the agents which thus break up the paper, rags, straw, leaves, and wood, &c., accumulating in cesspools, forests, marshes, and elsewhere in such abundance. The work of van Tieghem, van Senus, Fribes, Omeliansky, and others has now shown that while certain anaerobic bacteria decompose the substance of the middle lamella—chiefly pectin compounds—

Cellulose bacteria.

and thus bring about the isolation of the cellulose fibres when, for instance, flax is steeped or "retted," they are unable to attack the cellulose itself. There exist in the mud of marshes, rivers, and cloacæ, &c., however, other anaerobic bacteria which decompose cellulose, probably hydrolysing it first and then splitting the products into carbon-dioxide and marsh gas. When calcium sulphate is present, the nascent methane induces the formation of calcium carbonate, sulphuretted hydrogen, and water. We have thus an explanation of the occurrence of marsh gas and sulphuretted hydrogen in bogs, and it is highly probable that the existence of these gases in the intestines of herbivorous animals is due to similar putrefactive changes on the undigested cellulose remains.

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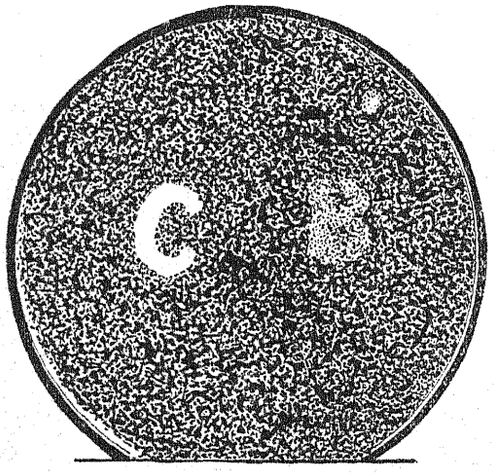
Sulphur bacteria.



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The ferric hydroxide accumulates in the sheath, and gradually passes into the more insoluble ferric oxide. These actions are of extreme importance in nature, as their continuation results in the enormous deposits of bog-iron ore, ochre, and—since Molisch has shown that the iron can be replaced by manganese in some bacteria—of manganese ores.

Considerable advances in our knowledge of the various chromogenic bacteria have been made by the studies of Beyerinck, Lankester, Engelmann, Ewart, and others, and have assumed exceptional importance owing to the discovery that *Bacterio-purpurin*—the red colouring matter contained in certain sulphur bacteria—absorbs certain rays of solar energy, and enables the organism to utilize the energy for its own life-purposes. Engelmann showed, for instance, that these red-purple bacteria collect in the ultra-red, and to a less extent in the orange and green, in bands which agree with the absorption spectrum of the extracted colouring matter. Not only so, but the evident parallelism between this absorption of light and that by the chlorophyll of green plants, is completed by the demonstration that oxygen is set free by these bacteria—*i.e.*, by means of radiant energy trapped by their colour-screens the living cells are in both cases enabled to do work, such as the reduction of highly oxidized compounds. In the case of these red-purple bacteria the colouring matter is contained in the protoplasm of the cell, but in most chromogenic bacteria it occurs as excreted pigment on and between the cells, or is formed by their action in the medium. Ewart has confirmed the principal conclusions concerning these purple, and also the so-called chlorophyll bacteria (*B. viride*, *B. chlorinum*, &c.), the results going to show that these are, as many authorities have held, merely minute Algæ. The pigment itself may be soluble in water, as is the case with the blue-green fluorescent body formed by *B. pyocyaneus*, *B. fluorescens*, and a whole group of fluorescent bacteria. Neelson found that the pigment of *B. cyanogenus* gives a band in the yellow and strong lines at E and F in the solar spectrum—an absorption spectrum almost identical with that of triphenyl-rosaniline. In the case of the scarlet and crimson red pigments of *B. prodigiosus*, *B. ruber*, &c., the violet of *B. violacens*, *B. janthinus*, &c., the red-purple of the sulphur bacteria, and indeed most

Pigment bacteria.

instance, if protected from access of free oxygen by an envelope of aerobic bacteria or fungi, and provided with the carbohydrates and minerals necessary for its growth, fixes nitrogen in proportion to the amount of sugar consumed. This interesting case of symbiosis is equalled by yet another case. The work of recent observers leaves no room for doubt that the free nitrogen of the atmosphere is brought into combination in the soil in the nodules filled with "bacteroids" on the roots of Leguminoseæ, and since these nodules are the morphological expression of a symbiosis between the higher plant and the bacteria-like "bacteroids," there is evidently here also a case similar to the last, though it is as yet impossible to say where and how the nitrogen is fixed.

As regards the ammonium carbonate accumulating in the soil from the conversion of urea and other sources, we know from Winogradsky's researches that it undergoes oxidation in two stages owing to the activity of the so-called "nitrifying" bacteria (an unfortunate term inasmuch as "nitrification" refers merely to a particular phase of the cycle of changes undergone by nitrogen). It had long been known that under certain conditions large

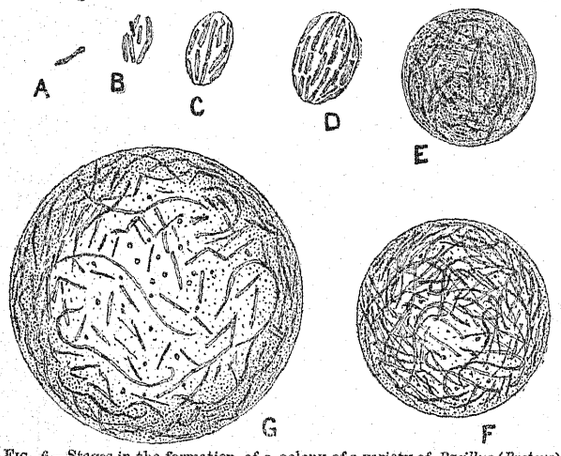

FIG. 6.—Stages in the formation of a colony of a variety of *Bacillus* (*Proteus*) *vulgaris* (Hauser), observed in a hanging drop. At 11 A.M. a rodlet appeared (A); at 4 P.M. it had grown and divided and broken up into eight rodlets (B); C shows further development at 8 P.M., D at 9.30 P.M.—all under a high power. At E, F, and G further stages are drawn, as seen under much lower power. (*Original.*)

quantities of nitrate (saltpetre) are formed on exposed heaps of manure, &c., and it was supposed that direct oxidation of the ammonia, facilitated by the presence of porous bodies, brought this to pass. But research showed that this process of nitrification is dependent on temperature, aeration, and moisture, as is life, and that while nitre-beds can infect one another, the process is stopped by sterilization. Warington, Schloesing, Müntz, and others had proved that nitrification was promoted by some organism, when Winogradsky hit on the happy idea of isolating the organism by using gelatinous silica, and so avoiding the difficulties which Warington had shown to exist with the organism in presence of organic nitrogen, owing to its refusal to nitrify on gelatine or other nitrogenous media. Winogradsky's investigations resulted in the discovery that two kinds of bacteria are concerned in nitrification: one of these, which he terms the *Nitroso-bacteria*, is only capable of bringing about the oxidation of the ammonia to nitrous acid, and the astonishing result was obtained that this can be done, in the dark, by bacteria to which only pure mineral salts—*e.g.*, carbonates, sulphates, and chlorides of ammonium, sodium, and magnesium—were added. In other words these bacteria can build up organic matter from purely mineral sources by assimilating carbon from carbon-dioxide in the dark, and by obtaining their nitrogen from ammonia. The energy liberated during the oxidation of the nitrogen is regarded as splitting the carbon-dioxide molecule,—in green plants it is the energy of the solar rays which does this. Since the supply of free oxygen is dependent on the activity of green plants the process is indirectly dependent on energy derived from the sun, but it is none the less an astounding one and outside the limits of our previous generalizations. It has been suggested that urea is formed by polymerization of ammonium carbonate, and formic aldehyde is synthesized from CO_2 and OH_2. The *Nitro-bacteria* are smaller, finer, and quite different from the nitroso-bacteria, and are incapable of attacking and utilizing ammonium carbonate. When the latter have oxidized ammonia to nitrite, however, the former step in and oxidize it still further to nitric acid. It is probable that important consequences of these actions result from the presence of nitrifying bacteria in rotten stone, decaying bricks, &c., where all the conditions are realized for preparing primitive soil, the breaking up of the mineral constituents being a secondary matter. That "soil" is thus prepared on barren rocks and mountain peaks may be concluded with some certainty.

In addition to the bacterial actions which result in the oxidization of ammonia to nitrous acid, and of the latter to nitric acid, the reversal of such processes is also brought about by numerous bacteria in the soil, rivers, &c. Warington showed some time ago that many species are able to reduce nitrates to nitrites, and such reduction is now known to occur very widely in nature. The researches of Gayon and Dupetit, Giltay and Aberson and others have shown, moreover, that bacteria exist which carry such reduction still further, so that ammonia or even free nitrogen may escape. The importance of these results is evident in explaining an old puzzle in agriculture, viz., that it is a wasteful process to put nitrates and manure together on the land. Fresh manure abounds in denitrifying bacteria, and these organisms not only reduce the nitrates to nitrites, even setting free nitrogen and ammonia, but their effect extends to the undoing of the work of what nitrifying bacteria may be present also, with great loss. The combined nitrogen of dead organisms, broken down to ammonia by putrefactive bacteria, the ammonia of urea, and the results of the fixation of free nitrogen, together with traces of nitrogen salts due to meteoric activity, are thus seen to undergo various vicissitudes in the soil, rivers, and surface of the globe generally. The ammonia may be oxidized to nitrites and nitrates, and then pass into the higher plants and be worked up into proteids, and so be handed on to animals, eventually to be broken down by bacterial action again to ammonia; or the nitrates may be degraded to nitrites and even to free nitrogen or ammonia, which escapes.

Another important advance is in our knowledge of the part played by bacteria in the circulation of carbon in nature. The enormous masses of cellulose deposited annually on the earth's surface are, as we know, principally the result of chlorophyll action on the carbon-dioxide of the atmosphere decomposed by energy derived from the sun; and although we know little as yet concerning the magnitude of other processes of carbon-assimilation—*e.g.*, by nitrifying bacteria—it is probably comparatively small. Such cellulose is gradually reconverted into water and carbon-dioxide, but until recently nothing positive was known as to the agents which thus break up the paper, rags, straw, leaves, and wood, &c., accumulating in cesspools, forests, marshes, and elsewhere in such abundance. The work of van Tieghem, van Senus, Fribes, Omeliansky, and others has now shown that while certain anaerobic bacteria decompose the substance of the middle lamella—chiefly pectin compounds—

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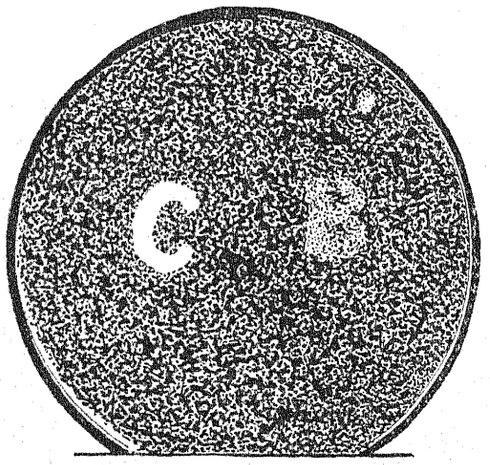

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Pigment bacteria.

bacterial pigments, solution in water does not occur, though alcohol extracts the colour readily. Finally, there are a few forms which yield their colour to neither alcohol nor water, *e.g.*, the yellow *Micrococcus cereus-flavus* and the *B. berolinensis*. Much work is still necessary before we can estimate the importance of these pigments. Their spectra are only imperfectly known in a few cases, and the bearing of the absorption on the life-history is still a mystery. In many cases the colour-production is dependent on certain definite conditions—temperature, presence of oxygen, nature of the food-medium, &c. Ewart's important discovery that some of these lipochrome pigments occlude oxygen, while others do not, may have bearings on the facultative anaerobism of these organisms.

A branch of bacteriology which offers numerous problems of importance is that which deals with the organisms so common in milk, butter, and cheese. Milk is a medium not only admirably suited to the growth of bacteria, but, as a matter of fact, always contaminated with these organisms in the ordinary course of supply. Lafar has stated that 20 per cent. of the cows in Germany suffer from tuberculosis, which also affected 17·7 per cent. of the cattle slaughtered in Copenhagen between 1891 and 1893, and that one in every thirteen samples of

Dairy bacteria.

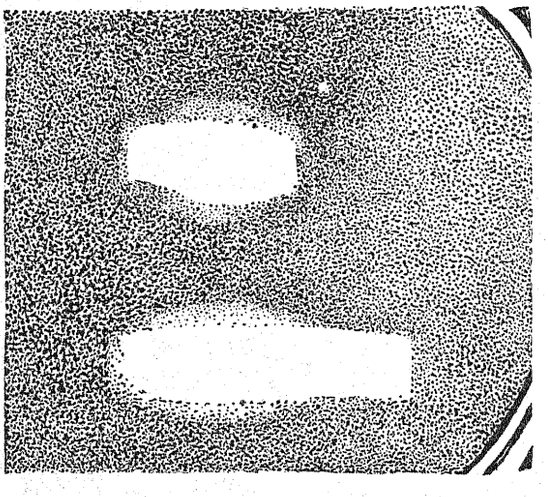

FIG. 8.—A similar preparation to Fig. 7, except that two slit-like openings of equal length allowed the light to pass, and that the light was that of the electric arc passed through a quartz prism and casting a powerful spectrum on the plate. The upper slit was covered with glass, the lower with quartz. The bacteria were killed over the clear areas shown. The left-hand boundary of the clear area corresponds to the line F (green end of the blue), and the beginning of the ultra-violet was at the extreme right of the upper (short) area. The lower area of bactericidal action extends much farther to the right, because the quartz allows more ultra-rays to pass than does glass. The red-yellow-green to the left of F were without effect. (*Original.*)

milk examined in Paris, and one in every nineteen in Washington, contained tubercle bacilli. Hence the desirability of sterilizing milk used for domestic purposes becomes imperative. No milk is free from bacteria, because the external orifices of the milk-ducts always contain them, but the forms present in the normal fluid are principally those which induce such changes as the souring or "turning" so frequently observed in standing milk (these were examined by Lord Lister as long ago as 1873-77, though several other species are now known), and those which bring about the various changes and fermentations in butter and cheese made from it. The presence of foreign germs, which may gain the upper hand and totally destroy the flavours of butter and cheese, has led to the search for those particular forms to which the approved properties are due. A definite bacillus to which the peculiarly fine flavour of certain butters is due, is said to be largely employed in pure cultures in American dairies, and in Denmark certain butters are said to keep fresh much longer owing to the use of pure cultures and the treatment employed to suppress the forms which cause rancidity. Quite distinct is the search for the germs which cause undesirable changes, or "diseases"; and great strides have been made in discovering the bacteria concerned in rendering milk "ropy," butter "oily" and "rancid," &c. Cheese in its numerous forms contains myriads of bacteria, and some of these are now known to be concerned in the various processes of ripening and other changes affecting the product, and although little is known as to the exact part played by any species, practical applications of the discoveries of the decade 1890-1900 have been made, *e.g.*, Edam cheese. The Japanese have cheeses resulting from the bacterial fermentation of boiled Soja beans.

That bacterial fermentations are accompanied by the evolution of heat is an old experience; but the discovery that the "spontaneous" combustion of sterilized cotton-waste does not occur simply if moist and freely exposed to oxygen, but results when the washings of fresh waste are added, has led to clearer proof that the heating of hay-stacks, hops, tobacco, and other vegetable products is due to the vital activity of bacteria and fungi, and is physiologically a consequence of respiratory processes like those in malting. It seems fairly established that when the preliminary heating process of fermentation is drawing to a close, the cotton, hay, &c., having been converted into a highly porous friable and combustible mass, may then ignite in certain circumstances by the occlusion of oxygen, just as ignition is induced by finely divided metals. A remarkable point in this connexion has always been the necessary conclusion that the living bacteria concerned must be exposed to temperatures of at least 70° C. in the hot heaps. Apart from the resolution of doubts as to the power of spores to withstand such temperatures for long periods, the discoveries of Miquel, Globig, and others have shown that there are numerous bacteria which will grow and divide at such temperatures, *e.g.*, *B. thermophilus*, from sewage, which is quite active at 70° C., and *B. Ludwigi* and *B. ilidzensis*, &c., from hot springs, &c.

Thermophilous bacteria.

The bodies of sea fish, *e.g.*, mackerel and other animals, have long been known to exhibit phosphorescence. This phenomenon is due to the activity of a whole series of marine bacteria of various genera, the examination and cultivation of which have been successfully carried out by Cohn, Beyerinck, Fischer, and others. The cause of the phosphorescence is still a mystery. The suggestion that it is due to the oxidation of a body excreted by the bacteria seems answered by the failure to filter off or extract any such body. Beyerinck's view that it occurs at the moment peptones are worked up into the protoplasm cannot be regarded as proved, and the same must be said of the suggestion that the phosphorescence is due to the oxidation of phosphoretted hydrogen. The conditions of phosphorescence are, the presence of free oxygen, and, generally, a relatively low temperature, together with a medium containing sodium chloride, and peptones, but little or no carbohydrates. Considerable differences occur in these latter respects, however, and interesting results were obtained by Beyerinck with mixtures of species possessing different powers of enzyme action as regards carbohydrates. Thus, a form termed *Photobacterium phosphorescens* by Beyerinck will absorb maltose, and will become luminous if that sugar is present, whereas *P. Pflugeri* is indifferent to maltose. If then we prepare densely inseminated plates of these two bacteria in gelatine food-medium to which starch is added as the only carbohydrate, the bac-

Phosphorescent bacteria.

teria grow but do not phosphoresce. If we now streak these plates with an organism, *e.g.*, a yeast, which saccharifies starch, it is possible to tell whether maltose or levulose and fructose are formed; if the former, only those plates containing *P. phosphorescens* will become luminous; if the latter, only those containing *P. Pflugeri.*

Oxidizing bacteria.

It has long been known that the production of vinegar depends on the oxidization of the alcohol in wine or beer to acetic acid, the chemical process being probably carried out in two stages, viz., the oxidation of the alcohol leading to the formation of aldehyde and water, and the further oxidation of the aldehyde to acetic acid. The process may even go farther, and the acetic acid be oxidized to CO_2 and OH_2; the art of the vinegar-maker is directed to preventing the accomplishment of the last stage. These oxidations are brought about by the vital activity of several bacteria, of which four—*Bacterium aceti*, *B. pasteurianum*, *B. kützingianum*, and *B. xylinum*—have been thoroughly studied by Hansen and A. Brown. It is these bacteria which form the zoogloea of the "mother of vinegar," though this film may contain other organisms as well. The idea that this film of bacteria oxidizes the alcohol beneath by merely condensing atmospheric oxygen in its interstices, after the manner of spongy platinum, has long been given up; but the explanation of the action as an incomplete combustion, depending on the peculiar respiration of these organisms—much as in the case of nitrifying and sulphur bacteria—is not clear, though the discovery that the acetic bacteria will not only oxidize alcohol to acetic acid, but further oxidize the latter to CO_2 and OH_2 supports the view that the alcohol is absorbed by the organism and employed as its respirable substance. Promise of more light on these oxidation fermentations is afforded by the recent discovery that not only bacteria and fungi, but even the living cells of higher plants, contain peculiar enzymes which possess the remarkable property of "carrying" oxygen—much as it is carried in the sulphuric acid chamber—and which have therefore been termed oxydases. It is apparently the presence of these oxydases which causes certain wines to change colour and alter in taste when poured from bottle to glass, and so exposed to air.

Bacteria and light.

Much as the decade from 1880-90 abounded with investigations on the reactions of bacteria to heat, so the following decade was remarkable for discoveries regarding the effects of other forms of radiant energy. The observations of Downes and Blunt in 1877 left it uncertain whether the bactericidal effects in broth cultures exposed to solar rays were

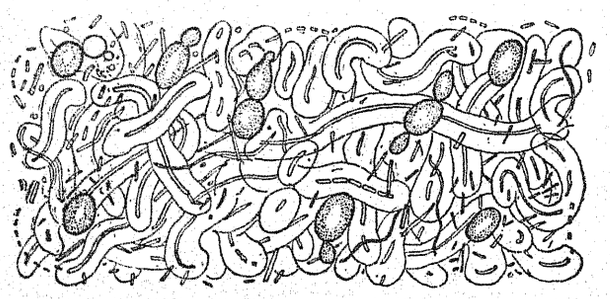

FIG. 9.—Ginger-beer plant, showing yeast (*Saccharomyces pyriformis*) entangled in the meshes of the bacterium (*B. vermiforme*). (*Original.*)

due to thermal action or not. Further investigations, in which Arloing, Buchner, Chmelewski, and others took part, have led to the proof that rays of light alone are quite capable of killing these organisms. The principal questions were satisfactorily settled by Marshall Ward's experiments in 1892-93, when he showed that even the spores of *B. anthracis*, which withstand temperatures of 100° C. and upwards, can be killed by exposure to rays of reflected light at temperatures far below anything injurious, or even favourable to growth. He also showed that the bactericidal action takes place in the absence of food materials, thus proving that it is not merely a poisoning effect of the altered medium. The principal experiments also indicate that it is the rays of highest refrangibility—the blue-violet and ultra-violet rays of the spectrum—which bring about the destruction of the organisms (Figs. 7, 8). The practical effect of the bactericidal action of solar-light is the destruction of enormous quantities of germs in rivers, the atmosphere, and other exposed situations, and experiments have shown that it is especially the pathogenic bacteria—anthrax, typhoid, &c.—which thus succumb to light-action; the discovery that the electric arc is very rich in bactericidal rays led to the hope that it could be used for disinfecting purposes in hospitals, but mechanical difficulties intervene. The recent application of the action of bactericidal rays to the cure of lupus is, however, an extension of the same discovery. Even when the light is not sufficiently intense, or the exposure is too short to kill the spores, the experiments show that attenuation of virulence may result, a point of extreme importance in connexion with the lighting and ventilation of dwellings, the purification of rivers and streams, and the general diminution of epidemics in nature.

Bacteria and heat.

As we have seen, thermophilous bacteria can grow at high temperatures, and it has long been known that some forms develop on ice. The somewhat different question of the resistance of ripe spores or cells to extremes of heat and cold has received attention. Ravenel, Macfadyen, and Rowland have shown that several bacilli will bear exposure for seven days to the temperature of liquid air (−192° C. to −183° C.) and again grow when put into normal conditions. More recent experiments have shown that even ten hours' exposure to the temperature of liquid hydrogen −252° C. (21° on the absolute scale) failed to kill them. Farmer has shown the probability that in all these cases of resistance of seeds, spores, &c., the fact that completely dry albumin does not lose its coagulability on heating to 110° C. for some hours may be of importance, since it is well known that completely ripe spores and dry heat are the conditions of extreme experiments.

Pathogenic bacteria.

No sharp line can be drawn between pathogenic and non-pathogenic Schizomycetes, and some of the most marked steps in the progress of our modern knowledge of these organisms depend on the discovery that their pathogenicity or virulence can be modified—diminished or increased—by definite treatment, and, in the natural course of epidemics, by alterations in the environment. Similarly we are unable to divide Schizomycetes sharply into parasites and saprophytes, since it is well proved that a number of species—facultative parasites—can become one or the other according to circumstances. These facts, and the further knowledge that many bacteria never observed as parasites, or as pathogenic forms, produce toxins or poisons as the result of their decompositions and fermentations of organic substances, have led to important results in the applications of bacteriology to medicine.

Bacteriosis in plants.

Bacterial diseases in the higher plants have been described, but the subject requires careful treatment, since several points suggest doubts as to the organism described being the cause of the disease referred to their agency. Until recently it was urged that the acid contents of plants explained their immunity from bacterial diseases, but it is now known that many bacteria can flourish in acid media. Another objection was that even if bacteria obtained

access through the stomata, they could not penetrate the cell-walls bounding the intercellular spaces, for although certain anaerobic forms are known to ferment cellulose, no undoubted bacterium has been shown to possess the power of penetrating the cell-walls of living cells, unless we except the bacteroids of Leguminosæ first described by Marshall Ward in 1887, and confirmed by Miss Dawson in 1898. On the other hand a long list of plant-diseases have been of late years attributed to bacterial action. Some, *e.g.*, wet rot of potatoes, the Sereh disease of the sugar-cane, the slime fluxes of oaks and other trees, are not only very doubtful cases, in which other organisms such as yeasts and fungi play their parts, but it may be regarded as extremely improbable that the bacteria are the primary agents at all; they are doubtless saprophytic forms which have gained access to rotting tissues injured

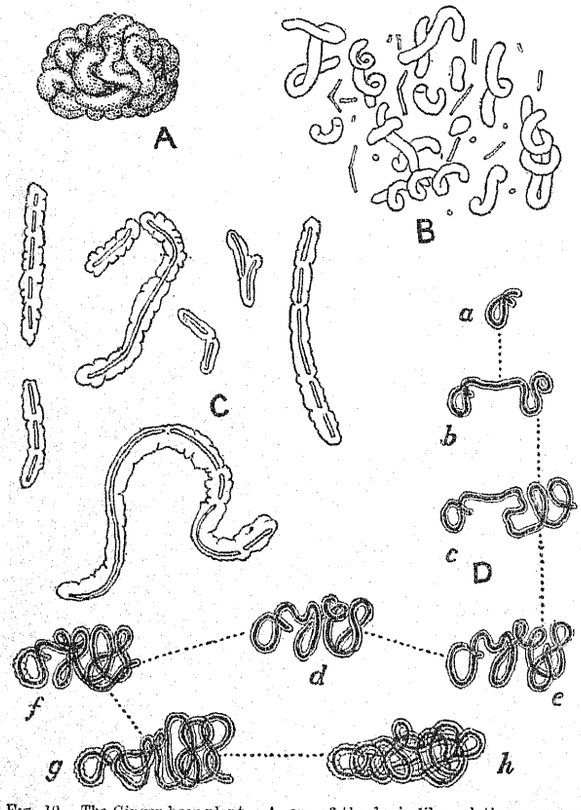

FIG. 10.—The Ginger-beer plant. A, one of the brain-like gelatinous masses into which the mature "plant" condenses; B, the bacterium with and without its gelatinous sheaths (cf. Fig. 9); C, typical filaments and rodlets in the slimy sheaths; D, stages of growth of a sheathed filament—*a* at 9 A.M., *b* at 3 P.M., *c* at 9 P.M., *d* at 11 A.M. next day, *e* at 3 P.M., *f* at 9 P.M., *g* at 10.30 A.M. next day, *h* at 24 hours later. (*Original.*)

by other agents. Saprophytic bacteria can readily make their way down the dead hypha of an invading fungus, or into the punctures made by insects, and Aphides have been credited with the bacterial infection of carnations, though more recent researches by Woods go to show the correctness of his conclusion that Aphides alone are responsible for the carnation disease. On the other hand, recent investigation has brought to light cases in which bacteria appear to be the primary agents in certain diseases of plants. The principal features are the stoppage of the vessels and consequent wilting of the shoots; as a rule the cut vessels on transverse sections of the shoots appear brown and choked with a dark yellowish slime in which bacteria may be detected, *e.g.*, cabbages, cucumbers, potatoes, &c. In the carnation disease and in certain diseases of tobacco and other plants the seat of bacterial action appears to be the parenchyma, and it may be that Aphides or other piercing insects infect the plants, much as insects convey pollen from plant to plant, or (though in a different way) as mosquitoes infect man with malaria. If the most recent work on the cabbage disease may be accepted, the bacteria make their entry at the water pores at the margins of the leaf, and thence *viâ* the glandular cells to the tracheids. Nothing is known of the mode of action of bacteria on these plants, but it may be assumed with great confidence that they excrete enzymes and poisons (toxins), which diffuse into the cells and kill them, and that the effects are in principle the same as those of parasitic fungi. Support is found for this opinion in Beyerinck's discovery that the juices of tobacco plants affected with the disease known as "leaf mosaic," will induce this disease after filtration through porcelain.

In addition to such cases as the Kephir and Ginger-beer plants (Figs. 9, 10), where anaerobic bacteria are associated with yeasts, several interesting examples of symbiosis among bacteria are now known. *Bacillus chauvœi* ferments cane-sugar solutions in such a way that normal butyric acid, inactive lactic acid, carbon-dioxide, and hydrogen result; *Micrococcus acidi-paralactici*, on the other hand, ferments such solutions to optically active paralactic acid. Nencki showed, however, that if both these organisms occur together, the resulting products contain large quantities of normal butyl alcohol, a substance neither bacterium can produce alone. Other observers have brought forward other cases. Thus neither *B. coli* nor the *B. denitrificans* of Burri and Stutzer can reduce nitrates, but if acting together they so completely undo the structure of sodium nitrate that the nitrogen passes off in the free state. Van Senus showed that the concurrence of two bacteria is necessary before his *B. amylobacter* can ferment cellulose, and the case of mud bacteria which evolve sulphuretted hydrogen below which is utilized by sulphur bacteria above has already been quoted, as also that of Winogradsky's *Clostridium pasteurianum*, which is anaerobic, and can fix nitrogen only if protected from oxygen by aerobic species. It is very probable that numerous symbiotic fermentations in the soil are due to this co-operation of oxygen-protecting species with anaerobic ones, *e.g.*, *Tetanus*.

Symbiosis.

Astonishment has been frequently expressed at the powerful activities of bacteria—their rapid growth and dissemination, the extensive and profound decompositions and fermentations induced by them, the resistance of their spores to desiccation, heat, &c.—but it is worth while to ask how far these properties are really remarkable when all the data for comparison with other organisms are considered. In the first place, the extremely small size and isolation of the vegetative cells place the protoplasmic contents in peculiarly favourable circumstances for action, and we may safely conclude that, weight for weight and molecule for molecule, the protoplasm of bacteria is brought into contact with the environment at far more points and over a far larger surface than is that of higher organisms, whether—as in plants—it is distributed in thin layers round the sap-vacuoles, or—as in animals—is bathed in fluids brought by special mechanisms to irrigate it. Not only so, the isolation of the cells facilitates the exchange of liquids and gases, the passage in of food materials and out of enzymes and products of metabolism, and thus each unit of protoplasm obtains opportunities of immediate action, the results of which are removed with equal rapidity, not attainable in more complex multicellular organisms. To put the matter in another way, if we could imagine all the living cells of a large oak or of a horse, having given up the specializations of function impressed on them during evolution and simply carrying

Activity of bacteria.

out the fundamental functions of nutrition, growth, and multiplication which mark the generalized activities of the bacterial cell, and at the same time rendered as accessible to the environment by isolation and consequent extension of surface, we should doubtless find them exerting changes in the fermentible fluids necessary to their life similar to those exerted by an equal mass of bacteria, and that in proportion to their approximation in size to the latter. Ciliary movements, which undoubtedly contribute in bringing the surface into contact with larger supplies of oxygen and other fluids in unity of time, are not so rapid or so extensive when compared with other standards than the apparent dimensions of the microscopic field. The microscope magnifies the distance traversed as well as the organism, and although a bacterium which covers 9-10 cm. or more in 15 minutes—say 0·1 mm. or 100 μ per second—appears to be darting across the field with great velocity, because its own small size—say $5 \times 1\ \mu$—comes into comparison, it should be borne in mind that if a mouse 2 inches long only, travelled twenty times its own length, *i.e.* 40 inches in a second, the distance traversed in 15 minutes at that rate, viz., 1000 yards, would not appear excessive. In a similar way we must be careful, in our wonder at the marvellous rapidity of cell-division and growth of bacteria, that we do not exaggerate the significance of the phenomenon. It takes any ordinary rodlet 30-40 minutes to double its length and divide into two equal daughter cells when growth is at its best (see Figs. 4 and 5); nearer the minimum it may require 3-4 hours or even much longer. It is by no means certain that even the higher rate is greater than that exhibited by a tropical bamboo which will grow over a foot a day, or even common grasses, or asparagus, during the active period of cell-division, though the phenomenon is here complicated by the phase of extension due to intercalation of water. The enormous extension of surface also facilitates the absorption of energy from the environment, and, to take one case only, it is impossible to doubt that some source of radiant energy must be at the disposal of those prototrophic forms which decompose carbonates and assimilate carbonic acid in the dark and oxidize nitrogen in dry rocky regions where no organic materials are at their disposal, even could they utilize them. It is usually stated that the carbon-dioxide molecule is here split by means of energy derived from the oxidation of nitrogen, but apart from the fact that none of these processes can proceed until the temperature rises to the minimum cardinal point, Engelmann's experiment shows that in the purple bacteria rays are used other than those employed by green plants, and especially ultra-red rays not seen in the spectrum, and we may probably conclude that "dark rays"—*i.e.*, rays not appearing in the visible spectrum—are absorbed and employed by these and other colourless bacteria. The purple bacteria have thus two sources of energy, one by the oxidation of sulphur and another by the absorption of "dark rays." Stoney (*Scient. Proc. R. Dub. Soc.*, 1893, p. 154) has suggested yet another source of energy, in the bombardment of these minute masses by the molecules of the environment, the velocity of which is sufficient to drive them well into the organism, and carry energy in of which they can avail themselves.

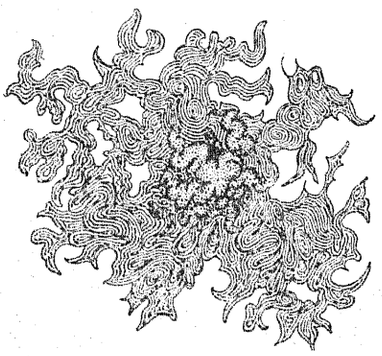

FIG. 11.—A plate-culture colony of a species of *Bacillus—Proteus* (Hauser)—on the fifth day. The flame-like processes and outliers are composed of writhing filaments, and the contours are continually changing while the colony moves as a whole. Slightly magnified. (*Original.*)

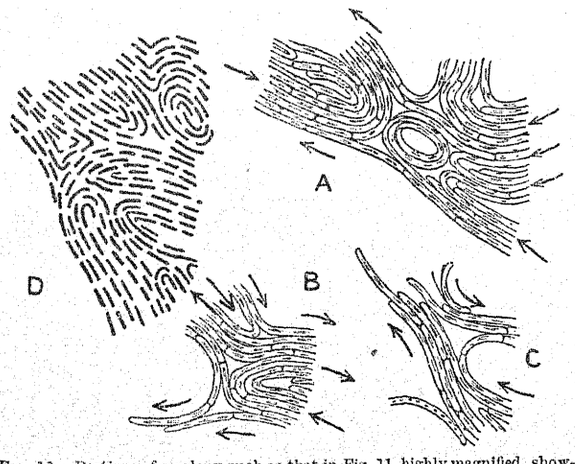

FIG. 12.—Portions of a colony such as that in Fig. 11, highly magnified, showing the kinds of changes brought about in a few minutes, from A to B, and B to C, by the growth and ciliary movements of the filaments. The arrows show the direction of motion. (*Original.*)

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II. PATHOLOGICAL.

Bacteriology.

The action of bacteria as pathogenic agents is in great part merely an instance of their general action as producers of chemical change, yet bacteriology as a whole has become so extensive, and has so important a bearing on subjects widely different from one another, that division of it has become essential. The science will accordingly be treated in this section from the pathological standpoint only. It will be considered under the three following heads, viz. (1) the methods employed in the study; (2) the modes of action of bacteria and the effects produced by them; and (3) the facts and theories with regard to immunity against bacterial disease.

Historical summary.

The demonstration by Pasteur (see SCHIZOMYCETES, *Ency. Brit.*, ninth ed.) that definite diseases could be produced by bacteria, proved a great stimulus to research in the etiology of infective conditions, and the result was a rapid advance in human knowledge. An all-important factor in this remarkable progress was the introduction by Koch of solid culture media, of the "plate-method," &c., an account of which he published in 1881. By means of these the modes of cultivation, and especially of separation, of bacteria were greatly simplified. Various modifications have since been made, but the routine methods in bacteriological procedure still employed are in great part those given by Koch. By 1876 the anthrax bacillus had been obtained in pure culture by Koch, and some other pathogenic bacteria had been observed in the tissues, but it was in the decade 1880-90 that the most important discoveries were made in this field. Thus the bacteria of suppuration, tubercle, glanders, diphtheria, typhoid fever, cholera, tetanus, and others were identified, and their relationship to the individual diseases established. In the last decade of the 19th century the chief discoveries were of the bacillus of influenza (1892), and of the bacillus of plague (1894).[1] Immunity against diseases produced by bacteria has been the subject of systematic research from 1880 onwards. In producing active immunity by the attenuated virus, Duguid and Burdon-Sanderson, and Greenfield in Great Britain, and Pasteur, Toussaint, and Chauveau in France, were pioneers. The work of Metchnikoff, dating from about 1884, has proved of high importance, his theory of phagocytosis having proved a great stimulus to research, and having also contributed to important advances. The modes by which bacteria produce their effects also became a subject of study, and attention was naturally turned to their toxic products. The earlier work, notably that of Brieger, chiefly concerned ptomaines (*vide infra*), but no great advance resulted. A new field of inquiry was, however, opened up when, by filtration, a bacterium-free toxic fluid was obtained which produced the important symptoms of the disease—in the case of diphtheria by Roux and Yersin (1888), and in the case of tetanus a little later by various observers. Research was thus directed towards ascertaining the nature of the toxic bodies in such a fluid, and Brieger and Fraenkel (1890) found that they were proteids, to which they gave the name "toxalbumins." Though subsequent researches have on the whole confirmed these results, it is still a matter of dispute whether these proteids are the true toxins or merely contain the toxic bodies precipitated along with them. In the United Kingdom the work of Sidney Martin, in the separation of toxic substances from the bodies of those who have died from certain diseases, is also worthy of mention. Immunity against toxins also became a subject of investigation, and the result was the discovery of the antitoxic action of the serum of animals immunized against tetanus toxin by Behring and Kitasato (1890), and by Tizzoni and Cattani. A similar result was also obtained in the case of diphtheria. The facts with regard to passive immunity were thus established, and were put to practical application by the introduction of diphtheria antitoxin as a therapeutic agent in 1894. The technique of serum preparation has become since that time greatly elaborated and improved, the work of Ehrlich in this respect being specially noteworthy. The laws of passive immunity were shown to hold also in the case of immunity against living organisms by Pfeiffer (1894), and various anti-bacterial sera have been introduced. Of these the anti-streptococcic serum of Marmorek (1895) is probably the most important. The principles of protective inoculation have been developed and practically applied on a large scale, notably by Haffkine in the case of cholera (1893) and plague (1896), and recently by Wright and Semple in the case of typhoid fever. One other discovery of great importance may be mentioned, viz., the agglutinative action of the serum of a patient suffering from a bacterial disease, first discovered in the case of typhoid fever independently by Widal and by Grünbaum in 1896, though led up to by the work of Pfeiffer, Gruber and Durham, and others. Thus a new aid was added to medical science, viz., serum diagnosis of disease. It will thus be seen that the last decade of the 19th century was largely occupied with the investigation of toxins, of questions of immunity, and of the properties of the serum of immunized animals; it will stand out in the history of medical science as the period in which serum therapeutics and serum diagnosis had their birth.

Methods of study.

The methods employed in studying the relation of bacteria to disease are in principle comparatively simple, but considerable experience and great care are necessary in applying them and in interpreting results. In any given disease there are three chief steps, viz. (1) the discovery of a bacterium in the affected tissues by means of the microscope; (2) the obtaining of the bacterium in pure culture; and (3) the production of the disease by inoculation with a pure culture. By means of microscopic examination more than one organism may sometimes be observed in the tissues, but one single organism by its constant presence and special relations to the tissue changes can usually be selected as the probable cause of the disease, and attempts towards its cultivation can then be made. Such microscopic examination requires the use of the finest lenses and the application of various *staining* methods. In these latter the basic aniline dyes in solution are almost exclusively used, on account of their special affinity for the bacterial protoplasm. The methods vary much in detail, though in each case the endeavour is to colour the bacteria as deeply, and the tissues as faintly, as possible. Sometimes a simple watery solution of the dye is sufficient, but very often the best result is obtained by

[1] A bacillus (*B. icteroides*) was described as the cause of yellow fever by Sanarelli in 1897, but the etiology of this disease must still (1901) be considered as *sub judice*.

increasing the staining power, *e.g.*, by addition of weak alkali, application of heat, &c., and by using some substance which acts as a mordant and tends to fix the stain to the bacteria. Excess of stain is afterwards removed from the tissues by the use of decolourizing agents, such as acids of varying strength and concentration, alcohol, &c. Different bacteria behave very differently to stains; some take them up rapidly, others slowly, some resist decolourization, others are easily decolourized. In some instances the stain can be entirely removed from the tissues, leaving the bacteria alone coloured, and the tissues can then be stained by another colour. This is the case in the methods for staining the tubercle bacillus and also in Gram's method, the essential point in which latter is the treatment with a solution of iodine before decolourizing. In Gram's method, however, only some bacteria retain the stain, while others lose it. The tissues and fluids are treated by various histological methods, but, to speak generally, examination is made either in films smeared on thin coverglasses and allowed to dry, or in thin sections cut by the microtome after suitable hardening and fixation of the tissue. In the case of any bacterium discovered, observation must be made in a long series of instances in order to determine its invariable presence.

In cultivating bacteria outside the body various media to serve as food material must be prepared and sterilized by heat. The general principle in their preparation is to supply the nutriment in a form as nearly similar as possible to that of the natural habitat of the bacterium—in the case of pathogenic bacteria, the natural fluids of the body. The media are used either in a fluid or solid condition, the latter being obtained by a process of coagulation, or by the addition of a gelatinizing agent, and are placed in glass tubes or flasks plugged with cotton-wool. To mention examples, blood serum solidified at a suitable temperature is a highly suitable medium, and various media are made with extract of meat as a basis, with the addition of gelatine or agar as solidifying agents and of non-coagulable proteids (commercial "peptone") to make up for proteids lost by coagulation in the preparation. The reaction of the media must in every case be carefully attended to, a neutral or slightly alkaline reaction being, as a rule, most suitable. The media from the store-flasks are placed in glass test-tubes or small flasks, protected from contamination by cotton-wool plugs, and are sterilized by heat. As a rule the solid media are to be preferred, since bacterial growth appears as a discrete mass and accidental contamination can be readily recognized. Cultures are made by transferring by means of a sterile platinum wire a little of the material containing the bacteria to the medium. The tubes, after being thus inoculated, are kept at suitable temperatures, usually either at 37° C., the temperature of the body, or at about 20° C., a warm summer temperature. For maintaining a constant temperature incubators with regulating apparatus are used. The simplest case is that in which only one variety of bacterium is present, and a "pure culture" may then be obtained at once. When, however, several species are present together, means must be adopted for separating them. For this purpose various methods have been devised, the most important being the *plate-method* of Koch. In this method the bacteria are distributed in a gelatine or agar medium liquefied by heat, and the medium is then poured out on sterile glass plates or in shallow glass dishes, and allowed to solidify. Each bacterium capable of growth gives rise to a colony visible to the naked eye, and, if the colonies are sufficiently apart, an inoculation can be made from any one to a tube of culture-medium and a pure culture obtained. Of course, in applying the method means must be adopted for suitably diluting the bacterial mixture.

Cultivation.

Another important method consists in inoculating an animal with some fluid containing the various bacteria. A pathogenic bacterium present may invade the body, and may be obtained in pure culture from the internal organs. This method applies especially to pathogenic bacteria whose growth on culture media is slow, *e.g.*, the tubercle bacillus.

The full description of a particular bacterium implies an account not only of its microscopical characters, but also of its growth characters in various culture media, its biological properties, and the effects produced in animals by inoculation. To demonstrate readily its action on various substances, certain media have been devised. For example, lactose and the other sugars are added to test the action of the bacterium on these substances; litmus is added to show changes in reaction, specially standardized media being used for estimating such changes; peptone solution is commonly employed for testing whether or not the bacterium forms indol; sterilized milk is used as a culture medium to determine whether or not it is curdled by the growth. Sometimes a bacterium can be readily recognized from one or two characters, but not infrequently a whole series of tests must be made before the species is determined; this is, for example, the case with members of the *bacillus coli* group.

The modes of cultivation described apply only to organisms which grow in presence of oxygen. Some, however—the strictly *anaerobic* bacteria—grow only in the absence of oxygen, hence means must be adopted for excluding this gas. It is found that if the inoculation be made deep down in a solid medium, growth of an anaerobic organism will take place, especially if the medium contains some reducing agent such as glucose. Such cultures are called "deep cultures." To obtain growth of an anaerobic organism on the surface of a medium, in using the plate method, and also for cultures in fluids, the air is displaced by an indifferent gas, usually hydrogen.

In testing the effects of bacteria by inoculation the smaller rodents, rabbits, guinea-pigs, and mice, are usually employed. One great drawback in certain cases is that such animals are not susceptible to a given bacterium, or that the disease is different in character from that in the human subject. In some cases, *e.g.*, Malta fever and relapsing fever, monkeys have been used with success, but in others, *e.g.*, leprosy, none of the lower animals have been found to be susceptible. Discretion must therefore be exercised in interpreting negative results in the lower animals. For purposes of inoculation young vigorous cultures must be used. The bacteria are mixed with some indifferent fluid, or a fluid culture is employed. The injections are made by means of a hypodermic syringe into the subcutaneous tissue, into a vein, into one of the serous sacs, or more rarely into some special part of the body. The animal, after injection, must be kept in favourable surroundings, and any resulting symptoms noted. It may die, or may be killed at any time desired, and then a post-mortem examination is made, the conditions of the organs, &c., being observed and noted. The various tissues affected are examined microscopically and cultures made from them; in this way the structural changes and the relation of bacteria to them can be determined.

Inoculation.

Though the causal relationship of a bacterium to a disease may be completely established by the methods given, another very important part of bacteriology is concerned with the poisons or toxins formed by bacteria. These toxins may become free in the culture fluid, and the living bacteria may then be got rid of by filtering through a filter of unglazed porcelain, whose pores are

sufficiently small to retain them. The passage of the fluid is readily effected by negative pressure produced by an ordinary water exhaust-pump. The effects of the filtrate are then tested by the methods used in pharmacology. In other instances the toxins are retained to a large extent within the bacteria, and in this case the dead bacteria are injected as a suspension in fluid. Sometimes, as in the preparation of Koch's new tuberculin, the bacteria are bruised in an agate mortar, so as to set free the intracellular toxins. The bacteria are usually killed by chloroform vapour or some volatile antiseptic, the agent used being afterwards got rid of by evaporation; when the toxins are comparatively resistant to heat, a suitable temperature may be used for the purpose. The study of the nature of toxins requires of course the various methods of organic chemistry. Attempts to obtain them in an absolutely pure condition have, however, failed in important cases. So that when a "toxin" is spoken of, a mixture with other organic substances is usually implied. Or the toxin may be precipitated with other organic substances, purified to a certain extent by re-solution, re-precipitation, &c., and desiccated. A "dry toxin" is thus obtained, though still in an impure condition. Toxic substances have also been separated by corresponding methods from the bodies of those who have died of certain diseases, and the action of such substances on animals is in some cases an important point in the pathology of the disease. Another auxiliary method has been applied in this department, viz., the separation of organic substances by filtration under high pressure through a colloid membrane, gelatine supported in the pores of a porcelain filter being usually employed. It has been found, for example, that a toxin may pass through such a filter while an antitoxin may not. The methods of producing immunity will be described in connexion with that subject.

Separation of toxins.

The fact that in anthrax, one of the first diseases to be fully studied, numerous bacilli are present in the blood of infected animals, gave origin to the idea that the organisms might produce their effect by using up the oxygen of the blood. Such action is now known to be quite a subsidiary matter. And although effects may sometimes be produced in a mechanical manner by bacteria plugging capillaries of important organs, *e.g.*, brain and kidneys, it may now be stated as an accepted fact that all the important results of bacteria in the tissues are due to poisonous bodies or toxins formed by them. Here, just as in the general subject of fermentation, we must inquire whether the bacteria form the substances in question directly or by means of non-living ferments or enzymes. With regard to toxin formation the following general statements may be made. In certain instances, *e.g.*, in the case of the tetanus and diphtheria bacilli, the production of soluble toxins can be readily demonstrated by filtering a culture in bouillon germ-free by means of a porcelain filter, and then injecting some of the filtrate into an animal. In this way the characteristic features of the disease can be reproduced. Such toxins being set free in the culture medium are often known as *extracellular*. In many cases, however, the filtrate, when injected, produces comparatively little effect, whilst toxic action is observed when the bacteria in a dead condition are used; this is the case with the organisms of tubercle, cholera, typhoid, and many others. The toxins are here manifestly contained within the bodies of the bacteria, *i.e.*, are *intracellular*, though they may become free on disintegration of the bacteria. The distinction between the two varieties, though convenient, must not be pushed too far, as we know little regarding their mode of formation. Although the formation of toxins with characteristic action can be demonstrated by these two methods, it must not be inferred that this can be done in every instance. On the contrary, it is highly probable that some toxins are only produced in the living tissues. We have at least examples of intense local toxic action round living bacteria, which have not yet been reproduced by means of separated toxins. Not only are the general symptoms of poisoning in bacterial disease due to toxic substances, but also the tissue changes, many of them of inflammatory nature, in the neighbourhood of the bacteria. Thus, to mention examples, diphtheria toxin produces inflammatory œdema which may be followed by necrosis; dead tubercle bacilli give rise to a tubercle-like nodule, &c. Furthermore a bacillus may give rise to more than one toxic body, either as stages in one process of change or as distinct products. Thus paralysis following diphtheria is in all probability due to a particular modification of the ordinary toxin, sometimes formed in specially large amount.

Bacteria as agents of disease.

Regarding the chemical nature of toxins less is known than regarding their physiological action. Though an enormous amount of work has been done on the subject, no important bacterial toxin has as yet been obtained in a pure condition, and, though many of them are probably of proteid nature, even this cannot be asserted with absolute certainty. Brieger, in his earlier work, found that alkaloids were formed by bacteria in a variety of conditions, and that some of them were poisonous. These alkaloids he called *ptomaines*. The methods used in the investigations were, however, open to objection, and it is now recognized that although organic bases may sometimes be formed, and may be toxic, the important toxins are not of that nature. A later research by Brieger along with Fraenkel pointed to the extracellular toxins of diphtheria, tetanus, and other diseases being of proteid nature, and various other observers have arrived at a like conclusion. The general result of such research has been to show that the toxic bodies are, like proteids, precipitable by alcohol and various salts; they are soluble in water, are somewhat easily dialysable, and are relatively unstable both to light and heat. Attempts to get a pure toxin by repeated precipitation and solution have resulted in the production of a whitish amorphous powder with highly toxic properties. Such a powder gives a proteid reaction, and is no doubt largely composed of albumoses, hence the name *toxalbumoses* has been applied. The question has, however, been raised whether the toxin is really itself a proteid, or whether it is not merely carried down with the precipitate. Recently Brieger and Boer have, by precipitation with certain salts, notably of zinc, obtained a body which is toxic but gives no reaction of any form of proteid. There is of course the possibility that the toxin is a proteid, but is in so small amount that it escapes detection. These facts show the great difficulty of the problem, which is probably insoluble by present methods of analysis; the only test, in fact, for the existence of a toxin is its physiological effect. It may also be mentioned that many toxins have now been obtained by growing the particular organism in a proteid-free medium, a fact which shows that if the toxin is a proteid it may be formed synthetically by the bacterium as well as by modification of proteid already present. With regard to the nature of intracellular toxins, there is even greater difficulty in the investigation and still less is known. Many of them, probably also of proteid nature, are much more resistant to heat; thus the intracellular toxins of the tubercle bacillus retain certain of their effects even after exposure to 100° C.

Nature of toxins.

We cannot as yet speak definitely with regard to the part played by enzymes in these toxic processes. Certain toxins resemble enzymes as regards their conditions of precipitation and relative instability, and the fact that in most cases a considerable period intervenes between the time of injection and the occurrence of symptoms has been adduced in support of the view that enzymes are present. In the case of diphtheria Sidney Martin obtained toxic albumoses in the spleen, which he considered were due to the digestive action of an enzyme formed by the bacillus in the membrane and absorbed into the circulation. According to this view, then, a part at least of the directly toxic substance is produced in the living body by enzymes present in the so-called toxin obtained from the bacterial culture. Recent researches go to show that enzymes play a greater part in fermentation by living ferments than was formerly supposed, and by analogy it is likely that they are also concerned in the processes of disease. But this has not been proved, and hitherto no enzyme has been separated from a pathogenic bacterium capable of forming, by digestive or other action, the toxic bodies from proteids outside the body.

Enzymes.

The action of toxins is little understood. It consists in all probability of disturbance, by means of the chemical affinities of the toxin, of the highly complicated molecules of living cells. This disturbance results in disintegration to a varying degree, and may produce changes visible on microscopic examination. In other cases such changes cannot be detected, and the only evidence of their occurrence may be the associated symptoms. The very important work of Ehrlich on diphtheria toxin shows that in the molecule of toxin there are at least two chief atom groups—one, the "haptophorous," by which the toxin molecule is attached to the cell protoplasm; and the other the "toxophorous," which has a ferment-like action on the living molecule, producing a disturbance which results in the toxic symptoms. On this theory, susceptibility to a toxin will imply both a chemical affinity of certain tissues for the toxin molecule and also sensitiveness to its action.

A bacterial infection when analysed is seen to be of the nature of an intoxication. There is, however, another all-important factor concerned, viz., the multiplication of the living organisms in the tissues; this is essential to, and regulates, the supply of toxins. It is important that these two essential factors should be kept clearly in view, since the means of defence against any disease may depend either upon the power of neutralizing toxins or of killing the organisms producing them. It is to be noted that there is no fixed relation between toxin production and bacterial multiplication in the body, some of the organisms most active as toxin producers having comparatively little power of invading the tissues.

Bacterial infection.

We shall now consider how bacteria may behave when they have gained entrance to the body, what effects may be produced, and what circumstances may modify the disease in any particular case. The extreme instance of bacterial invasion is found in some of the septicæmias in the lower animals, *e.g.*, anthrax septicæmia in guinea-pigs, pneumococcus septicæmia in rabbits. In such diseases the bacteria, when introduced into the subcutaneous tissue, rapidly gain entrance to the blood stream and multiply freely in it, and by means of their toxins cause symptoms of general poisoning. A widespread toxic action is indicated by the lesions found—cloudy swelling, which may be followed by fatty degeneration, in internal organs, capillary hæmorrhages, &c. In septicæmia in the human subject, often due to streptococci, the process is similar, but the organisms are found especially in the capillaries of the internal organs and may not be detectable in the peripheral circulation during life. In another class of diseases, the organisms first produce some well-marked local lesion, from which secondary extension takes place by the lymph or blood stream to other parts of the body, where corresponding lesions are formed. In this way secondary abscesses, secondary tubercle glanders and nodules, &c., result; in typhoid fever there is secondary invasion of the mesenteric glands, and clumps of bacilli are also found in internal organs, especially the spleen, though there may be little tissue change around them. In all such diseases there is seen a selective character in the distribution of the lesions, some organs being in any disease much more liable to infection than others. In still another class of diseases the bacteria flourish in some particular part of the body, and the symptoms are due to toxic absorption from it. Thus in cholera the bacteria are practically confined to the intestine, in diphtheria to the region of the false membrane, in tetanus to some wound. In the last-mentioned disease even the local multiplication depends upon the presence of other bacteria, as the tetanus bacillus has practically no power of multiplying in the healthy tissues when introduced alone.

The production of disease.

The effects produced by bacteria may be considered under the following heads: (1) tissue changes produced in the vicinity of the bacteria, either at the primary or secondary foci; (2) tissue changes produced at a distance by absorption of their toxins; (3) symptoms. The changes in the vicinity of bacteria are to be regarded partly as the *direct result* of the action of toxins on living cells, and partly as indicating a *reaction* on the part of the tissues. (Many such changes are usually grouped together under the heading of "inflammation" of varying degree—acute, subacute, and chronic.) Degeneration and necrosis of cells, hæmorrhages, serous and fibrinous exudations, leucocyte emigration, proliferation of connective tissue and other cells, may be mentioned as some of the fundamental changes. Acute inflammation of various types, suppuration, granulation tissue formation, &c., represent some of the complex resulting processes. The changes produced at a distance by distribution of toxins may be very manifold—cloudy swelling and fatty degeneration, serous effusions, capillary hæmorrhages, various degenerations of muscle, hyaline degeneration of small blood-vessels, and, in certain chronic diseases, waxy degeneration, all of which may be widespread, are examples of the effects of toxins, rapid or slow in action. Again, in certain cases the toxin has a special affinity for certain tissues. Thus in diphtheria changes both in nerve cells and nerve fibres have been found, and in tetanus minute alterations in the nucleus and protoplasm of nerve cells.

Tissue changes.

The lesions mentioned are in many instances necessarily accompanied by functional disturbances or clinical symptoms, varying according to site, and to the nature and degree of the affection. In addition, however, there occur in bacterial diseases symptoms to which the correlated structural changes have not yet been demonstrated. Amongst these the most important is fever with increased proteid metabolism, attended with disturbances of the circulatory and respiratory systems. Nervous symptoms, somnolence, coma, spasms, convulsions, and paralysis are of common occurrence. All such phenomena, however, are likewise due to the disturbance of the molecular constitution of living cells. Alterations in metabolism are found to be associated with some of these, but with others no corresponding physical change can be demonstrated. The action of toxins on various glands, producing diminished or increased functional activity, has a close analogy to that of certain drugs.

Symptoms.

The result of the entrance of a given bacterium into the tissues of an animal is not a disease with hard and fast characters, but varies greatly with circumstances. With regard to the subject of infection the chief factor is susceptibility; with regard to the bacterium virulence is all-important. Susceptibility, as is well recognized, varies much under natural conditions in different species, in different races of the same species, and amongst individuals of the same race. It also varies with the period of life, young subjects being more susceptible to certain diseases, *e.g.*, diphtheria, than adults. Further, there is the very important factor of acquired susceptibility. It has been experimentally shown that conditions such as fatigue, starvation, exposure to cold, &c., lower the general resisting powers and increase the susceptibility to bacterial infection. So also the local powers of resistance may be lowered locally by injury or depressed vitality. In this way conditions formerly believed to be the causes of disease are now recognized as playing their part in predisposing to the action of the true causal agent, viz., the bacterium. In health the blood and internal tissues are bacterium-free; after death they offer a most suitable pabulum for various bacteria; but between these two extremes lie states of varying liability to infection. The circumstances which alter the virulence of bacteria will be referred to again in connexion with immunity, but it may be stated here that, as a general rule, the virulence of an organism towards an animal is increased by sojourn in the tissues of that animal. The increase of virulence becomes especially marked when the organism is inoculated from animal to animal in series, the method of *passage*. This is chiefly to be regarded as an adaptation to surroundings, though the fact that the less virulent members of the bacterial species will be liable to be killed off also plays a part. Conversely, the virulence tends to diminish on cultivation on artificial media outside the body, especially in circumstances little favourable to growth.

Susceptibility.

By immunity is meant non-susceptibility to a given disease, or to experimental inoculation with a given bacterium or toxin. The term must be used in a relative sense, and account must always be taken of the conditions present. An animal may be readily susceptible to a disease on experimental inoculation, and yet rarely or never suffer from it naturally, because the necessary conditions of infection are not supplied in nature. That an animal possesses natural immunity can only be shown on exposing it to such conditions, this being usually most satisfactorily done in direct experiment. Further, there are various degrees of immunity, and in this connexion conditions of local or general diminished vitality play an important part in increasing the susceptibility. Animals naturally susceptible may acquire immunity, on the one hand by successfully passing through an attack of the disease, or, on the other hand, by various methods of inoculation. Two chief varieties of artificial immunity are now generally recognized, differing chiefly according to the mode of production. In the first—*active immunity*—a reaction or series of reactions is produced in the body of the animal, usually by injections of bacteria or their products. The second—*passive immunity*—is produced by the transference of a quantity of the serum of an animal actively immunized to a fresh animal; the term is applied because there is brought into play no active change in the tissues of the second animal. The methods of active immunity have been practically applied in *preventive inoculation* against disease; those of passive immunity have given us *serum therapeutics*. The chief facts with regard to each may now be stated.

Immunity.

I. *Active Immunity.*—The key to the artificial establishment of active immunity is given by the fact long established that recovery from an attack of certain infective diseases is accompanied by protection for varying periods of time against a subsequent attack. Hence follows the idea of producing a modified attack of the disease as a means of prevention—a principle which had been previously applied in inoculation against smallpox. Immunity, however, probably results from certain substances introduced into the system during the disease rather than from the disease itself; for by properly adjusted doses of the poison (in the widest sense), immunity may result without any symptoms of the disease occurring. Of the chief methods used in producing active immunity the first is by inoculation with bacteria whose virulence has been diminished, *i.e.*, with an "attenuated virus." Many of the earlier methods of attenuation were devised in the case of the anthrax bacillus, an organism which is, however, somewhat exceptional as regards the relative stability of its virulence. Many such methods consist, to speak generally, in growing the organism outside the body under somewhat unsuitable conditions, *e.g.*, at higher temperatures than the optimum, in the presence of weak antiseptics, &c. The virulence of many organisms, however, becomes diminished when they are grown on artificial media, and the diminution is sometimes accelerated by passing a current of air over the surface of the growth. Sometimes also the virulence of a bacterium for a particular kind of animal becomes lessened on passing it through the body of one of another species. Cultures of varying degree of virulence can be obtained by such methods, and immunity can be gradually increased by inoculation with vaccines of increasing virulence. The immunity may be made to reach a very high degree by ultimately using cultures of intensified virulence, this "supervirulent" character being usually attained by the method of *passage* already explained. A second method is by injection of the bacterium in the dead condition, whereby immunity against the living organism may be produced. Here manifestly the dose may be easily controlled, and may be gradually increased in successive inoculations. This method has a wide application. A third method is by injections of the separated toxins of a bacterium, the resulting immunity being not only against the toxin, but, so far as present knowledge shows, also against the living organism. It appears to be a general law that, when an animal becomes immune to the toxic products of an organism, the latter ceases to be able to flourish in its tissues. In the development of toxin-immunity the doses, small at first, are gradually increased in successive inoculations; or, as in the case of very active toxins, the initial injections are made with toxin modified by heat or by the addition of various chemical substances. Immunity of the same nature can be acquired in the same way against snake and scorpion poisons, and against certain vegetable toxins, *e.g.*, ricin, alorin, &c.

In order that the immunity may reach a high degree, either the bacterium in a very virulent state or a large dose of toxin must ultimately be used in the injections. In such cases the immunity is, to speak generally, specific, *i.e.*, applies only to the bacterium or toxin used in its production. A certain degree of non-specific immunity or increased tissue resistance may be produced locally, *e.g.*, in the peritoneum, by injections of non-pathogenic organisms, peptone, nucleic acid, and various other substances. In these cases the immunity is without specific character, and cannot be transferred to another animal. Lastly, in a few instances one organism has an antagonistic action to another; for example, the products of *B. pyocyaneus* have a certain protective action against *B. anthracis*. This method has, however, not yielded any important practical application.

II. *Passive Immunity: Anti-sera.*—The serum of an

animal actively immunized may have one of two properties —it may be antitoxic or it may be anti-bacterial. The term antitoxic signifies that the serum has the power of neutralizing the action of the toxin, as is shown by mixing them together outside the body and then injecting them into an animal. The antitoxic serum when injected previously to the toxin also confers immunity (passive) against it; when injected after the toxin it has within certain limits a curative action, though in this case its dose requires to be large. The antitoxic property is developed in a susceptible animal by successive and gradually increasing doses of the toxin. In the earlier experiments on smaller animals the potency of the toxin was modified for the first injections, but in preparing antitoxin for therapeutical purposes the toxin in its unaltered condition is used, the horse being the animal usually employed. The injections are made subcutaneously and afterwards intravenously. To obtain high antitoxic power the toxin must, at least ultimately, be a powerful one; and, while the dose must be gradually increased, care must be taken that this is not done too quickly, otherwise the antitoxic power of the serum may fall and the health of the animal suffer. The serum of the animal is tested from time to time against a known amount of toxin, *i.e.*, is standardized. The unit of antitoxin in Ehrlich's new standard is the amount requisite to antagonize the unit of toxin, *i.e.*, 100 times the minimum lethal dose to a guinea-pig of 500 grm. weight, "antagonizing" action signifying that a fatal result does not follow within five days after the injection. In the case of diphtheria the antitoxic power of the serum may reach 800 units per cubic centimetre, or even more. The laws of antitoxin production and action are not confined to bacterial toxins, but apply also to other vegetable and animal toxins, resembling them in constitution, viz., the vegetable toxalbumoses and the snake-venom group referred to above.

Antitoxic serum.

The production of antitoxin is one of the most striking facts of biological science, and two important questions with regard to it must next be considered, viz., how does the antitoxin act? and how is it formed within the body? Theoretically there are two possible modes of action: antitoxin may act by means of the cells of the body, *i.e.*, indirectly or physiologically; or it may act directly on the toxin, *i.e.*, chemically. The second view is now practically established, and, though the question cannot be fully discussed here, the chief grounds in support of a chemical action may be given. (*a*) The action of antitoxin on toxin, as tested by neutralization effects, takes place more quickly in concentrated than in weak solutions, and more quickly at a warm (within certain limits) than at a cold temperature. (*b*) Antitoxin acts more powerfully when injected along with the toxin than when injected at the same time in another part of the body; if its action were on the tissue-cells one would expect that the site of injection would be immaterial. (*c*) Antitoxic action is apparently governed by the law of simple multiples; that is, the amount of antitoxin necessary to neutralize varies directly with the amount of toxin. For example, the amount necessary to neutralize five times the lethal dose being determined, twenty times that amount will neutralize a hundred times the lethal dose. In the case of physiological antagonism of drugs this relationship does not hold. (*d*) It has been shown by Martin and Cherry, and by Kanthack and Cobbett, that in certain instances the toxin can be made to pass through a gelatine membrane, whereas the antitoxin cannot, its molecules being of larger size. If, however, toxin be mixed with antitoxin for some time, it can no longer be passed through, presumably because it has become combined with the antitoxin.

Action of antitoxin.

If this view as to the chemical relationship is correct—and none of the objections brought forward appear of a cogent nature—the antitoxin may act on the toxin in one of two ways. It may produce a disintegration of the toxin molecule, or it may combine with it to produce a body whose chemical affinities are satisfied. The latter view, strongly advocated by Ehrlich, is the more probable, as it harmonizes with the facts established with regard to toxic action and the behaviour of antitoxins. His view as to the dual composition of the toxin molecule has already been mentioned, and it is evident that if the haptophorous or combining group has its affinity satisfied by union with antitoxin, the toxin will no longer combine with living cells, and will thus be rendered harmless. One other important fact in support of what has been stated is that a toxin may have its toxic action diminished, and may still require the same amount of antitoxin as previously for neutralization. This is readily intelligible on the supposition that the toxophorous group is more labile than the haptophorous. Against the view that antitoxin combines with toxin there has been brought forward the statement, notably by Calmette, that in a neutral mixture of the two substances the toxic action reappears when exposed to a temperature sufficient to destroy the antitoxin in its free condition. This result has been questioned on the ground that the time necessary for complete combination was not taken into account, but even if the result be as stated, it is quite possible that of two complicated substances in combination the more labile may be destroyed by the same temperature as when free.

Regarding the origin of the antitoxin there has been, and still is, much discussion. There are three chief possibilities: (*a*) that the antitoxin is a modification of the toxin; (*b*) that it is a substance normally present, but produced in excess under stimulation of the toxin; (*c*) that it is an entirely new product. The first of these, which would imply a process of a very remarkable nature, is disproved by what is observed after bleeding an animal whose blood contains antitoxin. In such a case it has been shown that, without the introduction of fresh toxin, the antitoxin is partly restored, and therefore must be produced by the living tissues. The second theory is the more probable *à priori*, and if established removes the necessity for the third. It is strongly supported by Ehrlich who, in his so-called "side-chain" (*Seitenkette*) theory, explains antitoxin production as an instance of regeneration after loss. Living protoplasm, or in other words a biogen molecule, is regarded as consisting of a central atom group (*Leistungskern*), related to which are numerous secondary atom groups, or side-chains, with unsatisfied chemical affinities. The side-chains constitute the means by which other molecules are added to the living molecule, *e.g.*, in the process of nutrition. It is by means of such side-chains that toxin molecules are attached to the protoplasm, so that the living molecules are brought under the action of the toxophorous groups of the toxins. In antitoxin production this combination takes place, though not in sufficient amount to produce toxic symptoms. It is further supposed that the combination being of somewhat firm character, the side-chains thus combined are lost for the purposes of the cell and are therefore thrown off. By the introduction of fresh toxin the process is repeated, and the regeneration of side-chains is increased. Ultimately the regeneration becomes an over-regeneration, and free side-chains produced in excess are set free and appear in the blood as antitoxin molecules. In other words the substances, which when forming part of the cells fix the toxin to the cells, constitute antitoxin molecules when free in the serum. This theory,

Formation of anti-toxin.

"Side-chain" theory.

though not yet absolutely established, certainly affords the most satisfactory explanation of antitoxin production. In support of it there is the remarkable fact, discovered by Wassermann and Takaki in the case of tetanus, that there do exist in the nervous system molecules with combining affinity for the tetanus toxin. If, for example, the brain and spinal cord removed from an animal be bruised and brought into contact with tetanus toxin, a certain amount of the toxicity disappears, as shown by injecting the mixture into another animal. Further, these molecules in the nervous system present the same susceptibility to heat and other physical agencies as does tetanus antitoxin. There is therefore strong evidence that antitoxin molecules do exist as part of the living substance of nerve cells. In other diseases the evidence obtained is less definite, but in them the toxic action is less limited to a particular tissue. It has, however, been found that the serum of various animals has a certain amount of antitoxic action, and thus the basis for antitoxin production, according to Ehrlich's theory, is afforded. The theory also supplies the explanation of the power which an animal supplies of producing various antitoxins, since this depends ultimately upon susceptibility to toxic action. The explanation is thus carried back to the complicated constitution of biogen molecules in various living cells of the body.

In preparing anti-bacterial sera the lines of procedure correspond to those followed in the case of antitoxins, but the bacteria themselves in the living or dead condition are always used in the injections. Sometimes dead bacteria, living virulent bacteria, and living supervirulent bacteria, are used in succession, the object being to arrive ultimately at a high dosage, though the details vary in different instances. The serum of an animal thus actively immunized has powerful protective properties towards another animal, the amount necessary for protection being sometimes almost inconceivably small. As a rule it has no action on the corresponding toxin, *i.e.*, is not antitoxic. In addition to the protective action, such a serum may possess properties which evidence themselves by producing physical change in the bacterium in question. The first of these is the lysogenic action, which consists in the production of a change in the corresponding bacterium whereby it becomes granular, swells up, and ultimately may undergo dissolution. Pfeiffer was the first to show that this occurred when the bacterium was injected into the peritoneal cavity of the animal immunized against it, and also when a little of the serum of such an animal was injected with the bacterium into the peritoneum of a fresh, *i.e.*, non-immunized animal. Metchnikoff and Bordet subsequently devised means by which a similar change could be produced *in vitro*, and analysed the conditions necessary for its occurrence. It has been completely established that in this phenomenon of lysogenesis there are two substances concerned, one specially developed or developed in excess, and the other present in normal serum. The former (*Immunkörper* of Ehrlich, *substance sensibilisatrice* of Bordet) is the more stable, resisting a temperature of 60° C., and though giving the specific character to the reaction cannot act alone. The latter is ferment-like and much more labile than the former, being readily destroyed at 60° C. It may be added that the protective power is not lost by exposure to the temperature mentioned, this apparently depending upon the immune body. Furthermore, lysogenic action is not confined to the case of bacteria, but obtains also with other organized structures, *e.g.*, red corpuscles (Bordet, Ehrlich and Morgenroth), leucocytes and spermatozoa (Metchnikoff). That is to say, if an animal be treated with injections of these bodies, its serum acquires the power of dissolving them. Ehrlich and Morgenroth have shown in the case of red corpuscles that the immune body (specially developed) combines directly with the red corpuscles, and also effects a loose combination with the ferment-like substance, normally present, which he calls "addiment" or "complement." The development of the immune body with specific combining affinity thus presents an analogy to antitoxin production, the difference being that in lysogenesis another substance is necessary to complete the process.

Anti-bacterial serum.

Lysogenic action.

Another property which may be possessed by an anti-bacterial serum is that of agglutination. By this is meant the aggregation into clumps of the bacteria uniformly distributed in an indifferent fluid; if the bacterium is motile its movement is arrested during the process. The process is of course observed by means of the microscope, but the clumps soon settle in the fluid and ultimately form a sediment, leaving the upper part clear. This change, visible to the naked eye, is called *sedimentation*. Charrin and Roger first showed in the case of *B. pyocyaneus* that when a small quantity of the homologous serum (*i.e.*, the serum of an animal immunized against the bacterium) was added to a fluid culture of this bacillus, growth formed a sediment instead of a uniform turbidity. Gruber and Durham showed that sedimentation occurred when a small quantity of the homologous serum was added to an emulsion of the bacterium in a small test-tube, and found that this obtained in all cases where Pfeiffer's lysogenic action could be demonstrated. Shortly afterwards Widal, and also Grünbaum, showed that the serum of patients suffering from typhoid fever, even at an early stage of the disease, agglutinated the typhoid bacillus—a fact which laid the foundation of serum diagnosis. A similar phenomenon has been demonstrated in the case of Malta fever, cholera, plague, infection with *B. coli*, "meat-poisoning" due to Gärtner's bacillus, and some other diseases. As regards the mode of action of agglutinins, Gruber and Durham consider that it consists in a change in the envelopes of the bacteria, by which they swell up and become adhesive. This view has various facts in its support, but Kruse and Nicolle have found that if a bacterial culture be filtered germ-free, an agglutinating serum still produces some change in it, so that particles suspended in it become gathered into clumps. Duclaux, for this reason, considers that agglutinins are coagulative ferments. At present it is not possible to speak definitely on this question. Of more importance, however, is the relation of agglutinative to protective power. On the other hand a protective serum has not always agglutinative action, and the early appearance of the latter property in the serum, in a disease such as typhoid fever, has been considered by some to show that the two properties have no relation to one another. This conclusion is not justified, as we must suppose that the process of immunization begins to be developed at an early period in the disease, that it gradually increases, and ultimately results in cure. It is also doubtful whether a serum with high agglutinating power has been obtained without possessing protective properties at the same time. As regards resistance to heat, agglutinins cannot be separated from protective substances. It should also be stated that agglutinins are used up in the process of agglutination, apparently combining with some element of the bacterial structure. In view of all the facts it must be admitted that the agglutinins and protective bodies are the result of corresponding reactive processes, and are probably related to one another. It may be that some protective substances, but not all, are agglutinins, or it may be that the two are distinct. In the latter case they

Agglutination.

are both to be regarded as the products of a reactive process, and it is probable that the development of all antagonistic substances which confer the special character on antimicrobic sera, as well as antitoxins, will be expressed as the formation of bodies with specific combining affinity for the organic substance introduced into the system—toxin, bacterium, red corpuscle, &c., as the case may be. The bacterium, being a complex organic substance, may thus give rise to more than one antagonistic or combining substance.

Passive immunity has thus been shown to depend upon certain substances present in the serum. After, however, these substances have disappeared, as they always do in the course of time, the animal still possesses immunity (active) for a varying period. This apparently depends upon some alteration in the cells of the body, but its exact nature is not known.

The destruction of bacteria by direct cellular agency both in natural and acquired immunity must not be overlooked. The behaviour of certain cells, especially leucocytes, in infective conditions led Metchnikoff to place great importance on phagocytosis. In this process there are two factors concerned, viz., the ingestion of bacteria by the cells, and the subsequent intracellular digestion. If either of these is wanting or interfered with, phagocytosis will necessarily fail as a means of defence. As regards the former, leucocytes are guided chiefly by chemiotaxis, *i.e.*, by sensitiveness to chemical substances in their surroundings—a property which is not peculiar to them but is possessed by various unicellular organisms, including motile bacteria. When the cell moves from a less to a greater degree of concentration, *i.e.*, towards the focus of production, the chemiotaxis is termed positive; when the converse obtains, negative. This apparently purposive movement has been pointed out by Verworn to depend upon stimulation to contraction or the reverse. Metchnikoff showed that in animals immune to a given organism phagocytosis is present, whereas in susceptible animals it is deficient or absent. He also showed that the development of artificial immunity is attended by the appearance of phagocytosis; also, when an anti-serum is injected into an animal, the phagocytes which formerly were indifferent might move towards and destroy the bacteria. In the light of all the facts, however, especially those with regard to anti-bacterial sera, the presence of phagocytosis cannot be regarded as the essence of immunity, but rather the evidence of its existence. It is not sufficient to state that the leucocytes are stimulated to activity; it is necessary to explain how this is brought about. When positive chemiotaxis is brought into play by an anti-serum, it is just as likely that it is indirectly through some change produced in the bacterium by the anti-serum as by a direct stimulation of phagocytes. We think that the importance of phagocytosis as an explanation of immunity by Metchnikoff and his school has been considerably over-rated, but on the other hand that it is one valuable means of destroying bacteria. Extracellular destruction in the various conditions mentioned is, however, also an established fact. Evidence has been brought forward within recent years that the leucocytes constitute an important source of the antagonistic substances which appear in the serum. Much of such evidence possesses considerable weight, and seeing that these cells possess active digestive powers it is by no means improbable that substances with corresponding properties may be set free by them. To ascribe such powers to them exclusively is, however, not justifiable.

Phagocytosis.

We have thus endeavoured to state some of the chief facts with regard to artificial immunity. The subject has occupied a large proportion of bacteriological literature within recent years, and our endeavour has been mainly to indicate the general laws which are in process of evolution. When the facts of natural immunity are examined, we find that no single explanation is possible. Natural immunity against toxins must be taken into account, and, if Ehrlich's view with regard to toxic action be correct, this may depend upon either the absence of chemical affinity of the living molecules of the tissues for the toxic molecule, or upon insensitiveness to the action of the toxophorous group. It has been shown with regard to the former, for example, that the nervous system of the fowl, which possesses immunity against tetanus toxin, has little combining affinity for it. The non-sensitiveness of a cell to a toxic body when brought into immediate relationship cannot, however, at present be explained. Then as regards natural powers of destroying bacteria, phagocytosis aided by chemiotaxis plays a part, and it can be understood that an animal whose phagocytes are attracted by a particular bacterium will have an advantage over one in which this action is absent. The natural bactericidal power of the serum, as tested outside the body, also shows variations in different animals. Observations made on this property with respect to the anthrax bacillus at first gave the hope that variations in natural immunity could be thus explained, but further investigation showed that immunity did not vary *pari passu* with this property. It is, moreover, doubtful whether the bactericidal power of the serum in the living body is always indicated by the results obtained *in vitro*. We therefore cannot fully explain in every case the exact property or process on which the destruction of a bacterium in normal tissues depends.

Natural immunity.

AUTHORITIES.—Bacteriological literature has become so extensive that it is impossible to give here references to original articles, even the more important. A number of these, giving an account of classical researches, were translated from French and German, and published by the New Sydenham Society under the title *Micro-parasites in Disease: Selected Essays*, in 1886. The following list contains some of the more important books published within recent years:—ABBOTT. *Principles of Bacteriology*, 5th edit. London, 1899.—CROOKSHANK. *Bacteriology and Infective Diseases* (with bibliography), 4th edit. London, 1896.—DUCLAUX. *Traité de microbiologie*, vols. i. and ii. Paris, 1899.—FLÜGGE. *Die Mikroorganismen*, 3rd edit. Leipzig, 1896.—FISCHER. *Vorlesungen über Bakterien*. Jena, 1897.—GÜNTHER. *Einführung in das Studium der Bakteriologie*, 4th edit. Leipzig, 1893.—HEIM. *Lehrbuch der bacteriologischen Untersuchung und Diagnostik*. Stuttgart, 1894.—HEWLETT. *Manual of Bacteriology*. London, 1898.—HUEPPE. *Principles of Bacteriology* (translation). London, 1899.—KANTHACK and DRYSDALE. *Practical Bacteriology*. London, 1895.—KLEIN. *Micro-organisms and Disease*, 3rd edit. London, 1896.—LÖFFLER. *Vorlesungen über die geschichtliche Entwickelung der Lehre von der Bacterien*. Leipzig, 1887.—M'FARLAND. *Text-book upon the Pathogenic Bacteria*. London, 1896.—MUIR and RITCHIE. *Manual of Bacteriology* (with bibliography), 2nd edit. Edin. and London, 1899.—STERNBERG.—*Manual of Bacteriology* (with full bibliography), 2nd edit. New York, 1896.—THOINOT et MASSELIN. *Précis de Microbie*, 3rd edit. Paris, 1896.—WURTZ. *Précis de bactériologie clinique*. Paris, 1895.—WOODHEAD. *Bacteria and their Products* (with bibliography). London, 1891. The bacteriology of the infective diseases (with bibliography) is fully given in the *System of Medicine*, edited by CLIFFORD ALLBUTT. London, 1896-1900. For references consult *Centralbl. für Bakter. u. Parasitenk.* Jena, a "General Register" of which down to June 1899 (vols. i.-xxv.) has been published; also *Index Medicus*. (R. M*.)

Bacup, a municipal borough (1882) in the Rossendale parliamentary division of Lancashire, England, on the Irwell, 20 miles N. of Manchester by rail. A borough police force has been organized (1887), and a borough fire brigade constituted out of its members. An Established church has been rebuilt and a theatre erected, whilst in 1893 commodious public baths and a well-arranged recreation ground were presented to the town by Mr J. H.

Maden, M.P. Cotton spinning and power-loom weaving are the chief of the numerous manufacturing industries carried on. The principle of co-operation is strongly developed; a handsome store costing over £22,000 contains among other departments a free library for members, with upwards of 12,000 volumes. Area, 6083 acres; population (1881), 25,034; (1891), 23,498; (1901), 22,503.

Badajoz, a frontier province in the south-west of Spain, the largest of the whole kingdom with an area of 8688 square miles, only 2,850,000 acres of which are cultivated. The population grew from 475,183 in 1887 to 490,551 in 1897. The province is divided into 15 administrative districts and 162 parishes. In the north-east, south-east, and south, there are some hilly regions, but the greater part is flat or slightly undulating, and in many districts looks like a dreary steppe, with sparse vegetation that affords very meagre pasture for the numerous flocks. Comparatively little rain falls in average years, and barely 13,000 acres are properly irrigated, whilst 1,900,000 acres are devoted to pasture or covered with very thin bush and forest. The Guadiana, which flows through the north of the province, and its tributaries, have any considerable volume of water in their beds only at certain seasons of the year, and the Guadiana is often fordable in many parts of its course. Badajoz has more live stock than any other province—in all 1,302,754 head. This figure includes 10,705 horses, 33,471 mules, 38,273 asses, 35,057 cattle, 940,444 sheep, 108,354 goats, and 136,450 pigs, which supply famous hams, &c. 336,285 acres are devoted to the culture of wheat, 258,812 to oats, barley, rye; 86,437 to pod fruit; 88,942 to olive plantations, and 46,012 to vineyards. One copper and 24 lead mines are now at work, while no less than 575 are registered as unproductive. This stagnation of the mining interests is chiefly due to the lack of means of communication, though some impulse has been given of late years to the mining railways by a company that is working several concessions; another company has endeavoured to lease several good lead mines, and has bought others near the central Badajoz railway. The mines will certainly attract more notice when several local lines are completed. Among those at present unproductive are 345 lead, 170 iron, 27 copper, and 12 quicksilver, all duly registered. The local industries are not of much importance: manufactures of woollen and cotton stuffs of a coarse description, soaps, oil, cork, and leather. The purely commercial interests are more important than the industrial, because of the transit trade to and from Portugal through no less than seven custom-houses. The climate shows great extremes of heat in summer and of cold in winter, when fierce north and north-west winds blow across the plains. In the hot months intermittent fevers are prevalent in the Guadiana valley. There are 275 miles of railways in the province, the principal being 133 miles of the main line from Madrid to Lisbon, 78 of the Merida-Seville line, and 38 of the Huelva-Zafra. The roads, state and parish, are in bad condition, and totally insufficient. Very few inhabitants emigrate from this province, where the birth-rate considerably exceeds the death-rate. Education, even primary, is in a very backward condition, not 33 per cent. of the children between four and fourteen years of age being sent to school. BADAJOZ, the capital of the province, is situated near the Portuguese frontier, 310 miles south-west of Madrid by rail. Population (1897), 29,006. It is still the centre of an active trade with Portugal, but the local industries have declined considerably. A serious military and republican rising took place in August 1883, but the movement found no response among the majority of the inhabitants of the town or in the rest of Spain, and completely failed. (A. E. H.)

Badakshan.—The Afghan province of Badakshan requires new definition since the boundary agreement of 1893 limited Afghan territory to the left bank of the Oxus. Much of the interior of the province is still unexplored. On the west, Badakshan is bounded by a line which crosses the Turkestan plains southwards from the junction of the Kunduz and Oxus rivers till it touches the eastern water-divide of the Tashkurghan river (here called the Koh-i-Chungar), and then runs south-east, crossing the Sarkhab affluent of the Kunduz, till it strikes the Hindu Kush. The southern boundary is carried along the crest of the Hindu Kush as far as the Khawak pass, leading from Badakshan into the Panjshir valley. Beyond this it is indefinite. It is known that the Kafir occupy the west of the Hindu Kush eastwards of the Khawak, but how far they extend north of the main watershed is not ascertainable. The southern limits of Badakshan become definite again at the Dorah pass. The Dorah connects Zebak and Ishkashim at the elbow, or bend, of the Oxus with the Lutku valley leading to Chitral. From the Dorah eastwards the crest of the Hindu Kush again becomes the boundary till it effects a junction with the Muztagh and Sarikol ranges, which shut off China from Russia and India. Skirting round the head of the Tagdumbash Pamir, it finally merges into the lately-defined Pamir boundary, and turns westwards, following the course of the Oxus, to the junction of that river and the Kunduz. So far as the northern boundary follows the Oxus stream, under the northern slopes of the Hindu Kush, it is only separated by the length of these slopes (some 8 or 10 miles) from the southern boundary along the crest. Thus Badakshan (in which we include Wakhan) reaches out an arm into the Pamirs eastwards—bottle-shaped—narrow at the neck (represented by the northern slopes of the Hindu Kush), and swelling out eastwards so as to include a part of the great and little Pamirs (see AFGHANISTAN). Before the boundary settlement of 1893 the small states of Roshan and Shignan extended to the left bank of the Oxus, and the province of Darwaz, on the other hand, extended to the right bank. Now, however, the Darwaz extension northwards is exchanged for the Russian Pamir extension westwards, and the river throughout is the boundary between Russian and Afghan territory; the political boundaries of those provinces being no longer coincident with their geographical limits.

Subdivisions.—The following are the chief provincial subdivisions of Badakshan, omitting Roshan and Shignan:—On the west Rustak, Kataghan, Ghori, Narin, and Anderab; on the north Darwaz, Ragh, and Shiwa; on the east Charan, Ishkashim, Zebak, and Wakhan; and in the centre Faizabad, Farkhar, Minjan, and Kishm. There are others, but nothing certain is known about these minor subdivisions.

Physiography.—The conformation of the mountain districts, which comprise all the southern districts of Badakshan and the northern hills and valleys of Kafiristan, is undoubtedly analogous to that of the rest of the Hindu Kush westwards. The water-divide of the Hindu Kush from the Dorah to the Khawak pass, *i.e.* through the centre of Kafiristan, has never been accurately traced; but its topographical conformation is evidently a continuation of that which has been observed in the districts of Badakshan to the west of the Khawak. The Hindu Kush represents the southern edge of a great central upheaval or plateau. It breaks up into long spurs southwards, deep amongst which are hidden the valleys of Kafiristan, almost isolated from each other by the rugged and snow-capped altitudes which divide them. To the north the plateau gradually slopes away towards the Oxus, falling from an average altitude of 15,000 feet to 4000 feet about Faizabad, in the centre of Badakshan, but tailing off to 1100 at Kunduz, in Kataghan, where it merges into the flat plains bordering the Oxus.

Rivers and Roads.—The Kokcha river traverses Badakshan from south-east to north-west, and, with the Kunduz, drains all the northern slopes of the Hindu Kush west of the Dorah pass. Some of its sources are near Zebak, close to the great bend of the Oxus

northwards, so that it cuts off all the mountainous area included within that bend from the rest of Badakshan. Its chief affluent is the Minjan, which Robertson found to be a considerable stream where it approaches the Hindu Kush close under the Dorah. Like the Kunduz, it probably drains the northern slopes of the Hindu Kush by deep lateral valleys, more or less parallel to the crest, reaching westwards towards the Khawak pass. From the Oxus (1000 ft.) to Faizabad (4000 ft.) and Zebak (8500 ft.) the course of the Kokcha offers a high road across Badakshan; between Zebak and Ishkashim, at the Oxus bend, there is but an insignificant pass of 9500 ft.; and from Ishkashim by the Panja, through the Pamirs, is the continuation of what must once have been a much-traversed trade route connecting Afghan Turkestan with Kashgar and China. It is undoubtedly one of the great continental high roads of Asia. North of the Kokha, within the Oxus bend, is the mountainous district of Darwaz, of which the physiography belongs rather to the Pamir type than to that at the Hindu Kush.

A very remarkable meridional range extends for 100 miles northwards from the Hindu Kush (it is across this range that the route from Zebak to Ishkashim lies), which determines the great bend of the Oxus river northwards from Ishkashim, and narrows the valley of that river into the formation of a trough as far as the next bend westwards at Kila Wamar. The western slopes of this range drain to the Oxus either north-westwards, by the Kokcha and the Ragh, or else they twist their streams into the Shiva, which runs due north across Darwaz. Here again we find the main routes which traverse the country following the rivers closely. The valleys are narrow, but fertile and populous. The mountains are rugged and difficult; but there is much of the world-famous beauty of scenery, and of the almost phenomenal agricultural wealth of the valleys of Bokhara and Ferghana to be found in the as yet half-explored recesses of Badakshan. The people of the country are Tajak, dominated by Afghans.

There are no recent works on Badakshan and Darwaz which can be considered authoritative. The foregoing is compiled from unpublished notes of the Russo-Afghan and Pamir boundary surveys by the author. (T. H. H.*)

Badalona, a town and railway station of Spain, in province and diocese of Barcelona, situated in a plain, near the left bank of the river Besos. Woollen, cotton goods, glass, biscuits, sugar, and brandy are manufactured. The country around is fertile, and produces abundantly cereals, wine, oranges, and fruit of all kinds. Population, 18,165.

Baden, a grand duchy of the German empire, with an area of 5821 square miles, and population (1885) 1,601,255, (1895) 1,725,464, of whom 847,281 were males and 878,183 females. The density in 1895 was 296 inhabitants to the square mile; and of the total population over 45 per cent. were urban (*i.e.*, lived in places above 2000 inhabitants each), and nearly 55 per cent. rural. At the same date 1,057,075 confessed the Roman Catholic faith, 637,946 were Evangelical Protestants, and there were 25,903 Jews. Of the total area, 57·2 per cent. is under cultivation and 37·5 per cent. under forests. Of the total number of farms 223,631, or 94·7 per cent., were less than 25 acres, 12,411 were between 25 and 250 acres, and only 117 exceeded 250 acres. The crops most extensively cultivated are hay, potatoes, barley, oats, spelt, rye, maize, wheat, and beetroot. In 1898 42,400 acres were planted with the vine, and the yield was 5,316,500 gallons of wine, valued at £460,000. Tobacco was planted on 21,700 acres (17,860 acres in 1898), and the yield was 20,000 tons, valued at £822,000. In the same year the live stock consisted of 650,885 cattle, 411,253 pigs, 81,821 sheep, and 71,515 horses. In 1897 the breweries produced 60,306,450 gallons of beer, and in 1898 the distilleries 945,560 gallons of pure alcohol. The total length of railways in 1898 was 1080 miles, of which 992 belonged to the state; and from them was derived (1897) a revenue of £1,067,500. In 1897 there were 173,794 hands employed in the various industries. In addition to the two universities (Heidelberg and Freiburg), and the polytechnic at Carlsruhe, there are over 220 technical, agricultural, and other special schools, 60 middle schools (classical and modern), and over 1600 elementary schools. In 1900 the revenue and expenditure balanced at £4,125,300. The contribution to the imperial exchequer was fixed at £872,930 in 1900. The public debt, which has been incurred entirely for the construction of the railways, amounted in 1900 to £16,668,400.

Baden, or BADEN-BADEN, a town and watering-place of the grand-duchy of Baden, Germany, in the Black Forest, 23 miles S. by W. from Carlsruhe by rail. There are two chief bath establishments, the Frederick Baths (Renaissance building, 1869-77) and the Empress Augusta Baths (Renaissance, 1891-92), the former used by men only in summer, and by both sexes in winter, the latter used by women only in summer, and closed in winter. Almost every conceivable variety of bath can be had in both. The number of visitors exceeds 60,000 annually. Baden possesses a technical school. Population (1885), 12,779; (1895), 14,862.

Baden, or BADEN BEI WIEN, chief town of a government-district, and principal thermal springs and summer resort in Lower Austria, situated in the Schwechat valley, about 12 miles from Vienna. Population (1890), 11,263, or with Wiekersdorf, 15,776; (1900), 12,447, Wiekersdorf, 5287, all German and mostly Catholic (estimated to have 5 per cent. Jewish and 2 per cent. Protestant). It has now numerous educational institutions, new bathing establishments, fifteen in all, a town museum, new park and *kurhaus*, a summer theatre. There are about 20,000 visitors annually, including several members of the Austrian imperial family.

Badenweiler, a small village and watering-place of the grand-duchy of Baden, Germany, 28 miles N. by E. by rail from Basel, at the western edge of the Black Forest. Its new parish (Evangelical) church (1897) is built at the foot of the 11th-century castle (destroyed by the French in 1688) which belonged to the margraves of Baden. The place is visited by 5000 people annually, partly for its warm mineral springs (70°), partly for its whey cure, partly for its equable climate and picturesque surroundings. There are a *kurhaus*, built in 1853, and a park of 15 acres (1825 and 1865); also a grand-ducal castle, refitted in 1887-88. In 1784 well-preserved Roman baths were discovered here. The permanent population is about 600.

Badulla, the capital of the province of Uva, Ceylon, 54 miles S.E. of Kandy. It is the seat of a government agent and district judge, besides minor courts. It was in Kandyan times the home of a prince who ruled Uva as a principality. Badulla stands 2222 feet above sea-level; the average annual rainfall is 79½ inches; the average temperature 73°. The population of the town in 1901 was about 5600; of the Badulla district, 188,964. There is a botanic garden; and the town, being almost encircled by a river—the Badullaeya—and overshadowed by the Naminacooly Kande range of mountains (highest peak 6680 feet), is very picturesquely situated. The railway terminus at Bandarawella is 18 miles from Badulla, but there is a prospect of a tramway connexion. Tea is cultivated by the planters, and rice, fruit, and vegetables by the natives in the district.

Baer, Karl Ernst von (1792-1876), German biologist and founder of the science of comparative embryology, was born at Piep in Esthonia on the 29th February 1792. His father, a small landowner, sent him to school at Revel, which he left in his eighteenth year to study medicine at Dorpat University. Burdach's lectures suggested research in the wider field of life-history, and as at that time Germany offered quicker facilities for, and greater encouragement to, scientific work, von Baer went to Würzburg, where

the distinguished physiologist Döllinger, father of the famous Catholic theologian, was professor. In teaching von Baer comparative anatomy, Döllinger gave a direction to his studies which secured his future pre-eminence in the science of organic development. He collaborated with Pander in researches on the evolution of the chick, the results of which were first published in Burdach's treatise on physiology. Continuing his investigations alone, von Baer extended them to the evolution of organisms generally, and after a sojourn at Berlin he was invited by his old teacher Burdach, who had become professor of Anatomy at Königsberg, to join him as prosector and chief of the new Zoological Museum. Von Baer's great discovery of the human ovum is the subject of his *Epistola de Ovo Mammalium et Hominis Genesi* (Leipzig, 1827), and in the following year he published the first part of his *History of the Evolution of Animals* (*Ueber Entwickelungsgeschichte der Thiere*), which Haeckel says "even now is generally and rightly considered the most important and most valuable contribution to embryological literature." Until von Baer's discovery (for Wolff's cognate theory of epigenesis, promulgated seventy years earlier, had secured no adherents) it was believed that every egg contained, encysted as it were, the complete animal in miniature. On the logical assumption that the "animalculist" theory, as it was nicknamed, involved the existence of the preformed body in all ova, Haller made the ingenious calculation that the germs of two hundred billions of men were packed in the ovary of Eve! The "ovist" gave this fantastic speculation its quietus. Von Baer demonstrated, first, that the Graafian follicles (so named after their discoverer) in the ovary are not the actual eggs, but that they contain the spherical vesicle, which is the true ovum, a body about the $\frac{1}{120}$th of an inch in diameter, wherein, so great is the marvel of heredity, lie the properties transmitting the physical and mental characteristics of the parent or grandparent, or even of more remote ancestors. He next showed that in all vertebrates the primary stage of cleavage of the fertilized egg is followed by modification into leaf-like germ layers—skin, muscular, vascular, and mucous—whence arise by subtle differentiation the several organs of the body. He further discovered the gelatinous, cylindrical cord, known as the *chorda dorsalis*, which passes along the body of the embryo of vertebrates, in the lower types of which it is limited to the entire inner skeleton, while in the higher the backbone and skull are developed round it. His "law" of corresponding stages in the development of vertebrate embryos had example in the fact recorded by him concerning certain specimens preserved in spirit which he had omitted to label. "I am quite unable to say to what class they belong. They may be lizards, or small birds, or very young mammalia, so complete is the similarity in the mode of formation of the head and trunk in these animals. The extremities are still absent, but even if they had existed in the earliest stage of the development we should learn nothing, because all arise from the same fundamental form." And in his *History of Evolution* he suggests, "Are not all animals in the beginning of their development essentially alike, and is there not a primary form common to all?" (i. 223). Notwithstanding this, the "telic" idea, with the archetypal theory which it involved, possessed von Baer to the end of his life, and explains his inability to accept the theory of unbroken descent with modification when it was propounded by Darwin and Wallace in 1858. The influence of von Baer's discoveries has been far-reaching and abiding. Not only is he the pioneer in that branch of biological science to which Francis Balfour, gathering up the labours of many fellow-workers, gave coherence in his *Comparative Embryology* (1881); the impetus to Huxley's researches in the structure of the medusæ came from him (*Life*, i. 163); and Herbert Spencer found in von Baer's "law of development" the "law of all development" (*Essays*, i. 30). In 1834 von Baer was appointed librarian of the Academy of Sciences of St Petersburg. In 1835 he published his *Development of Fishes*, and as the result of collection of all available information concerning the fauna and flora of the Polar regions of the empire, he was appointed leader of an Arctic expedition in 1837. The remainder of his active life was occupied in divers fields of research, geological as well as biological, an outcome of the latter being his fine monograph on the fishes of the Baltic and Caspian Seas. One of the last works from his prolific pen was an interesting autobiography published at the expense of the Esthonian nobles on the celebration of the jubilee of his doctorate in 1864. Three years afterwards he received the Copley medal. He died at Dorpat on 28th November 1876. (E. Cl.)

Baeyer, Johann Friedrich Wilhelm Adolph (1835-——), German chemist, was born at Berlin, 31st October 1835. He studied chemistry under Bunsen and Kekulé, and in 1858 took his degree as Ph.D. at Berlin, becoming privat-docent a few years afterwards, and assistant professor in 1866. Five years later he was appointed professor of chemistry at Strasburg, and in 1873 he migrated in the same capacity to Munich. He has devoted himself mainly to investigations in organic chemistry, and in particular to synthetical studies by the aid of "condensation" reactions. The Royal Society of London awarded him the Davy medal in 1881 for his researches on indigo, the nature and composition of which he has done more to elucidate than any other single chemist, and which he has also succeeded in preparing artificially, though his methods have not been found commercially practicable. The "centric" view of the constitution of the benzene ring supported by him, and others of his contributions to chemical theory, are discussed in the article Chemistry.

Baffin, a barren insular tract in Franklin district, Canada, with an approximate area of 230,000 square miles, situated between 61° and 90° W. long. and 62° and 74° N. lat. The eastern and northern coasts are rocky and mountainous, and are deeply indented by large bays including Frobisher and Home Bays, Cumberland Sound and Admiralty Inlet. It is separated from Greenland by Baffin Bay and Davis Strait, from Ungava by Hudson Strait, from Keewatin and Melville Peninsula by Fox Channel and Fury-and-Hecla Strait, from Boothia Peninsula and North Somerset by the Gulf of Boothia and Prince Regent Inlet, and from North Devon by Lancaster Sound. The north-western portion is called Cockburn Land; the south-western, Fox Land; and the eastern, Cumberland Land.

Bagehot, Walter (1826-1877), English publicist and economist, editor of the *Economist* newspaper from 1858-60 to his death, was born at Langport, Somerset, 3rd February 1826, his father being a banker at that place. Bagehot was altogether a remarkable personality, his writings on different subjects exhibiting the same bent of mind and characteristics,—philosophic reflectiveness, practical common-sense, a bright and buoyant humour, brilliant wit, and always a calm and tolerant judgment of men and things. Though he belonged to the Liberal party in politics he was essentially of conservative disposition, and often spoke with sarcastic boastfulness to his Liberal friends of the stupidity and tenacity of the English mind in adhering to old ways, as displayed in city and country alike. His life was comparatively

uneventful, as he early gave up to literature the energies which might have gained him a large fortune in business or a great position in the political world. To write books, he remarked to the present writer not long before he died, a man must give up a good deal; and, as a man of letters, there is no doubt he made the sacrifice for himself willingly and cheerfully, following his true bent without turning to right or left. He took his degree at the London University in 1848, and was called to the bar in 1852, but from an early date he joined his father in the banking business of Stuckey & Co. in the West of England, and during a great part of his life, while he was editor of the *Economist*, he managed the London agency of the bank, lending its surplus money in "Lombard Street," and otherwise attending to its London affairs. He became also an underwriter at Lloyd's, taking no part, however, in the active detailed business, which was done for him by proxy.

Bagehot's connexion with the *Economist* began in 1858, about which time he married a daughter of the first editor, the Right Honourable James Wilson, at that time Secretary of the Treasury, and afterwards finance minister in India. Partly through this connexion he was brought into the inside of the political life of the time. He was an intimate friend of Sir George Cornewall Lewis, and was afterwards in constant communication with other political chiefs, especially with Mr Gladstone, Mr Lowe, and Mr Grant Duff, and with the permanent heads of the great departments of state. In the City in the same way he was intimate with the governor and directors of the Bank of England, and with leading magnates in the banking and commercial world, such as Mr Bertram Currie of Glyn's, Mr Wade of the National Provincial Bank, Mr William Fowler of Alexanders', afterwards of the National Discount Company, and Mr Newmarch; while his connexion with the Political Economy Club brought him into contact in another way with both City and politics. His active life in business and politics, however, was not of so absorbing a kind as to prevent his real devotion to literature, but the literature largely grew out of his activities, and of no one can it be said more truly than of Bagehot that the atmosphere in which he lived gave tone and colour and direction to his studies, one thing of course acting and reacting on another. The special note of his books, apart from his remarkable gift of conversational epigrammatic style, which gives a peculiar zest to the writing, was the quality of scientific dispassionate description of matters which were hardly thought of previously as subjects of scientific study. This is specially the case with the two books which perhaps brought him the most reputation, *The English Constitution* (1867) and *Lombard Street* (1873). They are both books of observation and description. The English Constitution is described, not from law books and as a lawyer would describe it, but from the actual working, as Bagehot himself had witnessed it, in his contact with ministers and the heads of Government departments, and with the life of the society in which the politicians moved. The true springs and method of action are consequently described with a vivid freshness which gives the book a wonderful charm, and makes it really a new departure in the study of politics. It is the same with *Lombard Street*. The money market is there pictured as it really was in 1850-70, and as Bagehot saw it with philosophic eyes. Beginning with the sentence, "The objects which you see in Lombard Street are the Bank of England, the joint stock banks, the private banks, and the discount houses," he describes briefly and clearly the respective functions of these different bodies in the organism of the City, according to his own close observation as a banker himself, knowing the ways and thoughts of the men he describes, and as a man of business likewise in other ways, knowing at first hand the relation of banking to the trade and commerce of the country. *Lombard Street* is perhaps a riper work than *The English Constitution*, as its foundation was really laid in 1858 in a series of articles which Bagehot then wrote in the *Economist*, though it was not published till the early 'seventies, after it had been twice rewritten and revised with infinite labour and care. *Lombard Street*, like *The English Constitution* in political studies, is thus a new departure in economic and financial studies, applying the same sort of keen observation which Adam Smith used in the analysis of business generally to the special business of banking and finance in the complex modern world. It is, perhaps, not going too far to say that the whole theory of a one-reserve system of banking and how to work it, and of the practical means of fixing an "apprehension minimum" below which the reserve should not fall, originated in *Lombard Street* and the articles which were the foundation of it; and the subsequent conduct of banking in England and throughout the world has been infinitely better and safer in consequence. A like note is also struck in *Physics and Politics* (1869), which is a description of the evolution of communities of men. The materials here are derived mainly from books, the surface to be observed being so extensive, but the attitude is precisely the same, that of a scientific observer. To a certain extent the *Physics and Politics* had even a more remarkable influence on opinion, at least on foreign opinion, than *The English Constitution* or *Lombard Street*. It "caught on" as a development of the theory of evolution in a new direction, and Darwin himself was greatly interested, while one of the pleasures of Bagehot's later years was to receive a translation of the book into the Russian language. In *Literary Studies* (1879) and *Economic Studies* (1880), published after his death, there is more scope than in the books already mentioned for other characteristics besides those of the scientific observer, but observation always comes to the front, as in the account of Ricardo, whom Bagehot describes as often, when he is most theoretical, really describing what a first-rate man of business would do and think in actual transactions. The observation, of course, is that of a type of business man in the City to which Ricardo as well as Bagehot belonged, though Ricardo could hardly look at it from the outside as Bagehot was able to do.

Bagehot had great City, political, and literary influence, to which all his activities contributed, and much of his influence was lasting. In politics and economics especially his habit of scientific observation affected the tone of discussion, and both the English Constitution and the Money Market have been better understood generally because he wrote and talked and diffused his ideas in every possible way. He was unsuccessful in two or three attempts to enter Parliament, but he had the influence of far more than an ordinary member, as director of the *Economist* and as the adviser behind the scenes of the Ministers and permanent heads of departments who consulted him. His death, on the 24th of March 1877, occurred at Langport very suddenly, when he was in the fullest mental vigour, and might have looked forward to the accomplishment of much additional work and the exercise of even wider influence.

It is impossible to give a full idea of the brightness and life of Bagehot's conversation, although the conversational style of his writing may help those who did not know him personally to understand it. With winged words he would transfix a fallacy or stamp a true idea so that it could not be forgotten. He was certainly greater than his books and always full of ideas. The present writer recalls two notions he had, not for writing new books

himself, but as something that might be done. One was that there might be a history of recent politics with new lights if some one were to do it who knew the family connexions and history of English politicians. This was *apropos* of the passage of a certain Bill through Parliament, when the head of the department in the House of Commons failed and the management of the measure was taken by the Chancellor of the Exchequer himself, a relative of the permanent head of the department concerned, who was thus able to carry his own ideas in legislation notwithstanding the failure of his political chief. Another book he wished to see written was an account of the differences in the administrative systems of England and Scotland, by which he had been greatly impressed, the differences not being in detail, but in fundamental idea and in form, so that no judicial or other officers in the one were represented in the other by corresponding functionaries. Many other illustrations might be given of his fulness of ideas which helped to make him an ideal editor. Reference must also be made to the assistance which Bagehot gave as a journalist to the study of statistics. From the manipulation of figures he was most averse, and he rather boasted that he was unable to add up. But he was a most excellent mathematician, and no one could be so careful as he was about the logic of the figures got together for his articles, which he always most carefully scrutinized. He would frequently point out that his figures were illustrative merely, and did not by themselves establish an argument. He was always anxious, again, to impress on those about him that a subject could not be studied with the help of figures and accounts alone. Whether it was insurance, or banking, or underwriting, or shipowning, he insisted that some one who knew the business should see the writing before it was published. Knowing so many departments of business from actual experience, he was a host in himself as referee, but when in doubt he would always consult some one who knew the facts; and he used his great influence so well that in subsequent years it inspired indirectly not a few who were hardly aware of his claims to be a statistician at all. (R. GN.)

Baghdad, (1) a viláyet of Asiatic Turkey, situated between Persia and the Syrian desert, and including the greater part of ancient Babylonia. The original viláyet extended from Mardin on the north to Basra on the south, but in 1878 it was reduced in size by the creation of the Mosul viláyet out of its northern sanjaks, and again in 1884 by that of the Basra viláyet out of its southern sanjaks. Baghdad is still one of the largest and most important provinces of the empire, and includes some of the most fertile lands in the valleys of the Euphrates and Tigris. The climate is very hot in summer, mean temperature 97° F., but generally healthy. In November heavy rains commence, and during the winter the thermometer falls to 46° F. There are springs of bitumen, locally called *kara sakiz*, "black mastic," of naphtha, and of white petroleum in the province. Population, 852,000 (Moslems, 790,000, including 481,000 Shiás; Christians, 8000; Jews, 54,000). (2) The capital of the viláyet, and headquarters of the army corps which garrisons the Baghdad, Mosul, and Basra viláyets, situated in a fertile but arid plain on both banks of the Tigris. Eastern Baghdad, on the left bank, is the larger and more modern city, and contains the principal buildings, bazárs, &c. A bridge of boats connects it with "Old Baghdad," a suburb chiefly occupied by Shiás, on the right bank. Here stood the "Round City" founded by Mansúr in A.D. 762, with its three concentric walls, enclosing as a central point the palace and mosque of the Khalif, and its four equi-distant gates. Of this city no trace remains; walls and houses have been destroyed by civil war and fire, or have been swept away by inundations.

The exact position of Mansúr's palace is unknown, but it seems certain that the tomb of Zobeide was near the river at Kazimín and not where now shown. Eastern Baghdad has no distinctive architectural character. Little remains of the great buildings of the khalifs, and there is nothing imposing in the barracks, bazárs, khans, and narrow winding streets. The old city walls of brick have been demolished except in a few places; but the great fosse remains, and a line of mounds marks the position of the glacis. Baghdad is unrivalled for position and fertility of soil, and under better government would regain its former prosperity. Many improvements were introduced by Midhat Pasha. Barracks and schools were built, a tram-way was laid down to the Shiá shrines at Kazimín, trade was encouraged, and the nomads were brought under control. But no effort has been made to restore the old system of canalization which made the country between the Euphrates and Tigris a continuous garden. A Turkish and an English company run steamers from Baghdad to Basra, but the state of the Tigris has become a source of anxiety. No steps are taken to stop the outflow of water to the desert and the marshes, and the main channel becomes almost unnavigable during August and September. Above Baghdad sailing vessels of about 30 tons are employed. The exports and imports pass chiefly through Basra. Population, according to Cuinet, 145,000, but this is probably an exaggeration. Baghdad is the seat of a British consul-general.

G. LE STRANGE. "Description of Mesopotamia and Baghdad about A.D. 900; and Greek Embassy to Baghdad in A.D. 917," in *Journal Royal Asiatic Society*, 1895, 1897; *Baghdad under the Abbasid Caliphate*, 1901. (C. W. W.)

Baghelkhand, or BHAGELKHAND, a tract of country in Central India, lying between the North-West and the Central Provinces, east of Bundelkhand. It takes its name from the Baghel clan of Rajputs, now represented by the Maharaja of Rewa. Politically, it consists of five native states under the Baghelkhand agency, of which Rewa is by far the most important. The total area is 11,324 square miles. Population (1891), 1,737,095, being an average of 153 persons per square mile; (1901), 1,554,577, showing a decrease of 11 per cent., due to the effects of famine. The country is for the most part hilly, and the soil is poor.

Bagheria, or BAGARIA, a decaying town of the province of Palermo, Sicily, 8 miles by rail E. by S. from Palermo. It contains palaces of Sicilian magnates, and has manufactures of macaroni, preserved food, olive oil, and casks. Under the Bourbon kings (first half of 19th century) it was a favourite seaside resort. Population, about 11,600.

Bagirmi. See CHAD, LAKE.

Bagnara, a town of the province of Reggio, Calabria, Italy, 20 miles N. by E. from Reggio by rail. It was founded by Robert Guiscard in the 11th century, but suffered severely from the earthquake of 1783. It has tunny and swordfish fishing. Population, about 10,000.

Bagnolet, a town in the arrondissement of Saint-Denis, department of Seine, France, ½ mile E. of the outer circle of Paris. Market gardening is extensively carried on, and the manufacture of billiard balls, perfumery, fancy soaps, and glue are the principal industries. Population, 7100.

Bago, a town of 16,000 inhabitants on the eastern coast of Cebu, Philippine Islands, near its northern extremity. The climate is hot, but healthful. The surrounding country is fertile, producing rice, cacao, and hemp in abundance. Sinamay and guinara cloths are woven and exported to a limited extent. The fisheries are of considerable local importance. The language is Cebu-Visayan.

Bahamas, or LUCAYOS, an extensive archipelago of the British West Indies, which recent surveys (1870-90) show to consist of 12 large islands, 661 islets or cays

(keys) as they are called, and 2387 banks, reefs, and rocks above the surface of the water, all but thirty uninhabited. They all rise on the margin of large coral banks, and are themselves exclusively of coralline formation, with a mean elevation of 100 feet, but rising here and there to 300 or even 400 feet above the sea. They are disposed in the direction from north-west to south-east, extending from Florida along the *Great Bahama Bank* for a distance of about 780 miles to Turks islets north of San Domingo. They have a collective area of 5450 square miles, with a population which was returned in 1891 at 47,564 (about 12,000 white, the rest coloured), and was estimated in 1900 at about 60,000. The largest and most important members of the group, following in the normal direction from north-west to south-east, are :—Bahama, which gives its name to the archipelago ; Great Abaco, Eleuthera, New Providence, Andros, Cat Island, Watling, Yuma, Aclin, Mariguana, The Caicos (North, Grand, and East), Inagua (Great and Little), and Turks. Cat (Guanahani), the highest land in the group (400 feet), was long supposed to be the island which was first reached by Columbus (12th October 1492), and was named by him San Salvador. Then the distinction was successively transferred to the neighbouring Watling, Great Turk, and Mariguana ; but in 1880 the American marine surveyor, G. V. Fox, identified San Salvador, on seemingly good grounds, with Samana (Atwood Cay), which lies about midway between Watling and Mariguana. The chief difficulty is its size, for if Samana is the true San Salvador, it must have been considerably larger 400 years ago than it now is. The Bahamas are unaffected by the depressed state of the sugar market in so many other West Indian groups, the chief produce being fruits (principally oranges), hemp fibre, sponges, salt, and some cotton. The salt and sponge latterly seem to be dying out, while fruit cultivation is on the increase. The imports rose from £195,000 in 1896 to £238,000 in 1898, and the exports from £139,000 to £175,000 in the same period. The revenue in 1896, £65,000, and 1898, £87,000 ; expenditure (1896), £60,000 ; (1898), £64,000 ; debt (1900) £118,400. The total trade with America is nearly four times that with Great Britain. Trade with British Colonies or with other countries than America and the United Kingdom is quite insignificant. A number of visitors from America and Canada come every year to winter in the Bahamas. The total tonnage of vessels, inwards and outwards, was 741,522 in 1898. There has been rapid increase of late years owing to steamers calling on their way to and from the ports of the Gulf of Mexico to engage and to re-land labourers. There is regular fortnightly mail communication with New York and Cuba, and frequent sailing vessels to and from Cuba and Key West. The extent of Crown lands is estimated at 500,000 acres, lying chiefly in the islands of Inagua, Andros, Grand Bahama, and Abaco, but little of this is serviceable for cultivation. There are 44 Government schools, with 5998 pupils on the register, and 4050 in average attendance in 1898. There are 11 schools which receive grants-in-aid, besides others, independent of such aid, belonging chiefly to the Anglican Church body. There are no railways or telegraphs, and but few roads, except in New Providence. Cable communication with the United States was established in 1892. There are no regular forces, militia, or volunteers. The constabulary is a semi-military force, originally enlisted in Barbados, but recruited at times in the Bahamas. (A. H. K.)

Bahawalpur, a native state of India, within the Punjab, stretches for more than 300 miles along the left bank of the Sutlej, the Punjnud, and the Indus, and is bordered on the other side by the desert of Rajputana. The area covers 17,285 square miles ; in 1881 the population was 573,494 ; in 1891 it was 650,042 (average density, 38 persons per square mile) ; in 1901, 720,662, showing a further increase of 11 per cent. The estimated gross revenue is Rs.16,00,000 ; the military force (including police) is 1607 men. There is no tribute. The chief, whose title is Nawab, is a Mahommedan of the Daudputra family from Sind. The dynasty established its independence of the Afghans towards the end of the 18th century, and made a treaty with the British in 1838, to which it has always been loyal. The benefits of canal irrigation were introduced during the minority of the late Nawab, and the revenue thus doubled. The territory is traversed throughout its length by the North-Western and Southern Punjab railways. In 1896-97 the total number of schools was 487, with 5828 pupils, of whom 721 were girls ; the proportion of boys at school to the total male population was 1 in every 61. There are an arts college, and 7 Anglo-vernacular schools, with 856 pupils.

The town of BAHAWALPUR is situated near the left bank of the Sutlej ; railway station 63 miles from Mooltan. It has a magnificent palace. Population, 13,635.

Bahia, an Atlantic state of Brazil between 9° 55′ and 18° 15′ S. lat. and 37° 40′ and 39° 40′ W. long. Its area covers 164,640 square miles. Its population in 1890 was 1,919,800, and in 1897 was estimated at 1,822,000. The chief towns are Bahia or S. Salvador, the capital, and Alagoinhas (12,000), Bom-Fim (14,000), Feira de Sant Anna (16,000), Marogogipe (13,000), Santo Amaro (11,000), Jacobina (9000), Ilhéos (6000), Cachoeira (9200), Barra do Rio Grande. There are over 70 towns in the state. Railways run from Bahia to Joazeiro on the northern border of the state and thence to other localities beyond ; from Nazareth to Maragogipe ; from Amaro to near the port of Abbadia ; from Caravellas to Serra dos Aymores. Others are in construction. The capital, BAHIA or SAN SALVADOR, is a seaport with a population estimated at between 180,000 and 200,000. The port was visited in 1896 by 1045 ships of 1,538,881 tons, in 1897 by 1028 ships of 1,533,078 tons, and in 1898 by 881 ships of 1,504,797 tons. The value of the exports in 1897 was £1,519,930. The principal articles of export were coffee, tobacco, cacao, sugar, rosewood, logwood, and hides.

Bahraich, a town and district of British India, in the Faizabad division of Oudh. The town is on the river Sarju. Since the opening of the railway the place has begun to flourish. It contains the most popular place of pilgrimage in Oudh, the tomb of Masaud, a champion of Islam, slain in battle by the confederate Rajputs in 1033, which is resorted to by Mahommedans and Hindus alike. There is also a Mussulman monastery, and the ruined palace of a nawab of Oudh. The American Methodists have a mission here. Population, about 24,000.

The district of BAHRAICH lies between the Tarai of Nepal and the river Gogra. It contains an area of 2680 square miles. The population in 1891 was 1,000,432, being 373 persons per square mile ; classified according to religion, Hindus numbered 830,459, Mahommedans 169,798, Christians 124, including 28 Europeans, "others" 51. In 1901 the population was 1,051,856, showing an increase of 5 per cent. Land revenue and rates are returned as Rs.10,93,737, the incidence of assessment per acre being Rs.0 : 9 : 4 on the temporarily settled, and Rs.0 : 15 : 7 on the permanently settled area ; the number of police was 2820. In 1896-97, out of a total cultivated area of 919,844 acres, 60,975 were irrigated from tanks, wells, &c. A considerable trade is conducted with Nepal, chiefly

in timber. A line of railway has been opened through the district to Nepalganj on the frontier.

Bahrein Islands.—The Bahreins include a group of islands situated about 20 miles east of the coast of Al Hasa, in the Persian Gulf, a little to the south of the port of Al Katif, which, under the ancient name of Gerrha, has been celebrated throughout history as the mart of Indian trade, the starting-point of caravans across Arabia. The largest of the group is called Bahrein. It is about 27 miles long from north to south and about 10 wide—a low flat space of sandy waste with cultivated oases and palm groves of great luxuriance and beauty. The rocky hill of Jebel Dukhan (the "mountain of the mist") rises in the midst of it to a height of 400 feet. The rest of the group are of coral formation. The next island in size to Bahrein is Moharek, curved in shape, and about 5 miles long by $\frac{1}{2}$ mile in breadth. It lies 1 mile to the north of Bahrein. Sitrah (4 miles long) Nebbi, Saleh, Sayeh, Khasifeh, and Arad ($\frac{3}{4}$ mile long) complete the group. Of these minor islands Arad alone retains its classical name.

The sea around the Bahrein islands is shallow, so shallow as to admit only of the approach of native craft, and the harbour is closely shut in by reefs. There is very little doubt that it was from these islands that the Puni, or Phœnicians, emigrated northwards to the Mediterranean. Bahrein has always been the centre of the pearl fishing industry of the Persian Gulf. There are about 400 boats now employed in the pearl fisheries, each of them paying a tax to the Sheikh. The pearl export from Linja is valued at about £30,000 to £35,000 per annum.

The capital town of Bahrein is *Manameh*, a long, straggling, narrow town of about 8000 inhabitants, chiefly of the Wahabi sect. Manameh is adjacent to the most northern point of the island, and looks across the narrow strait to Moharek.

Fish and sea-weed form the staple food of the islanders. The water-supply of Moharek is probably unique. It is derived from springs which burst through the beds below sea-level with such force as to retain their freshness in the midst of the surrounding salt water. Scattered through the islands are some fifty villages, each possessing its own date groves and cultivation, forming features in the landscape of great fertility and beauty. Most of these villages are walled in for protection.

The present Sheikh of Bahrein (who lives chiefly at Moharek) is of the family of El Kalifa which furnishes chiefs to the Uttubi tribe. This ruling race was driven from the mainland (where they held great possessions) by the Turks about 1850. In the year 1867 the Persians threatened Bahrein, and in 1875 the Turks laid their hands on it. British interference in both cases was successful in maintaining the integrity of Arab rule, and the Bahrein Islands are now under British protection.

To the south-west of the picturesque belts of palm trees which stretch inland from the northern coast of Bahrein, is a wide space of open sandy plain filled with gigantic tumuli, or earth mounds, of which the outer layers of gravel and clay have been hardened by the weather action of centuries to the consistency of conglomerate. Within these mounds are two-chambered sepulchres, built of huge slabs of limestone, several of which have been opened and examined by Durand, Bent, and others, and found to contain relics of undoubted Phœnician design. Scattered here and there throughout the islands are isolated mounds, or smaller groups, all of which are of the same appearance, and probably of similar origin.

See Bent, vol. xii. *Proceedings R. G. S.* (T. H. H.*)

Bahr-el-Ghazal. See SUDAN, NILE, and EGYPT.

Baiburt, chief town of a district of the Erzerúm vilâyet of Asiatic Turkey, altitude 5114 feet, situated on both banks of the Choruk Su (*Acampsis*), at the point where the Trebizond-Erzerúm road crosses that river. The town is dominated by an old Armenian fortress on an isolated mass of rock. Population, 10,000 (Moslems, 8500; Christians, 1500).

Baikal, a lake of Russia, East Siberia, the sixth in size of all the lakes of the world and the largest fresh-water basin of Eurasia. It has the shape of a narrow crescent, which spreads from S.W. to N.E. (51° 29′ to 55° 50′ N. lat. and 103° to 110° E. long.) separating the province of Irkutsk from Transbaikalia, and has a length of 376 miles and a width of from 20 to 70 miles. Its south-western extremity penetrates into the high plateau of East Asia, and the lake lies entirely in the Alpine zone which fringes the plateau from the north-west. Its area is 13,500 square miles, *i.e.*, nearly as great as Switzerland. The length of its coast-line is 525 miles along the western, and 640 along the eastern shore. Its altitude is now estimated by Russian geographers at 1587 and at 1651 feet—90 feet above the level of the Angara at Irkutsk—both figures being derived from a levelling accomplished in the 'seventies across Siberia (*Zapiski, Russ. Geog. Soc., Gen. Geogr.* xv. 1885); but owing to errors which have crept into that levelling between Krasnoyarsk and Irkutsk, these altitudes seem to be exaggerated and 1500 feet (1433 feet for Irkutsk) would seem a more correct altitude (*Izvestia, East Sib. Branch,* xxviii. 1, 1897). Its level is subject to slight oscillations, and after the heavy five weeks' rains of 1869, it rose by 7 feet, an immense territory at the mouth of the Selenga being submerged.

The elongated hilly island of Olkhon and the peninsula Svyatoi Nos which rises as its continuation on the opposite eastern shore, divide the lake into two basins. Careful soundings show that the deepest part of the lake is in the south-west, at the foot of the Khamar-daban border-ridge of the high plateau. An elongated cavity, 66 miles long, reaches there a depth of over 600 fathoms, with a maximum depth of 791 fathoms, *i.e.*, about 3240 feet below the level of the ocean. The bottom of the lake has very steep slopes as a rule, the 100- and even the 250-fathom lines running close to the shores. Only at the mouth of the Selenga, which is a mighty stream 800 miles long, entering the lake from the south-east, and pouring into it the waters and the deposits from a drainage area of 173,500 square miles, a wide delta protrudes into the lake, reducing its width to 20 miles and spreading under its waters, so as to leave only a narrow channel, 230 to 247 fathoms deep, along the opposite coast.

The depths of the middle portion of the lake have not yet been measured but must exceed 500 fathoms. It was expected that an underground ridge would be found connecting Olkhon with Svyatoi Nos; but depths exceeding 622 fathoms were found even along that line. As to the northern basin, the configuration of its bottom is in accordance with the high mountains which surround it, and most of its area has a depth exceeding 400 fathoms, the maximum depths along three lines of soundings taken across it being 491, 485 and 476 fathoms respectively.

Temperature.—The surface-layers of this immense basin are heated in the summer along the coast so as to reach temperatures of from 55° to 67° Fahr. both close to the shores and at some distance from the mouth of the Selenga; but these warmer layers are not thick and a uniform temperature of nearly 39° F. is generally found at a depth of 20 fathoms, as also on the surface in the middle of the lake. At a depth of 500 fathoms there is a nearly uniform temperature of 38° from top to bottom. The lake freezes usually at the end of December or in the beginning of January, so solidly that a temporary post-horse station is erected on the ice in the midst of the lake, and it remains frozen till the second half of May. The evaporation from this large basin exercises a certain influence on the climate of the surrounding country, while the absorption of heat for the thawing of the ice has a notable cooling effect in early summer.

Rivers.—Lake Baikal receives over 300 streams, mostly short mountain torrents, besides the Upper Angara, which enters its north-east extremity, the Barguzin on its east shore, and the Selenga from the south-east. Its only outflow is the Lower Angara, which issues through a rocky cleft on the west shore. The Irkut reaches the Baikal no more. After approaching its south-west extremity it abandons the broad valley which leads to the lake and makes its way northwards through a narrow cleft pierced in high mountains, to join the Angara at Irkutsk.

Mountains.—With the exception of the delta of the Selenga, lake Baikal is surrounded with high mountains. The Khamar-daban border-ridge (the top of a mountain of the same name is 5300 feet above the lake) falling with steep cliffs towards the lake, fringes it in the south; a massive, deeply ravined highland occupies the space between the Irkut and the Angara; the Onot and Baikal ridges (also Primorskiy) run along its north-west shore, reaching it in a diagonal direction; an Alpine complexus of yet unexplored mountains spreads along its north-east shore; the Barguzin range reaches its shores in an oblique direction in the east, and the Ulan Burgasu mountains appear in the delta of the Selenga.

Geology.—It is certain that in previous geological ages lake Baikal had a much greater extension. It spread westwards into the Tunka valley of the Irkut, and up the lower portions of the valleys of the Upper Angara and the Barguzin. Volcanic activity took place around its shores at the end of the Tertiary or during the Quaternary age, and mighty streams of lava cover the Sayan and Khamar-daban mountains, as well as the Tunka valley. Earthquakes are still frequent along its shores. The researches of Meglitzky (1851) and Chersky (1875) have proved that the northern portion of Baikal is a diagonally-running *transversal* rift which was made in the Laurentian schists and slates, whose synclinal and anticlinal plications run from south-west to north-east, crossing in an oblique direction the present axis of the lake; while its southern portion has the character of a *longitudinal* valley, immensely modified by erosion and running between the outer foot of the border-ridge of the high plateau and the Alpine zone which fringes it. The mountains around lake Baikal (granites, syenites, gneisses, and various crystalline schists, conglomerates and limestones) belong chiefly to the Laurentian, Huronian, Cambrian, and Silurian ages—red Devonian sandstones (Silurian, according to Baron Toll ?) lying in nearly horizontal layers at the outer foot of the Onot and Baikal ranges. Jurassic and Tertiary deposits of fresh-water origin occur in the old valleys. Gold is found at its northern extremity, and beautiful lapis-lazuli, baikalite, and some graphite on the slopes of the Khamar-daban, near Kultuk.

Fauna.—The fauna of lake Baikal, explored by Dybowski and Godlewski, is much richer than it was supposed to be, and has quite an original character; but hypotheses as to a direct communication having existed between lake Baikal and the Arctic Ocean during the Post Tertiary or Tertiary ages, are not proved. Still, lake Baikal has a seal (*Phoca vitulina*, *Phoca baikalensis* of Dybowski) quite akin to the seals of Spitzbergen. The waters of the lake swarm with fishes (sturgeons, salmonidæ), and its herring (*Salmo omul*) yields the chief product of the fisheries, about 11,000 casks every year. Its quantity, however, notably diminished within the last forty or fifty years. The little lake Frolikha, situated close to lake Baikal near its northern extremity and communicating with it by means of a river of the same name, is interesting on account of the species of trout, *Salmo erythræus*, which is found in it but is not known elsewhere.

Navigation.—Navigation on lake Baikal is rendered difficult both by sudden storms and by the absence of good bays and ports. The main port on the western shore, Listvenichnaya, near the outflow of the Angara, is an open roadstead at the foot of high mountains. Steamers ply from it thrice a week to Posolskoye, on the opposite shore, five times a year to Verkhne-Angarsk, at the northern extremity of the lake, and frequently to the mouth of the Selenga which becomes an important artery of trade. Steamers go up that river to Bilyutai, near the Mongolian frontier, and bring back nearly 6660 tons of tea, out of the 16,500 tons imported *viâ* Kiakhta, while nearly 5000 tons of grain, cedar nuts, salt, soda, wool, and timber are shipped on rafts down the Khilok, Chikoi, and Uda (tributaries of the Selenga), and about 1000 tons of manufactured goods are taken up the river for export to China. Ten steamers ply on lake Baikal and three on the Selenga. Besides, attempts are being made to render the Angara navigable below Irkutsk down to the Yenisei. In winter, when the lake is covered with a crust of ice three to four feet thick, it is crossed on sledges from Listvenichnaya to Posolskoye. The lake offering, nevertheless, a serious interruption on the main road which leads through Siberia to the Amur, a highway, available all the year round, was made in 1863-64 around its southern shore, partly by piercing the cliffs falling to the lake. It will be followed by the trans-Siberian railway, notwithstanding the considerable difficulties offered by a great number of streams wildly rushing to the lake from the Khamar-daban. In the meantime, a powerful protected ice-breaker (3750 horse-power, 4200 tons) will carry over the trains (up to twenty-five carriages) from Listvenichnaya to the head of the Transbaikalian railway at Posolskoye.

Towns.—The shores of the lake are thinly populated. The chief villages are Listvenichnaya, Posolsk monastery and Posolskoye, Verkhne-Angarak at the north-eastern extremity, Kultuk at the south-western extremity, and several villages in the delta of the Selenga.

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Bailey, Philip James (1816-——), English poet, author of *Festus*, was born at Nottingham, 22nd April 1816. His father, who himself published both prose and verse, owned and edited from 1845 to 1852 *The Nottingham Mercury*, one of the chief journals in his native town. Philip James Bailey received a local education until his sixteenth year, when he matriculated at Glasgow University. He did not, however, take his degree, but moved in 1835 to London, and entered Lincoln's Inn. Without making serious practice of the law he settled at Basford, and for three years was occupied with the composition of *Festus*, which appeared anonymously in 1839. Its success, both in England and America, was immediate. It passed through a dozen editions in the country of its birth, and nearly three times as many in the United States; and when in 1889 its author was able to publish a "Jubilee Edition" he could feel that it was one of the few poems of its time which was known to both the older and younger generations. Its author is known almost exclusively by his one voluminous poem, for though Bailey published other verses he is essentially a man of one book. *Festus* has undergone many changes and incorporations, but it remains a singular example of a piece of work virtually completed in youth and never supplanted or reinforced by later achievements of its author. It is a vast pageant of theology and philosophy, comprising in some twelve divisions an attempt to represent the relation of God to man and of man to God, to emphasize the benignity of Providence, to preach the immortality of the soul, and to postulate "a gospel of faith and reason combined." It contains fine lines and dignified thought, but its extraordinarily ambitious theme, and a certain incoherency in the manner in which it is worked out, prevent it from being easily readable by any but the most conscientious and most sympathetic student.

Baillieston, a large mining village of Old Monkland parish, Lanarkshire, 6½ miles E. of Glasgow by rail. There are 13 collieries at present working in the vicinity, with a daily output of 4300 tons, and employing 3000 men. There is a large nursery and market garden. Population (1881), 2927; (1891), 4026; (1901), 5151.

Bain, Alexander (1818-——), Scottish logician and philosopher, was born in Aberdeen, 11th June 1818, and received his early education there. In 1836 he entered Marischal College, the younger of the two universities that had then a separate existence in Aberdeen; and, while a student, he came under the influence of Professor John Cruickshank, who held the Chair of Mathematics, and of Dr William Knight, who was Professor of Natural Philosophy—from each of whom he received a considerable impetus. His college career was very distinguished, especially in the departments of mental philosophy, mathematics, and physics. Towards the end of his arts course he became a contributor to the *Westminster Review*, and thereby came into contact with John Stuart Mill. This was the beginning of his connexion with Mill, which was to lead to a life-long friendship. In 1841 he became substitute for Dr Glennie, the Professor of Moral Philosophy,

who, through ill-health, was unable to discharge the active duties of the chair. This post he occupied for three successive sessions, during which time he continued writing for the *Westminster*, and also in 1842 helped Mill with the revision of the MS. of his *System of Logic*, giving special aid in the province of Induction, and supplying many of the more important examples of the experimental methods. In 1844, when the chair of Natural Philosophy was vacant through the death of Dr Knight, he filled the gap until the appointment of a new professor. He was unsuccessful in his application for the chair; but, in 1845, he was appointed Professor of Mathematics and Natural Philosophy in the Andersonian University of Glasgow. This he did not long retain, but, preferring a wider field, resigned the position and devoted himself to literary work, partly in connexion with the magazines, but still more in the production of scientific manuals and philosophical articles for Messrs Chambers of Edinburgh. In 1848 he removed to London to fill a post in the Board of Health under Edwin Chadwick. While resident in London he was a member of the brilliant coterie that included George Grote and John Stuart Mill, and was associated with them in the leading political, social, and intellectual movements of the time. In 1855 he published his first large work, *The Senses and the Intellect*, which was followed in 1859 by *The Emotions and the Will*. Through these two treatises his place as an independent thinker was assured. This led in 1860 to his appointment by the Crown, on the recommendation of the then Home Secretary, Sir G. Cornewall Lewis, to the chair of Logic and English in the University of Aberdeen. That chair had just been created, on the amalgamation of the two universities (King's and Marischal) by the Scottish Universities Commission of 1858; and Mr Bain became its first occupant. In his new capacity he had a twofold work to perform. Up to this date neither Logic nor English had received adequate attention in Aberdeen, and now was the opportunity for furthering the interests of both. Mr Bain threw himself with great energy into the task. Not content with shaping lectures for his class, he set to work by published writings to instruct the outside world also; and in this way he succeeded not only in raising the standard of education in the north of Scotland, but also in forming a school of philosophy, and in widely influencing the teaching of English grammar and of composition. His efforts were first directed to the English part of his charge. This resulted in the publication of the *Higher English Grammar* in 1863, followed in 1866 by the *Manual of Rhetoric*, in 1872 by *A First English Grammar*, and in 1874 by the *Companion to the Higher Grammar*. These works covered a large field, and by their original views and new methods aroused much interest, and met with wide acceptance in the scholastic world. But the other subject of his chair also called for attention. No doubt his own philosophical writings already published, especially *The Senses and the Intellect* (to which was added, in 1861, *The Study of Character*), were ready to hand for the purposes of prelection; but the volumes were too large for effective use in the class-room. A psychological handbook was needed, for there was hardly anything of that stamp in existence, certainly nothing at all satisfactory. Accordingly, in 1868, he published his *Manual of Mental and Moral Science*, mainly a condensed form of his own larger philosophical treatises, but with the doctrines re-stated, and in many instances freshly illustrated, and with many important additions, chiefly in the shape of chapters on the history of the intellectual controversies (universals, sense-perception, &c.), and of a recasting of the ethical positions, and an elaborate analysis of the leading systems of Ethics, ancient and modern. The year 1870 saw the publication of the *Logic*. This, too, was a work designed specially for the use of students, based on Mill, but differing from him in many particulars, and having as distinctive features the treatment of the doctrine of the conservation of energy in connexion with causation and the detailed application of the principles of logic to the various sciences. After the publication of the *Logic*, his eminent services to education in Scotland were recognized by the conferment of the honorary degree of Doctor of Laws by the University of Edinburgh in 1871. Next came two publications in "The International Scientific Series," namely, *Mind and Body* (1872), and *Education as a Science* (1879). The first of these is a re-statement of Mr Bain's intellectual system, with an appended chapter on the history of the conception of the Soul; and the second carries the principles of psychology with great thoroughness into the province of teaching.

All these works, from the *Higher English Grammar* downwards, were written by Mr Bain during his twenty years' occupancy of the chair of Logic in the University of Aberdeen. To the same period belongs his institution of the philosophical journal *Mind;* the first number of which appeared in January 1876, under the editorship of a former pupil and attached disciple, Professor G. Croom Robertson of University College, London. To this journal Mr Bain contributed many important articles and discussions; and he continued sole proprietor of it till Robertson, owing to ill-health, resigned the editorship in 1891, when it passed into other hands. Feeling the burden of the teaching work as years advanced, Dr Bain resigned his professorship in 1880. This did not, however, mean cessation of intellectual activity or of productive energy. On the contrary, his interest in thought and his desire to complete the scheme of work which he had mapped out for himself in earlier years remained as keen as ever. Accordingly, in 1882 appeared the *Biography of James Mill*, and accompanying it *John Stuart Mill: A Criticism, with Personal Recollections*. Next came (1884) a collection of articles and papers, most of which had appeared in magazines, under the title of *Practical Essays*. This was succeeded in 1887 by the first volume of the new edition of the *Rhetoric*, devoted to the handling of the Intellectual qualities of style, and, along with it, a book *On Teaching English*, being an exhaustive application of the principles of rhetoric to the criticism of style, for the use of teachers. The following year the second volume of the new *Rhetoric* appeared, dealing with the Emotional qualities of style. This completed, attention was next directed to a revision of *The Senses and the Intellect*, which resulted in the fourth edition of the work, published in 1894, in which may be found Dr Bain's last word on psychology; for, although a new edition of *The Emotions and the Will* was brought out in 1899, the author's physical condition did not permit of any recasting of the treatise such as had been accorded to the companion volume.

Dr Bain's life has been mainly that of a thinker and a man of letters. But he is also so far a man of affairs that he has always taken a keen interest, and frequently an active part, in the political and social movements of the day; and so highly did the students of Aberdeen rate his practical ability that, after his retirement from the chair of Logic, they twice in succession elected him Lord Rector of the University, each term of office extending over three years. This was no mere compliment to a former professor, of whom they were naturally proud, but a deliberate selection of the man whom they believed best able to guide the affairs of the university as head of its superior court. Being the acknowledged leader of the Progressive party, he was all on the side of reform, pushing forward the interests of science, and strenuously advocating, in the face of much

opposition, the recognition of the claims of the modern languages to a place in the academic curriculum. In like manner, the vast amount of work that Dr Bain did for the community as a member of the first School Board, and in connexion with the management first of the Mechanics' Institute, and next of the Free Public Library, shows him to be no mere recluse. It was in appreciation of his services of this kind that the people of Aberdeen placed a marble bust of him in the Public Library—just as his former pupils, in gratitude for the inspiration of his teaching, have presented a portrait of him in his rectorial robes, painted by Sir George Reid, to the university, to be hung in the picture gallery of Marischal College.

Wide as Professor Bain's influence has been as a logician, a grammarian, and a writer on rhetoric, his greatest reputation rests on his psychology. At one with Johannes Müller in the conviction *psychologus nemo nisi physiologus*, he was the first in Great Britain during the 19th century to apply physiology in a thoroughgoing fashion to the elucidation of mental states, and thereby to advance the science of mind at a bound. His happy idea of applying the natural history method of classification to psychical phenomena further gave scientific character to his work, the value of which was still more enhanced by the author's faculty of methodical exposition and his exceptional command of felicitous illustration. In line with this, too, is his rigorous demand that psychology shall be cleared of metaphysics; and to his lead is no doubt due in great measure the position that psychology has now acquired as a distinct positive science. Although his work pre-dated the psycho-physical developments of the present day, these are all in the exact spirit of it; and although he has from the beginning strongly and consistently advocated the supremacy of the introspective method in psychological investigation, he was among the first to appreciate the help that may be given to it by animal and social and infant psychology as subsidiary adjuncts. He may justly claim the merit of having effectively guided the awakened psychological interest of British thinkers of the second half of the 19th century into fruitful channels. Nor will any just estimate of his work ignore the subtlety and suggestiveness of his analyses; or his masterly handling of the laws of Association, alike penetrating and exhaustive, bold in the application of them to each and every province of mind—intellectual, emotional, and volitional. These mark him off among psychologists, and determine his place in the history of philosophy.

Bainaluka, or BANJALUKA, a town of Bosnia, Austria-Hungary, situated on the Vrbas, on the borders of a plain fronting the entrance to a narrow defile, at the terminus of a railway line from Sunja, from which by rail it is distant 85 miles S.E. Among the mosques the most notable is the Feradija-Djami, dating from the end of the 16th century. On the right bank of the Vrbas are the ruins of the ancient citadel. There are powder mills and cloth factories, and also a Government tobacco factory. Borings have lately been made by the Government in the neighbouring coal-fields. Bainaluka, under the name of Servitium, was a Roman military station. The population is 13,666, of whom the majority are Mahommedans.

Baindir, a town in Asiatic Turkey, in the Aidin, Smyrna, viláyet, situated in the valley of the Kuchuk Mendere (ancient *Caystrus*). It is connected with Smyrna by railway, and has a trade in cotton, figs, raisins, and tobacco. Population, 10,000 (Moslems, 7500; Christians, 2500).

Baird, Spencer Fullerton (1823-1887), American scientist, was born in Reading, Pennsylvania, 3rd February 1823. He graduated at Dickinson College, Carlisle, Penn., in 1840. The next year, when eighteen years old, he made an ornithological excursion through the mountains of Pennsylvania, walking, says one of his biographers, "400 miles in twenty-one days, and the last day sixty miles." In 1838 he met Audubon, and thenceforward his studies were largely ornithological, Audubon giving him a part of his own collection of birds. After studying medicine for a time, Baird became professor of natural history in Dickinson College, assuming likewise the duties of the chair of chemistry, and meanwhile giving instruction in physiology and mathematics. This variety of duties, in a small college, tended to give him that breadth of scientific interest which characterized him through life, and made him perhaps the most representative general scientist in America. For the long period between 1850 and 1878 he was assistant-secretary of the Smithsonian Institution, Washington, and on the death of Joseph Henry, in the latter year, he became secretary. While an officer of the Smithsonian, Baird's duties consisted, in large part, of the gathering of information from many fields, and the superintendence of the labour of workers in widely different lines. Thus, apart from his assistance to others, his own studies and published writings cover a broad range: iconography, geology, mineralogy, botany, anthropology, general zoology, and, in particular, ornithology; while for a series of years he edited an annual volume summarizing progress in all scientific lines of investigation. He gave general superintendence, between 1850 and 1860, to several Government expeditions for scientific exploration of the western territories of the United States, preparing for them a manual of *Instructions to Collectors*, and enlisting the collaboration even of such army officers as Scott, M'Clellan, and Thomas, as well as of officers in the navy. Of his own publications, the bibliography by G. Brown Goode, from 1843 to the close of 1882, includes 1063 entries, of which 775 were short articles in his *Annual Record*. His most important volumes, on the whole, were *Birds*, in the series of reports of explorations and surveys for a railway route from the Mississippi river to the Pacific ocean (1858), of which Dr Elliott Coues says (as quoted in the *Popular Science Monthly*, xxxiii. 553), that it "exerted an influence perhaps stronger and more widely felt than that of any of its predecessors, Audubon's and Wilson's not excepted, and marked an epoch in the history of American ornithology"; *Mammals of North America: Descriptions based on Collections in the Smithsonian Institution* (Philadelphia, 1859); and the monumental work (with Thomas Mayo Brewer and Robert Ridgway) *History of North American Birds* (Boston, 1875-84; "Land Birds," 3 vols., "Water Birds," 2 vols.). He died 19th August 1887, at the great marine biological laboratory at Wood's Holl, Massachusetts, an institution largely the result of his own efforts, and one which has exercised a wide effect not only upon scientific but upon economic ichthyology. (C. F. R.)

Bajaor, a small district peopled by Pathan races of Afghan origin, about 45 miles long by 20 broad, lying at a high level to the east of the Kunar valley, from which it is separated by a continuous line of rugged frontier hills forming a barrier easily passable at one or two points. Across this barrier the old road from Kabul to India ran, before the Khaibar was adopted as the main route. To the south of Bajaor is the wild mountain district of the Mohmands, an Afghan race. To the east, beyond the Panjkora river, are the hills of Swat, dominated by another Afghan race. To the north is an intervening watershed between Bajaor and the small state of Dir; and it is over this watershed and through

the valley of Dir that the new road from Malakand and the Punjab runs to Chitral. The drainage of Bajaor flows eastwards, starting from the eastern slopes of the dividing ridge which overlooks the Kunar and terminating in the Panjkora river, so that the district lies on a slope tilting gradually downwards from the Kunar ridge to the Panjkora. Nawagai is the chief town of Bajaor, and the Khan of Nawagai is under British protection for the safeguarding of the Chitral road. Jandul, one of the northern valleys of Bajaor, has ceased to be of political importance since the failure of its chief, Umra Khan, to appropriate to himself Bajaor, Dir, and a great part of the Kunar valley. It was the active hostility between the Amir of Kabul (who claimed sovereignty of the same districts) and Umra Khan that led, firstly to the demarcation agreement of 1893 which fixed the boundary of Afghanistan in Kunar; and secondly to the invasion of Chitral by Umra Khan (who was no party to the boundary settlement) and the siege of the Chitral fort in 1895.

An interesting feature in Bajaor topography is a mountain spur from the Kunar range, which curving eastwards culminates in the well-known peak of Koh-i-Mor, which is visible from the Peshawur valley. It was here, at the foot of the mountain, that Alexander found the ancient city of Nysa and the Nysæan colony, traditionally said to have been founded by Dionysos. The Koh-i-Mor has been identified as the Meros of Arrian's history—the three-peaked mountain from which the God issued. It is also interesting to find that a section of the Kafir community of Kamdesh still claim the same Greek origin as did the Nysæans; still chant hymns to the god who sprang from Gir Nysa (the mountain of Nysa); whilst they maintain that they originally migrated from the Swat country to their present habitat in the lower Bashgol. Long after Buddhism had spread to Chitral, Gilgit, Dir, and Swat; whilst Ningrehar was still full of monasteries and temples, and the Peshawur valley was recognized as the seat of Buddhist learning, the Kafirs or Nysæans held their own in Bajaor and in the lower Kunar valley, where Buddhism apparently never prevailed. It is probable that the invader Babar (who has much to say about Bajaor) fought them there in the early years of the 16th century, when on his way to found the Turk dynasty of India centuries after Buddhism had been crushed in Northern India by the destroyer Mahmud.

The Gazetteers and Reports of the Indian Government contain nearly all the modern information available about Bajaor. The Autobiography of Babar (by Leyden and Erskine) gives interesting details about the country in the 16th century. For the connexion between the Kafirs and the ancient Nysæans of Swat, see *R.G.S. Journal*, vol. vii. 1896. (T. H. H.*)

Baker, a city of Oregon, U.S.A., capital of Baker county, in the eastern part of the State, in the valley of the Powder river, at the east base of the Blue Mountains, and on the Oregon Railroad and Navigation Co. Railway. It is a supply-point for the mines in these mountains and those in the Wallowa range, to the north-east. Population (1880), 1258; (1890), 2604; (1900), 6663.

Baker, Sir Samuel White (1821-1893), English traveller and author, was born in London, 8th June 1821. He was educated partly in England and partly in Germany. His father destined him for a commercial career, but a short experience of office-work proved him to be entirely unsuited to such a life. On 3rd August 1843 he married Henrietta Biddulph Martin, daughter of the rector of Maisemore, and the two following years were spent, with his wife, in Mauritius, looking after some property held there by his father. The desire for travel took him in 1846 to Ceylon, where, in the following year, he founded an agricultural settlement at Newara Eliya, a mountain health-resort. Aided by his brother, he brought emigrants thither from England, together with choice breeds of cattle, and before long the new settlement was a success. His health necessitated his leaving Ceylon in 1855; and soon after his return to England his wife died (29th December 1855), leaving him with four children. During his residence in Ceylon he published *The Rifle and the Hound in Ceylon* (1853), and, two years later, *Eight Years' Wanderings in Ceylon* (1855). After a journey to Constantinople and the Crimea in 1856, he found an outlet for his restless energy by undertaking the supervision of the construction of a railway across the Dobruja, connecting the Danube with the Black Sea. After its completion he spent some months in a tour in south-eastern Europe and Asia Minor. It was during this time that he met, in Hungary, the lady who (in 1860) became his second wife, Florence, daughter of Herr Finnian von Sass. In 1861 he started upon his first tour of exploration in Central Africa. This, in his own words, was undertaken "to discover the sources of the Nile, with the hope of meeting the East African expedition under Captains Speke and Grant somewhere about the Victoria Lake." After a year's exploration of Abyssinia, as a result of which he fixed the position of the chief Nile tributaries in that region, he started from Khartum, in December 1862, to follow up the course of the White Nile. Two months later he met Speke and Grant, who were returning after their discovery of Victoria Nyanza. Their success made him fear that there was nothing left for his own expedition to accomplish; but the two explorers generously gave him information which enabled him, after separating from them, to achieve the discovery of Albert Nyanza, of whose existence credible assurance had already been given to Speke and Grant. Baker first sighted the lake on 14th March 1864, after which, having spent some time in the exploration of the neighbourhood, he started upon his return journey, and reached Khartum, after many checks, in May 1865. In the following October he returned to England, with his wife, who had accompanied him throughout the whole of the perilous and arduous journey. In recognition of his achievements the Royal Geographical Society awarded him its gold medal, and a similar distinction was bestowed on him by the Paris Geographical Society. In August 1866 he was knighted. In the same year he published *The Albert Nyanza, Great Basin of the Nile, and Explorations of the Nile Sources*, and, in 1867, *The Nile Tributaries of Abyssinia*, both books quickly going through several editions. In 1868 he published a story called *Cast up by the Sea*. In 1869, at the request of the Khedive, Baker undertook the command of a military expedition to Central Africa, with the object of suppressing the slave trade there and opening the way to commerce and civilization. Before starting from Cairo with a force of 1700 Egyptian troops he was given the rank of Pacha and Major-General in the Ottoman army. Lady Baker, as before, accompanied him. The Khedive appointed him Governor-General of the new territory for four years, at a salary of £10,000 a year; and it was not until the expiration of that time that Baker returned to Cairo, leaving his work to be carried on by the new governor, Colonel Gordon. He had at least succeeded in planting in the new territory the foundations upon which others could build up an administration; had he remained longer there, or had the Khedivial Government supported him with more vigour, the results of his efforts might have been more permanent. He returned to England with his wife in 1874, and in the

following year purchased the estate of Sandford Orleigh, in South Devon, where he made his home for the rest of his life. He published his narrative of the Central African expedition, under the title of *Ismailia*, in 1874. *Cyprus as I saw it in 1879*, was the result of a visit to that island. With the exception of winters spent in Egypt and India, Baker passed the rest of his life in comparative seclusion at Sandford Orleigh. He kept up an exhaustive and vigorous correspondence with men of all shades of opinion upon Egyptian affairs. Next to these, questions of maritime defence and strategy chiefly attracted him in his later years. He died at Sandford Orleigh on 30th December 1893. (R. F. S.)

Bakhtiári, one of the great nomad tribes of Persia, whose camping grounds are in the hilly district known as the Bakhtiári province. This province extends from Chahar Mahál (west of Isfahan) in the E., to near Shushtar in the W., and separated from Luristán in the N. by the Dizful river (Ab i Diz), and in the S. touches Behbahán and Ram Hormuz. The Bakhtiári are divided into the two great divisions Haft-lang and Chahar-lang, and a number of branches and clans, and were known until the 15th century as the "Great Lurs," the "Little Lurs" being the tribes settled in the district now known as Luristán, with Khorremábád as capital. According to popular tradition the Lurs originally came from Syria in the 10th century, but it is now held that they were in Persia long, perhaps fifteen centuries, before. They speak the Lur language, a Persian dialect. The Bakhtiári number about 38,000 or 40,000 families, under 200,000 souls, while the area of the district occupied by them is about 25,000 square miles. About fifty or sixty years ago they could put 20,000 well-equipped horsemen into the field, but in consequence of misrule and long-lasting feuds between the different branches, which the Government often fostered, or even instigated, the district has become poor, and it would now be difficult to find 4000 horsemen. The province is under the governor-general of Arabistan, and pays a yearly tribute of about £5000. The chiefs of the Bakhtiári, in 1897, having obtained the Shah's permission for improving the road between Shushtar, or Ahváz, and Isfahan, an iron suspension bridge with a span of 120 feet was erected over the Karun river at Gudár i Balútek; another, with a span of 70 feet, over the Bázuft river at Pul i Amárat; and a stone bridge over the Karun at Do-pu-lán. A great part of the traffic from the Persian Gulf to Isfahan will probably now be diverted from the Bushire-Shiraz-Isfahan road to the Ahvaz-Bakhtiári-Isfahan one.

For accounts of the Bakhtiári and their country the following works may be consulted with advantage:—Mrs Bishop. *Journeys in Persia and Kurdistan.* London, 1893.—C. de Bode. *Travels in Luristan.* London, 1841.—Hon. G. N. Curzon. *Persia and the Persian Question,* vol. ii. 283-303. London, 1892.—Sir H. Layard. *Early Adventures in Persia.* London, 1894. (A. H.-S.)

Bakony, a large chain of mountains in south-west Hungary, E. of the Alps, in the counties of Veszprém, Zala, and Fejér. It extends some 68 miles from south-west to north-east, and 18 to 31 miles from north-west to south-east. The highest peak is Köröshegy (2339 feet). On the shores of Lake Balaton the range has many beautiful basaltic cones, and its other peaks are also mostly coniform or dome-shaped, being richly covered with beech-woods. Formerly the Bakony was a wild forest, full of game, but its wild character has disappeared. Only the stag, deer, and badger are now found in any numbers. Glass-works, porcelain manufactories, forges, and sawmills have been built on its wooded slopes. The soil produces grapes yielding excellent wine, and on the tops of the hills are many romantic ruins of old castles.

Baku, a Russian government of Transcaucasia, bounded by the Caspian Sea from 41° 50′ to 38° 30′ N. lat. in the E., and the Russian provinces of Daghestan and Elisabethpol and Persia in the W. and S. It covers part of the plains on the north-east slope of the Caucasus (Kuba plain); the south-east extremity of the main Caucasus range, from Shah-dagh and Bazardyuz to the Caspian, where it ends in the Apsheron peninsula; the low plains and steppes of the lower Kura; and finally a narrow belt of the slopes of the Anti-Caucasus plateaus, steeply falling about Lenkoraň to the Caspian Sea, where the gulf of Kyzyl-agach, protected by a peninsula of the same name, is formed. The province is watered by the lower Kura and by a number of small rivers.

The northern part, on both slopes of the Caucasus, is very fertile and well irrigated, with fine forests and rich fields (partly rice) and gardens. Shemakha is renowned for silkworm culture. The plains on the Kura are also fertile, but require irrigation, especially for the cotton-tree plantations. The Mugaň and Shirvan steppes are richly covered with grass from October to March. The fisheries at the mouth of the Kura (Bozhiy Promysel) are the richest in Russia. The Lenkoraň district has a very warm climate (year, 58° Fahr.; January, 38°; July, 79°), and has a large rainfall (47·6 in.), *i.e.*, five times as much as Baku. Rice-fields and rich gardens are characteristic of the district. The Apsheron peninsula is dry and nearly devoid of vegetation, but it contains very rich naphtha wells, the richest of which are 8 miles E.N.E. and 3 miles S.W. of Baku. The extraction of naphtha, which attained only 5500 tons in 1863, has grown rapidly, reaching 7,380,000 tons in 1898. The wells, opened by boring 500 to 680 feet deep, throw out enormous quantities of naphtha mixed with sea-water (up to 10,000 tons a day); 765,000 tons of refined paraffin oil were obtained in the same year, and 788,000 exported abroad. It is exported in cistern-ships and railway carriages. The vine tree is widely grown, as also the mulberry tree for silkworm rearing, especially in the district of Shemakha. Spirit is obtained in large quantities. Permanent population (1897), 789,659; 814,789 according to the Caucasus census of 1896. Of the 712,703 inhabitants inscribed in 1891, only 42,430 were Russians, 376,520 were Tatars, 118,165 Tates, 55,460 Armenians, 50,510 Talyshins, 41,784 Kyurins, and so on. It is divided into six districts, the chief towns of which are:—Baku, capital of the province (112,253 inhabitants in 1897); Geok-chai (2247 in 1896); Saliany, chief town of Jevat district (10,168); Kuba (15,346); Lenkoraň (8768); Shemakha (20,008).

Baku, capital of the above province, on the S. coast of the Apsheron peninsula, 381 miles by rail E.S.E. of Tiflis, 40° 21′ N. and 49° 50′ E., is now connected by a railway with the seaport of Petrovsk, and consequently with the Russian railway system *via* Vladikavkaz. No other town of Russia has developed as rapidly as Baku, its population having grown from 13,381 in 1860 to 112,253 in 1897.

Baku has in its southern part a stone quay, 1⅛ mile long, the governor's house, the old garden of the khans, and many rich shops. Numbers of well-paved streets with good European buildings spread inwards, while the Asiatic town, with narrow winding streets, is built in terraces on the slope of a hill. Here are the ruins of a once beautiful palace of the khans built in the 15th century, the mosque of the shahs built in 1078, and, by the sea, the "tower of the girls," now transformed into a lighthouse. The "black town," with its naphtha wells and works, lies to the north. The climate of Baku is extreme, the average temperature being: year, 58° Fahr.; January, 38°; July, 80°; yearly rainfall, 9·4 inches. A north-north-west wind of exceptional force blows occasionally in winter. Owing to its good harbour and fortunate position, Baku is also the chief depot for all sorts of goods coming from Persia and Transcaucasia—raw cotton, rice, silk, wine, fish, dried fruit, and timber—as also for Russian manufactured goods. The port is visited yearly by 3550 steamers and about 2200 sailing vessels.

Balaghat (=above the *ghats* or passes, the highlands), a district of British India in the Nagpur division of the Central Provinces. The administrative headquarters are at the town of Burha. The district contains an area of 3139 square miles. The population in 1891 was

383,331, being 122 persons per square mile; Hindus numbering 282,169, Mahommedans 6901, aborigines 93,917 (chiefly Gonds), Christians 35, of whom 14 were Europeans. In 1901 the population was 326,704, showing a decrease of 15 per cent., due to the effects of famine. The total amount of land revenue and rates was returned as Rs.1,18,835, the incidence of assessment being Rs.0:3:6 per acre of assessed area; the number of police was 237. In 1897-98, out of a total cultivated area of 332,761 acres, 51,827 were irrigated from tanks, &c. A large part of the area (554,313 acres) is still covered with forest, the most valuable timber-tree being *sal*. There are no railways, and few good roads. In 1897-98 there were 66 schools, attended by 3791 pupils. The district suffered very severely from the famine of 1896-97. In 1897 the death-rate was returned at 84 per 1000, rising to 307 in the town of Burha. It suffered again in 1900, when in April the number of persons relieved rose above 100,000.

Balakovo, a village of south-eastern Russia, government of Samara, 10 miles above the mouth of the Irghiz. It is one of the chief river ports on the Volga. Nearly 167,000 tons of grain are exported every year, while manufactured goods are imported for a wide and wealthy prairie region. It also contains iron works. The population is 15,995.

Balance of Trade.—This term belongs originally to the period of Political Economics when the "mercantile theory" prevailed, but it is still in use, though not quite perhaps in the same way as at its origin. The "balance of trade" was then identified with the sum of the precious metals which a country received in the course of its trading with other countries or with particular countries. There was no doubt an idea that somehow or other the amount of the precious metals received represented profit on the trading, and each country desired as much profit as possible. Princes and sovereigns, however, with political aims in view, were not close students of mercantile profits, and would probably have urged the acquisition of the precious metals as an object of trade even if they had realized that the country as a whole was exporting "money's worth" in order to buy the precious metals which were desired for political objects. The "mercantile theory" was exploded by Adam Smith's demonstration that gold and silver were only commodities like others with no special virtue in them, and that they would come into a country when there was a demand for them, according to the amount, in proportion to other demands, which the country could afford to pay; but the ideas in which the theory itself have originated have not died out, and the idea especially of a "balance of trade" to which the rulers of a country should give attention is to be found in popular discussions of business topics and in politics, the general notion being that a nation is prosperous when its statistics show a "trade balance" in its favour and unprosperous when the reverse is shown. In recent times the excess of imports over exports or of exports over imports, shown in the statistics of foreign trade, has also come to be identified in popular speech with the "balance of trade," and many minds are no doubt imbued with the ideas (1) that an excess of imports over exports is bad, and (2) an excess of exports over imports is the reverse, because the former indicates an "unfavourable" and the latter a "favourable" trade balance. In the former case it is urged that a nation so circumstanced is living on its capital. Exact remedies are not suggested, although the idea of preventing or hampering foreign imports as a means of developing home trade and of thus altering the supposed disastrous trade balance is obviously the logical inference from the arguments. A consideration of these ideas, and of recent discussions about imports and exports, appears accordingly to be needed, although the mercantile theory is itself exploded.

The phrase "balance of trade," then, appears to be an application of a trader's language in his own business to the larger affairs of nations or rather of the aggregate of individuals in a nation engaged in foreign trade. A trader in his own books sets his sales against his purchases, and the amount by which the former exceed the latter is his trade balance or profit. What is true of the individual, it is assumed, must be true of a nation or of the aggregate of individual traders in a nation engaged in the foreign trade. If their collective sales amount to more than their collective purchases the trade balance will be in their favour, and they will have money to receive. Contrariwise, if their purchases amount to more than their sales, they will have to pay money, and they will presumably be living on their capital. The argument fails, however, in many ways. Even as regards the experience of the individual trader, it is to be observed that he may or may not receive his profit, if any, in money. As a rule he does not do so. As the profit accrues he may invest it either by employing labour to add to his machinery or warehouses, or by increasing his stock-in-trade, or by adding to his book debts, or by a purchase of stocks or shares outside his regular business. At the end of a given period he may or may not have an increased cash balance to show as the result of his profitable trading. Even if he has an increased cash balance, according to the modern system of business, this might be a balance at his bankers', and they in turn may have invested the amount so that there is no stock of the precious metals, of "hard money," anywhere to represent it. And the argument fails still further when applied to the transactions between nations, or rather, to use the phrase already employed, between the aggregate of individuals in nations engaged in the foreign trade. It is quite clear that if a nation, or the individuals of a nation, do make profit in their foreign trading, the amount may be invested as it accrues—in machinery, or warehouses, or stock-in-trade, or book debts, or stocks and shares purchased abroad, so that there may be no corresponding "balance of trade" to bring home. There is no doubt also that what may be is in reality what largely happens. A prosperous foreign trade carried on by any country implies a continuous investment by that country either abroad or at home, and there may or may not be a balance receivable in actual gold and silver.

In another particular the argument also fails. In the aggregate of individual trading with foreign countries, there may sometimes be purchases and sales as far as the individuals are concerned, but not purchases and sales as between the nations. We see this in the dealings with foreign governments. Goods are exported from the United Kingdom, ammunition and stores and ships, which appear in the British returns as exports, and which have really been sold by individual British traders to individuals abroad; but these sales are not set off by any purchases on the other side which come into the international account, as the set-off is a loan by the people of one country to the people or government of another. The same with the export of railway and other material when goods are exported for the purpose of constructing railways or other works abroad. The sales are made by individuals here to individuals abroad; but there is no set-off of purchases on the other side. *Mutatis mutandis* the same explanation applies to the remittance of goods by one country to another, or by individuals in one country to individuals in another to pay the interest or repay the capital of loans which have been received in

former times. These are all cases of the movement of goods irrespective of international sales and purchases, though the movements themselves appear in the international records of imports and exports, and therefore it seems to be assumed, though without any warrant, in the international records of the balance of trade. There is yet another failure in the comparison. The individual trader would include in his sales and purchases services such as repairs performed by him for others, and similar services which others do for himself; but no similar accounts are kept of the corresponding portions of international trade such as the earning of freights and commissions, although in strictness, it is obvious, they belong as much to international trade as the imports and exports themselves, which cannot therefore show a complete "balance of trade."

The illusions which may result then from the confusion of ideas between a balance of trade or profit, and a balance of cash paid or received, and from the identification of an excess of imports over exports or of exports over imports with the balance of trade itself, though they are not the same things, hardly need description. The believers in such illusions are not entitled to any hearing as economists, however much they may be accepted in the market-place or among politicians.

The "balance of trade" and "the excess of imports over exports" are thus simply pitfalls for the amateur and the unwary. On the statistical side, moreover, there is a good deal more to be urged in order to impress the student with care and attention. The records of imports and exports themselves may vary from the actual facts of international purchases and sales. The actual values of the goods imported and paid for by the nation may vary from the published returns of imports which are, by the necessity of the case, only estimated values. And so with the exports. The actual purchases and sales may be something very different. A so-called sale may prove abortive through its not being paid for at all, the debtor failing altogether. In any case the purchases of a year may not be paid for by the sales of the year, and the "squaring" of the account may take a long time. Still more the estimates of value may be so taken as not to give even an approximately correct account as far as the records go. Thus in the plan followed in the United Kingdom imports are valued as at the port where they arrive and exports at the port where they are despatched from—a plan which so far places them on an equal footing for the purpose of striking a balance of trade. But in the import and export records of the United States a different plan is followed. The imports are no longer valued as at the port of arrival with the freight and other charges included, but as at the port of shipment. The results on the balance of trade drawn out must accordingly be quite different in the two cases. With other countries similar differences arise. To deduce then from records of imports and exports any conclusions as to the excess of imports or exports at different times is a work of enormous statistical difficulty, quite apart from the farther difficulties of substance above described which beset the problem.

It remains only to notice that the country which presents the most interesting questions in connexion with the study is the United Kingdom, which has by far the largest foreign trade. Its annual imports and exports, excluding bullion, exceed 800 millions sterling, and the bullion one year with another is 100 millions more. Its excess of imports moreover in the last forty years has gradually risen from a small figure to 180 millions sterling annually, and has given rise mainly to the popular discussion referred to respecting an "adverse" balance of trade, and particularly to the belief existing in many quarters that the nation is living on its capital. The result has been a new investigation of the subject, so as to bring out and present the credits to which the country is entitled in its trade as a shipowner and commission merchant, and to exhibit at the same time the magnitude of British foreign investments, which cannot be less than 2000 millions sterling and must bring in an enormous annual income. Other countries, however, such as France, Germany, Belgium, Holland, Denmark, Norway, and Sweden, are in the same condition, though their foreign trade is not on the same scale, and similar rules apply to the reading of their import and export accounts. The United States, on the other hand, is a conspicuous instance of a country which as yet is in the position of a borrower and has a large excess of exports over imports, though there are signs of a change in the opposite direction. New countries generally, such as Canada, Australia, and the South American countries, resemble the United States. Comparisons are made difficult by the want of uniformity in the methods of stating the figures, but that different countries have to be grouped according as they are indebted or creditor countries is undeniable, and no study of the trade statistics is possible without recognition of the underlying economic circumstances.

In conclusion it may be useful to repeat the main propositions laid down as to the balance of trade. (1) A "balance of trade" to the individual trader, from whose experience the phrase comes, is not necessarily, as is supposed, a balance received or receivable in the precious metals. It may be invested as it accrues—in machinery, or warehouses, or stock-in-trade, or in book debts, or in stocks and shares or other property outside the trader's business, as well as in cash. (2) What is true of the individual trader is also true of the aggregate of individuals engaged in the foreign trade of a country. Cash is only one of the forms in which they may elect to be paid. (3) The imports and exports recorded in the statistical returns of a country do not correspond with the purchases and sales of individual traders, as the sales especially may be set off by loans, while the so-called imports may include remittances of interest and of capital repaid. (4) When capital is repaid the country receiving it need not be living on it, but may be investing it at home. (5) The foreign trading of countries may also comprise many transactions, such as the earning of freights and commissions, which ought to appear in a proper account showing a balance of trade, as similar transactions appear in an individual trader's account, but which are not treated as imports or exports in the statistical returns of a nation's foreign trade. (6) Import and export returns themselves are not the same as accounts of purchases and sales; the values are only estimates, and must not be relied on literally without study of the actual facts. (7) Import and export returns in different countries are not in all cases taken at the same point, there being important variations, for instance, in this respect between the returns of two great countries, the United Kingdom and the United States, which are often compared, but are really most difficult to compare. (8) The United Kingdom is a conspicuous instance of a country which has a great excess of imports over exports in consequence of its large lending abroad in former times; while its accounts are specially affected by the magnitude of its services as a trading nation carrying passengers and goods all over the world, which do not result, however, in so-called "exports." The United States, on the other hand, is a conspicuous instance of an indebted nation, which has or had until lately few or no sums to its credit in foreign trade except the visible exports. (9) The various countries of the world naturally fall into groups. The nations of Western Europe, such as France, Germany, Belgium, Holland, with Sweden and Norway, fall into a group with Great Britain as creditor nations, while Canada, Australasia, and the South American countries fall into a group with the United States as

undeveloped and indebted countries. So also of other countries. Each belongs naturally to one group or another. (10) The excess of imports or exports may vary indefinitely at different times according as a creditor country is receiving or lending at the time, or according as a debtor country is borrowing or paying off its debts at the time, but the permanent characteristics are always to be considered.

(R. Gr.)

Balanoglossus is the general name given to certain peculiar opaque worm-like animals which live an obscure life under stones, and burrow in the sand from between tide-marks down to the abyssal regions of the sea. Their colour is usually some tone of yellow with dashes of red, brown, and green, and they frequently emit a pungent odour. The name has reference to the tongue-shaped muscular proboscis by which the animal works its way through the sand. The proboscis is not the only organ of locomotion, being assisted by the succeeding segment of the body, the buccal segment or collar. By the waves of contraction executed by the proboscis accompanied by inflation of the collar, progression is effected, sometimes with marvellous rapidity. The third body-region or trunk may attain a great length, one or two feet, or even more, and is also muscular, but the truncal muscles are of subordinate importance in locomotion, serving principally to promote the peristaltic contractions of the body by which the food is carried through the gut. The function of alimentation is closely associated with that of locomotion, somewhat as in the burrowing earthworm; in the excavation of its burrows the sand is passed through the body, and any nutrient matter that may adhere to it is extracted during its passage through the intestine, the exhausted sand being finally ejected through the vent at the orifice of the burrow and appearing at low tide as a worm casting. In accordance with this manner of feeding, the mouth is kept permanently open and prevented from collapsing by a pair of skeletal cornua belonging to a sustentacular apparatus (the **nuchal skeleton**), the body of which lies within the narrow neck of the proboscis; the latter is inserted into the collar and surrounded by the anterior free flap of this segment of the body.

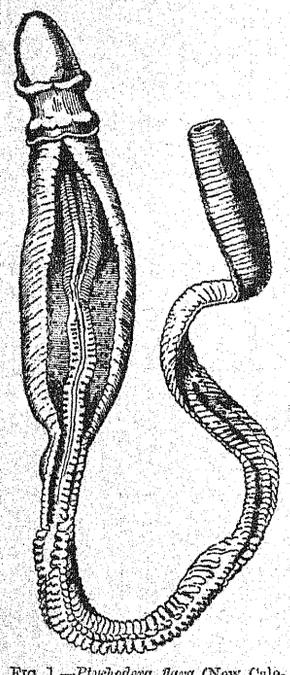

Fig. 1.—*Ptychodera flava* (New Caledonia), from above; about life size.

When first discovered by Eschscholtz at the Marshall Islands in 1825, Balanoglossus was described as a worm-like animal belonging to the Echinoderm order of Holothurians or sea-cucumbers. In 1865 Kowalevsky discovered that the organs of respiration consist of numerous pairs of gill-slits leading from the digestive canal through the thickness of the body-wall to the exterior. On this account the animal was subsequently placed by Gegenbaur in a special class of Vermes, the **Enteropneusta**. In 1883-86 Bateson showed by his embryological researches that the Enteropneusta exhibit chordate (vertebrate) affinities in respect of the cœlomic, skeletal, and nervous systems as well as in regard to the respiratory system, and, further, that the gill-slits were formed upon a plan similar to that of the gill-slits of Amphioxus, being subdivided by tongue-bars which depend from the dorsal borders of the slits.

Cœlom and Pore-canals.—In correspondence with the tri-regional differentiation of the body in its external configuration, the **cœlom** (body-cavity, perivisceral cavity) is divided into three portions completely separated from one another by septa:—(1) proboscis-cœlom, or first body-cavity; (2) the collar-cœlom, or second body-cavity; (3) truncal cœlom, or third body-cavity. Of these divisions of the cœlom the first two communicate with the exterior by means of a pair of ciliated **pore-canals** placed at the posterior end of their respective segments. The proboscis-pores are highly variable, and frequently only one is present, that on the left side; sometimes the pore-canals of the proboscis unite to open by a common median orifice, and sometimes their communication with the proboscis-cœlom appears to be occluded, and finally the pore-canals may be quite vestigial. The collar-pores are remarkable for their constancy; this is probably owing to the fact that they have become adapted to a special function, the inhalation of water to render the collar turgid during progression. There are reasons for supposing that the truncal cœlom was at one time provided with pore-canals, but supposed vestiges of these structures have only been described for one genus, *Spengelia*, in which they lie near the anterior end of the truncal cœlom.

Enteron.—Not only is the cœlom thus subdivided, but the enteron (gut, alimentary canal, digestive tube) itself shows indications of three main subsections in continuity with one another:—(1) proboscis-gut ("Eicheldarm," stomochord, *vide infra*); (2) collar-gut (buccal cavity, throat); (3) truncal gut extending from the collar to the vent.

Stomochord.—The proboscis-gut occurs as an outgrowth from the anterior dorsal wall of the collar-gut, and extends forwards into the basal (posterior) region of the proboscis, through the neck into the proboscis-cœlom, ending blindly in front. Although an integral portion of the gut, it has ceased to assist in alimentation, its epithelium undergoes vacuolar differentiation and hypertrophy, and its lumen becomes more or less vestigial. It has, in fact, become metamorphosed into a resistant supporting structure resembling in some respects the notochord of the true Chordata, but probably not directly comparable with the latter structure, being related to it solely by way of substitution. On account of the presence and mode of origin (from the gut-wall) of this organ Bateson introduced the term **Hemichorda** as a phyletic name for the class Enteropneusta. As the proboscis-gut appears to have undoubtedly skeletal properties, and as it also has topographical relations with the mouth, it has been designated in English by the non-committal term stomochord. It is not a simple diverticulum of the collar-gut, but a complex structure possessing paired lateral pouches and a ventral convexity (ventral cæcum), which rests in a concavity at the front end of the body of the nuchal skeleton (Fig. 3). In some species (Spengelidæ) there is a long capillary vermiform extension of the stomochord in front. The **nuchal skeleton** is a non-cellular laminated thickening of basement-membrane underlying that portion of the stomochord which lies between the above-mentioned pouches and the orifice into the throat. At the point where the stomochord opens into the buccal cavity the nuchal skeleton bifurcates, and the two cornua thus produced pass obliquely backwards and downwards embedded in the wall of the throat, often giving rise to projecting ridges that bound a dorsal groove of the collar-gut which is in continuity with the wall of the stomochord (Fig. 3).

Nervous System.—At the base of the epidermis (which is in general ciliated) there is over the entire surface of the body a layer of nerve-fibres, occurring immediately outside the basement-membrane which separates the epidermis from the subjacent musculature. The nervous system is thus essentially epidermal in position and diffuse in distribution; but an interesting concentration of nerve-cells and fibres has taken place in the collar-region, where a medullary tube, closed in from the outside, opens in front and behind by anterior and posterior neuropores. This is the collar nerve-tube. Sometimes the central canal is wide and uninterrupted between the two neuropores; in other cases it becomes broken up into a large number of small closed medullary cavities, and in others again it is obsolete. In one family, the Ptychoderidæ, the medullary tube of the collar is connected at intermediate points with the epidermis by means of a variable number of unpaired outgrowths from its dorsal wall, generally containing an axial lumen derived from and in continuity with the central canal. These hollow **roots** terminate blindly in the dorsal epidermis of the collar, and place the nervous layer of the latter in direct connexion with the fibres of the nerve-tube. The exact significance of these roots is a matter for speculation, but it seems possible that they are epiphysial

structures remotely comparable with the epiphysial (pineal) complex of the craniate vertebrates. In accordance with this view there would be also some probability in favour of regarding the collar nerve-tube of the Enteropneusta as the equivalent of the cerebral vesicle only of Amphioxus and the Ascidian tadpole, and also of the primary fore-brain of vertebrates.

Special thickenings of the diffuse nervous layer of the epidermis occur in certain regions and along certain lines. In the neck of the proboscis the fibrous layer is greatly thickened, and other intensifications of this layer occur in the dorsal and ventral middle lines of the trunk extending to the posterior end of the body. The dorsal epidermal nerve-tract is continued in front into the ventral wall of the collar nerve-tube, and at the point of junction there is a circular commissural thickening following the posterior rim of the collar and affording a special connexion between the dorsal and ventral nerve-tracts. From the ventral surface of the collar nerve-tube numerous motor fibres may be seen passing to the subjacent musculature. These fibres are not aggregated into roots.

Gill-slits.—The possession of gill-slits is as interesting a feature in the organization of Balanoglossus as is the presence of tracheæ in Peripatus. These gill-slits occupy a variable extent of the anterior portion of the trunk, commencing immediately behind the collar-trunk septum. The branchial bars which constitute the borders of the clefts are of two kinds:—(1) **Septal bars** between two contiguous clefts, corresponding to the primary bars in Amphioxus; (2) **Tongue-bars.** The chief resemblances between Balanoglossus and Amphioxus in respect of the gill-slits may be stated briefly as follows:—(*a*) the presence of two kinds of branchial bars in all species and also of small cross-bars (synapticulæ) in many species; (*β*) numerous gill-slits, from forty to more than a hundred pairs; (*γ*) the addition of new gill-slits by fresh perforation at the posterior end of the pharynx throughout life. The chief differences are, that (*a*) the tongue-bar is the essential organ of the gill-slit in Balanoglossus, and exceeds the septal bars in bulk, while in Amphioxus the reverse is the case; (*b*) the tongue-bar contains a large cœlomic space in Balanoglossus, but is solid in Amphioxus; (*c*) the skeletal rods in the tongue-bars of Balanoglossus are double; (*d*) the tongue-bar in Balanoglossus does not fuse with the ventral border of the cleft, but ends freely below, thus producing a continuous U-shaped cleft. The meaning of this singular contrast between the two animals may be that we have here an instance of an interesting gradation in evolution. From serving primitively as the essential organ of the cleft the tongue-bar may have undergone reduction and modification, becoming a secondary bar in Amphioxus, subordinate to the primary bars in size, vascularity, and development; finally, in the craniate vertebrates it would then have completed its involution, the suggestion having been made that the tongue-bars are represented by the thymus-primordia.

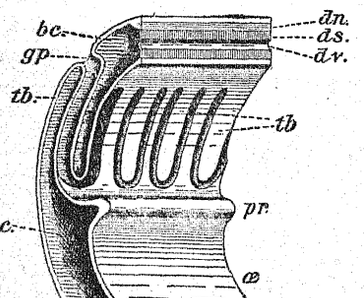

FIG. 2.—Structure of branchial region. *bc*, cœlom; *gp*, gill-pore; *tb*, tongue-bars; *dn*, dorsal nerve; *ds*, mesentery; *dv*, vessel; *pr*, ridge; *œ*, œsophagus; *vv*, vessel; *vs*, mesentery; *vn*, ventral nerve.

Gill-pouches and Gill-pores.—Only rarely do the gill-slits open freely and directly to the exterior (Fig. 1). In most species of Balanoglossus each gill-slit may be said to open into its own atrial chamber or **gill-pouch**; this in its turn opens to the exterior by a minute **gill-pore.** There are, therefore, as many gill-pouches as there are gill-slits, and as many gill-pores as pouches. The gill-pores occur on each side of the dorsal aspect of the worm in a longitudinal series at the base of a shallow groove, the **branchial groove.** The respiratory current of water is therefore conducted to the exterior by different means from that adopted by Amphioxus, and this difference is so great that the theory which seeks to explain it has to postulate radical changes of structure, function, and topography.

Excretory and Vascular Systems.—It seems likely that the cœlomic pore-canals were originally excretory organs, but in the existing Enteropneusta the pore-canals (especially the collar canals) have, as we have seen, acquired new functions or become vestigial, and the function of excretion is now mainly accomplished by a structure peculiar to the Enteropneusta called the **glomerulus,** a vascular complex placed on either side of the anterior portion of the stomochord, projecting into the proboscis-cœlom. The vascular system itself is quite peculiar, consisting of lacunæ and channels destitute of endothelium, situated within the thickness of the basement-membrane of the body-wall, of the gut-wall, and of the mesenteries. The blood, which is a non-corpuscular fluid, is propelled forwards by the contractile dorsal vessel and collected into the **central blood-sinus**; this lies over the stomochord, and is surrounded on three sides by a closed vesicle, with contractile walls, called the **pericardium** ("Herzblase"). By the pulsation of the pericardial vesicle (best observed in the larva) the blood is driven into the glomerulus, from whence it issues by efferent vessels which effect a junction with the ventral (sub-intestinal) vessel in the trunk. The vascular system does not readily lend itself to morphological comparison between such widely different animals as Balanoglossus and Amphioxus, and the reader is therefore referred to the memoirs cited at the end of this article for further details.

Reproductive System.—The sexes are separate, and when mature are sometimes distinguished by small differences of colour in the genital region. Both male and female gonads consist of more or less lobulated hollow sacs connected with the epidermis by short ducts. In their disposition they are either uniserial, biserial, or multiserial. They occur in the branchial region, and also extend to a variable distance behind it. In exceptional cases they are either confined to the branchial region or excluded from it. When they are arranged in uniserial or biserial rows the genital ducts open into or near the branchial grooves in the region of the pharynx, and in a corresponding position in the post-branchial region. An important feature is the occurrence in some species (Ptychoderidæ) of paired longitudinal pleural or lateral folds of the body which are mobile, and can be approximated at their free edges so as to close in the dorsal surface, embracing both the median dorsal nerve-tract and the branchial grooves with the gill-pores, so as to form a temporary peribranchial and medullary tube, open behind where the folds cease. On the other hand, they can be spread out horizontally so as to expose their own upper side as well as the dorsal surface of the body (Fig. 1). These folds are called the **genital pleuræ** because they contain the bulk of the gonads. Correlated with the presence of the genital pleuræ there is a pair of vascular folds of the basement membrane proceeding from the dorsal wall of the gut in the post-branchial portion of the branchio-genital region, and from the dorsal angles made by the pleural folds with the body-wall in the pharyngeal region; they pass, in their most fully developed condition, to the free border of the genital pleuræ. These vascular membranes are called the **lateral septa.** Since there are many species which do not possess these genital pleuræ, the question arises as to whether their presence or their absence is the more primitive condition. Without attempting to answer this question categorically, it may be pointed out that within the limits of the family (Ptychoderidæ) which is especially characterized by their presence there are some species in which the genital pleuræ are quite obsolete, and yet lateral septa occur (*e.g. Ptychodera ruficollis*), seeming to indicate that the pleural folds have in such cases been secondarily suppressed.

Development.—The development of Balanoglossus takes place according to two different schemes, known as **direct** and **indirect,** correlated with the occurrence in the group of two kinds of ova, large and small. Direct development, in which the adult form is achieved without striking metamorphosis by a gradual succession of stages, seems to be confined to the family Balanoglossidæ. The remaining two families of Enteropneusta, Ptychoderidæ and Spengelidæ, contain species of which probably all pursue an indirect course of development, culminating in a metamorphosis by which the adult form is attained. In these cases the larva, called *Tornaria*, is pelagic and transparent, and possesses a complicated ciliated seam, the longitudinal ciliated band, often drawn out into convoluted bays and lappets. In addition to this ciliated band the form of the *Tornaria* is quite characteristic and unlike the adult. The *Tornaria* larva offers a certain similarity to larvæ of Echinoderms (sea-urchins, star-fishes, and sea-cucumbers), and when first discovered was so described. It is within the bounds of possibility that *Tornaria* actually does indicate a remote affinity on the part of the Enteropneusta to the Echinoderms, not only on account of its external form, but also by reason of the possession of a dorsal **water-pore** communicating with the anterior body-cavity. In the direct development Bateson showed that the three divisions of the cœlom arise as pouches constricted off from the archenteron or primitive gut, thus resembling the development of the mesoblastic somites of Amphioxus. It would appear that while the direct development throws light upon the special plan of organization of the Enteropneusta, the indirect development affords a clue to their possible derivation. However this may be, it is sufficiently remarkable that a small and circumscribed group like the Enteropneusta, which presents such a comparatively uniform plan of composition and of

external form, should follow two such diverse methods of development.

Distribution.—Some thirty species of Balanoglossus are known, distributed among all the principal marine provinces from Greenland to New Zealand. The species which occurs in the English Channel is *Ptychodera sarniensis*. The Ptychoderidæ and Spengelidæ are predominantly tropical and subtropical, while the Balanoglossidæ are predominantly arctic and temperate in their distribution. One of the most singular facts concerning the geographical distribution of Enteropneusta has recently been brought

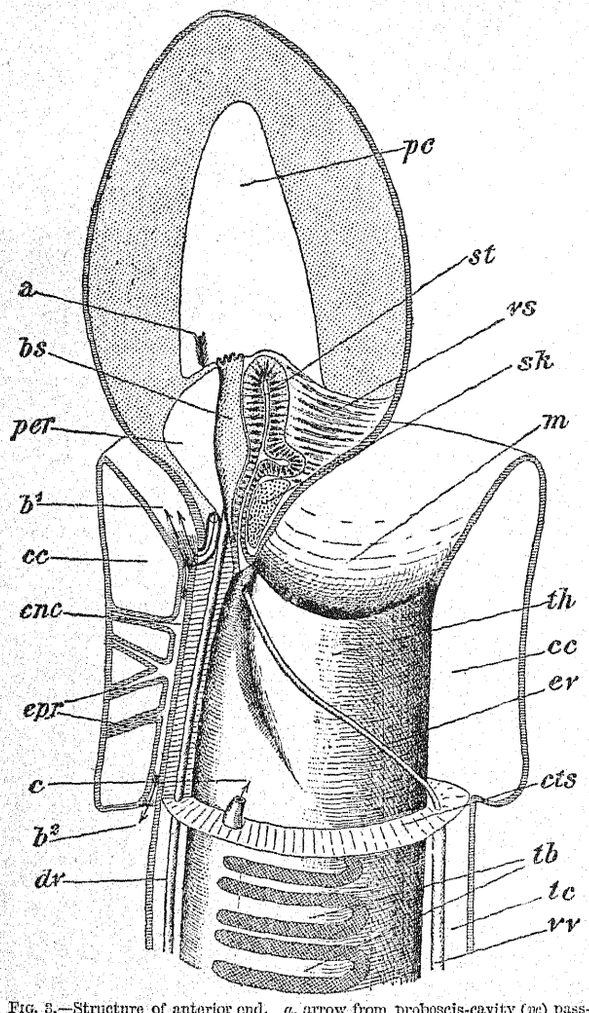

FIG. 3.—Structure of anterior end. *a*, arrow from proboscis-cavity (*pc*) passing to left of pericardium (*per*) and out through proboscis pore-canal; b^1, arrow from central canal of neurochord (*cnc*) passed out through anterior neuropore; b^2, ditto, through posterior neuropore; *c*, arrow intended to pass from 1st gill pouch through collar pore-canal into collar cœlom (*cc*); *cts*, posterior limit of collar; *dv*, dorsal vessel passing into central sinus (*bs*); *ev*, efferent vessel passing into ventral vessel (*vv*); *epr*, epiphysial tubes; *st*, stomochord; *vs*, ventral septum of proboscis; *sk*, body of nuchal skeleton; *m*, mouth; *th*, throat; *tb*, tongue-bars; *tc*, trunk cœlom.

to light by Benham, who found a species of *Balanoglossus s. str.* on the coast of New Zealand hardly distinguishable from one occurring off Japan. Finally, *Glandiceps abyssicola* (Spengelidæ) was dredged during the *Challenger* expedition in the Atlantic Ocean off the coast of Africa at a depth of 2500 fathoms.

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(A. W.*)

Balasore, a town and district of British India, in the Orissa province of Bengal, on the right bank of the river Burabalang, about seven miles from the sea. The town still possesses a large maritime trade, despite the silting-up of the river mouth. It is a station on the East Coast railway. It has a high school, two printing-presses, which each issue a vernacular newspaper, and three literary institutions. Population, about 21,000.

The district of BALASORE, which stretches along the coast between the sea and the hills of Orissa, has an area of 2473 square miles. The population in 1891 was 994,536, giving an average density of 402 persons per square mile; Hindus numbering 969,211, Mahommedans 24,250, Christians 1075, of whom 96 were Europeans. In 1901 the population was 1,081,426, showing an increase of 9 per cent. Land revenue and rates (1897-98) were Rs.4,88,011; the number of police was 396; boys at school (1896-97), 31,277. Almost the only crop grown is rice, which is largely exported by sea. The registered death-rate (1897) was 30·5 per 1000. The former industry of manufacturing salt from sea-brine by boiling in pots is now extinct. The country is exposed to destructive floods from the hill-rivers, and also from cyclonic storm-waves. The district is traversed throughout its entire length by the navigable Orissa coast canal, and also by the East Coast railway, from Calcutta to Madras. The seaports of Balasore, Chandbali, and Dhamra conduct a very large coasting trade, valued in 1897-98 at Rs.1,38,05,460, or nearly a million sterling. The number of vessels that cleared was 420, with a tonnage of 107,919. The exports are almost confined to rice, which is sent to Ceylon, the Maldives, and Mauritius. The imports consist of cotton twist and piece goods, mineral oils, metals, betel-nuts, and salt.

Balaton (PLATTENSEE), the largest lake of Middle Europe, in the south-west of Hungary, situated between the counties of Veszprém, Zala, and Somogy. Its length is 48 miles, average breadth $3\frac{1}{2}$-$4\frac{1}{2}$ miles, greatest breadth $7\frac{1}{2}$ miles, least breadth a little less than 1 mile. It covers 266 square miles, and has a greatest depth of 149 feet. Its northern shores are bordered by the beautiful basaltic cones of the Bakony Mountains, the volcanic soil of which produces grapes yielding excellent wine; the southern consist partly of a marshy plain, partly of downs. The most beautiful point of the lake is that where the peninsula of Tihany projects in the waters. An ancient church of the Benedictines is here situated on the top of a hill. In a tomb therein is buried Andrew I. (*d.* 1061), a king of the Hungarian Arpadian dynasty. The temperature of the water varies greatly, in a manner resembling that of the sea, and many connect its origin with a sea of the Miocene period, the waters of which are said to have covered the Hungarian plain. About fifty streams flow into the lake, which drains into the Danube and is well stocked with fish. It often freezes in winter. Lake Balaton is of growing importance as a bathing resort.

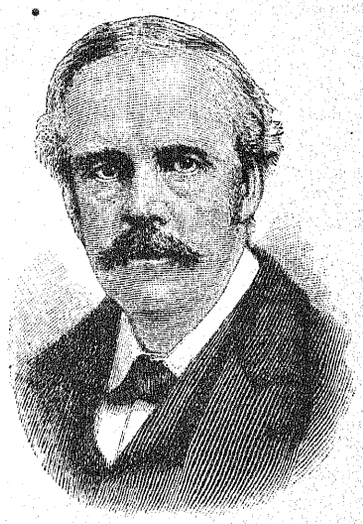
Balayan, a town of 24,700 inhabitants, at the head of the Gulf of Balayan, in the province of Batangas, Luzon, Philippine Islands. It has an extremely healthful climate, and is in the midst of a very fertile district, which produces rice, cacao, coffee, pepper, and cotton. Horses and cattle are raised for market in considerable number. The fisheries are important. The language is Tagalog.

Balearic Islands, a group of islands in the Mediterranean, off the east coast of Spain, of which they

form a province 1860 square miles in area, divided into five administrative districts and sixty-one parishes. The population was 289,035 in 1877, and 312,646 in 1887, when Mallorca contained 248,993 inhabitants, Menorca 38,959, Ibica 22,509, Fromentera 1984, and the smaller islands the remaining 201. In 1897 the total population had decreased to 309,807. This decrease has not been due exclusively to emigration, as barely 650 inhabitants in all depart annually for Algeria or the Spanish mainland. In 1897 the live stock numbered only 176,113 head, this figure including 1737 horses, 17,289 mules, 8928 asses, 7275 cattle, 94,290 sheep, 10,432 goats, and 36,162 pigs. Only 15,000 acres are irrigated, but wheat is grown on 139,535 acres; oats, rye, barley on 101,187 acres; pod fruit on 35,877 acres; vines on 35,460 acres, and the olive on 67,100 acres. The export of oranges has greatly declined, their culture having been abandoned owing to an insect plague. Figs also are now only used to feed live stock and for consumption in the province. Besides the salt mines of Ibica, eight lignite, and ten lead mines are actually worked in the islands, and there are seventy-four unproductive mines, mostly lignite. The output of lignite amounted to 18,000 tons in 1898. The means of communication are being improved by the local corporations. Forty-eight miles of railways have been completed in Mallorca, the main line (40 miles) running from Palma to Manacor. The standard of primary education is well up to the average for Spain, and there are higher schools in the principal towns. The local industries are thriving. Shoemaking is one of the most prosperous trades in the islands. There is not a very active trade direct with foreign countries, as the principal imports—cotton, leather, petroleum, sugar, coal, and timber—are introduced into the islands through Barcelona. The export trade is chiefly with the peninsula, France, Italy, Algeria, and the Spanish West Indies. Most of the agricultural products are sent to the peninsula; wine, figs, marble, almonds, lemons, and rice, to Europe and Africa. In 1898 the imports of the Balearic isles were valued at £143,687 and the exports at £442,942.

The best modern work on the Balearics is that of the Archduke Ludwig Salvator, published in several volumes at Leipzig 1869-90, of which an abridged edition in Spanish was published at Palma in 1886. (A. E. H.)

Balfour, Arthur James (1848-——), British statesman, eldest son of the late James Maitland Balfour of Whittinghame, Haddingtonshire, and of Lady Blanche Gascoyne Cecil, second daughter of the second Marquis of Salisbury, was born 25th July 1848. He was educated at Eton and Trinity College, Cambridge. In 1874 he was elected in the Conservative interest for Hertford, and represented that constituency until 1885. When, in the spring of 1878, Lord Salisbury became Foreign Minister on the resignation of the 15th Lord Derby, Mr Balfour became his private secretary. In that capacity he accompanied Lord Salisbury to the Berlin Congress, and gained his first experience of international politics in connexion with the settlement of the Russo-Turkish conflict. It was at this time also that he became known in the world of letters, the intellectual subtlety and literary capacity of his *Defence of Philosophic Doubt* (1879) suggesting that he could, if he chose, make a reputation as a speculative thinker. Belonging, however, to a class to which the responsibilities of government are a traditional duty, Mr Balfour divided his time between the political arena and the study. Being released from his duties as private secretary by the general election of 1880, he began to take a rather more active part in parliamentary affairs. He was for a time politically associated with Lord Randolph Churchill, Sir Henry Drummond Wolff, and Sir John (then Mr) Gorst, the quartette becoming known as the "Fourth Party," and gaining notoriety by the freedom of the criticisms directed by its leader, Lord Randolph Churchill, against Sir Stafford Northcote, Lord Cross, and other prominent members of the "old gang." In these sallies, however, Mr Balfour had no direct share. He was thought to be merely amusing himself with politics. It was regarded as doubtful whether his health could withstand the severity of English winters, and the delicacy of his physique and the languor of his manner helped to create the impression that, however great his intellectual powers might be, he had neither the bodily strength nor the energy of character requisite for a political career.



Arthur James Balfour.
(From a photograph by Elliott and Fry, London.)

He was the "odd man" of the Fourth Party, apparently content to fetch and carry for his colleagues, and was believed to have no definite ambitions of his own. His reputation in the Parliament of 1880-86 was that of a dilettante, who allied himself with the three politicians already named from a feeling of irresponsibility rather than of earnest purpose; he was regarded as one who, on the rare occasions when he spoke, was more desirous to impart an academic quality to his speeches than to make any solid contribution to public questions. The House, indeed, did not take him quite seriously. Members did not suspect the reserve of strength and ability beneath what seemed to them to be the pose of a parliamentary *flaneur*, looking upon him merely as a young member of the governing classes who remained in the House because it was the proper thing for a man of family to do. As a member of the clique known as the "Souls" he was, so to speak, caviare to the general. Indolence was supposed to be the keynote of his character—a refined indolence not, however, without cleverness of a somewhat cynical and superior order.

That these views were not shared by Lord Salisbury is sufficiently shown by the fact that in his first Administration (June 1885-January 1886) he made Mr Balfour President of the Local Government Board, and in forming his second administration (July 1886) secretary for Scotland with a seat in the Cabinet. These offices gave few opportunities for distinction, and may be regarded merely as Mr Balfour's apprenticeship to Departmental responsibilities. The accidents of political life suddenly opened out to him a career which made him, next to Lord Salisbury, the most prominent, the most admired, and the most attacked Conservative politician of the day. Sir Michael Hicks-Beach, who was chief secretary for Ireland, suffered from an affection of the eyes, and found it desirable to resign, and Lord Salisbury appointed his nephew in his stead. The selection took the political world by surprise, and was much criticized. By the Irish Nationalists it was received with contemptuous ridicule, for none suspected Mr Balfour's immense strength of will, his debating power, his ability in attack, and his still greater capacity to disregard

criticism. The debates on the Crimes Bill and the Irish Land Bill quickly undeceived them, and the steady and even remorseless vigour with which the government of Ireland was conducted speedily convinced the House of Commons and the country that Mr Balfour was in his right place as Chief Secretary. His policy was that of "coercion"—the fearless administration of the Crimes Act,—coupled with remedial legislation; and he enforced the one while he proceeded with the other, regardless of the risk of outrage outside the House and of insult within. Mr Balfour's work at this period covered one of the most turbulent and most exciting periods in modern Parliamentary history and Irish administration. With a courage that never faltered he broke down the Plan of Campaign in Ireland, and in Parliament he not only withstood the assaults of the Irish Nationalists, but waged successful warfare with the entire Home Rule party. He combined an iron will with a mastery of facts unsurpassed by any of his predecessors in the Secretaryship. Events, it is true, were in his favour. The disclosures before the Parnell Commission, the O'Shea divorce proceedings, the downfall of Mr Parnell, and the disruption of the Irish party, assisted him in his task; but the fact remains that by persistent courage and undeviating thoroughness he reduced crime in Ireland to a vanishing point. His work was also constructive, for he broadened the basis of material prosperity and social progress by creating the Congested Districts Board in 1890. During this period, from 1886-92, moreover, he developed gifts of oratory which made him one of the most effective of public speakers. Impressive in matter rather than in manner of delivery, and seldom rising to the level of eloquence in the sense in which that quality was understood in a House which had listened to Bright and Gladstone, his speeches were logical and convincing, and their attractive literary form delighted a wider audience than that which listens to the mere politician.

In 1888 Mr Balfour served on the Gold and Silver Commission, currency problems from the standpoint of bimetallism being among the more academic subjects which had engaged his attention. On the death of Mr W. H. Smith in 1891 he became First Lord of the Treasury and leader of the House of Commons, and in that capacity introduced in 1892 a Local Government Bill for Ireland. The Conservative Government was then at the end of its tether, and the project fell through. For the next three years Mr Balfour led the Opposition with great skill and address. On the return of the Unionists to power in 1895 he resumed the leadership of the House, but not at first with the success expected of him, his management of the abortive education proposals of '96 being thought, even by his own supporters, to show a disinclination for the continuous drudgery of parliamentary management under modern conditions. But after the opening session matters proceeded more smoothly, and Mr Balfour regained his old position in the estimation of the House and the country. He had the satisfaction of seeing a Bill pass for providing Ireland with an improved system of local government, and took an active share in the debates on the various foreign and domestic questions that came before Parliament during 1895-1900. His championship of the Voluntary Schools, his adroit Parliamentary handling of the problems opened up by the so-called "crisis in the Church" caused by the Protestant movement against ritualistic practices, and his pronouncement in favour of a Roman Catholic University for Ireland—for which he outlined a scheme that met with much adverse criticism both from his colleagues and his party,—were the most important aspects of Mr Balfour's activity during these years. His speeches and work throughout this period took a wider range than before his accession to the leadership of the Commons. During the illness of Lord Salisbury in 1898, and again in Lord Salisbury's absence abroad, he was in charge of the Foreign Office, and it fell to his lot to conduct the very critical negotiations with Russia on the question of railways in North China. To his firmness, and at the same time to the conciliatory readiness with which he accepted and elaborated the principles of a *modus vivendi*, the two Powers owed the avoidance of what threatened to be a dangerous quarrel. As a member of the Cabinet responsible for the Transvaal negotiations in 1899 he bore his full share of controversy, and during the war his high character and personal charm helped the Government over some awkward places, though in his attitude on the charges of hospital deficiency made by Mr Burdett Coutts, he permitted himself to depart from the suavity which had usually distinguished his conduct in the House. At the general election of 1900 he was returned for East Manchester (which he had represented since 1885) by a majority of 2453, and continued in office as First Lord of the Treasury. His leadership of the House of Commons in the first session of the new Parliament was marked by considerable firmness in the suppression of obstruction, but there was a slight revival of the criticisms which had been current in 1896. Mr Balfour's inability to get the maximum amount of work out of the House must, however, be regarded in relation to the situation in South Africa, which absorbed the intellectual energies of the House and of the country and impeded the progress of legislation. On Lord Salisbury's resignation in July 1902, Mr Balfour succeeded him as Prime Minister, with the cordial approval of all sections of the Unionist party.

Besides the *Defence of Philosophic Doubt* Mr Balfour has published *Essays and Addresses* (1893) and *The Foundations of Belief, being Notes introductory to the Study of Theology*. He was made LL.D. of Edinburgh University in 1881; of St Andrews University in 1885; of Cambridge University in 1888; of Dublin and Glasgow Universities in 1891; Lord Rector of St Andrews University in 1886; of Glasgow University in 1890; Chancellor of Edinburgh University in 1891; Member of the Senate London University in 1888; and D.C.L. of Oxford University in 1891. He is a cultured musician and an enthusiastic golf player, having been captain of the Royal and Ancient Golf Club of St Andrews in 1894-95; his taste for cycling is attested by his presidency of the National Cyclists' Union, 1896.

Bali, an island E. of Java, Dutch East Indies, and separated from it by the Bali Strait. In 1882, for administrative purposes, it was separated from Java and combined with the island of Lombok to form the residency of Lombok and Bali. Politically its divisions are two: (1) the two districts, Buleleng and Jembrana, on Dutch territory; and (2) the autonomous states of Klung Kung, Bangli, Mengui, Badung, and Tabanan. Exploration of the island has proved its geological formation to include (as does that of Java) three regions, the central volcanic, the southern peninsula of Tertiary limestone, and alluvial plains between the older formations. The highest volcanoes, Tabanan, Batur, and Gunung Agung, have respectively the height of 7545, 7383, and 10,497 feet, the central chain having an average altitude of 3282 feet. The only roadstead safe all the year round is Temukus on the north coast. The rivers are not navigable. Agriculture is the chief means of subsistence. Rice is cultivated. Other crops grown for export are coffee, tobacco, cocoa, and indigo. Gold-working, the making of arms and

musical instruments, wood-carving, cotton, silk, and gold thread weaving are of importance. The value of the combined exports and imports of late years has been about £400,000-£500,000. The area of the island is 2240 square miles, the population on Dutch territory being 103,101, and in the autonomous states 1,259,135.

VAN ECK. *Schetsen van het eiland Bali.* Tijdsch. van Nederl. Indie, 1878-79.—Dr. JACOBS. *Eenigen tijd onder de Baliers,* Batavia, 1883.—Dr. TONKES. *Volks Kunde von Bali.* Halle, 1888.—LIEFRINCK. *De rijst cultuur op Bali.* Indische Gids. 1886.

Balikisri, the chief town of the Karási sanjak, in Asia Minor, altitude 575 feet, situated on rising ground above a broad fertile valley which drains to the sea of Marmora. It is a centre of trade in opium, silk, and cereals. Population, 20,000 (Moslems, 15,000; Christians, 5000). The sanjak lies to the south of the sea of Marmora, and is fertile and well-watered. It is also rich in mineral wealth; silver mines are worked at Balia, and boracite mines at Susurlu.

Balkan Peninsula.—The Balkan Peninsula, formerly known as Turkey in Europe, is the most easterly of the three large peninsulas which form the southern extremities of the European continent. Its area is slightly greater than that of the Iberian peninsula, and somewhat less than twice that of Italy. Its northern boundary is generally regarded as marked by the courses of the rivers Danube, Save, and Kulpa; but may, perhaps, be more accurately defined by a line drawn from the Kilia mouth of the Danube to the northern extremity of the Adriatic near Trieste. On the east it is bounded by the Black Sea, the Sea of Marmora, and the Ægean; on the south by the Mediterranean; on the west by the Ionian Sea and the Adriatic. With the exception of the Black Sea coast and the Albanian littoral, its shores are considerably indented and flanked by groups of islands. The Peninsula in its general contour resembles an inverted pyramid or triangle, terminating at its apex in a subsidiary peninsula, the Peloponnesus, or Morea. Its surface is almost entirely mountainous, the only extensive plains being those formed by the valleys of the Danube and Maritza and the basin of Thessaly, drained by the Salambria (Peneus). The Danubian plain is enclosed by the Carpathians on the north, and the Balkans (from which the peninsula derives its name) on the south: these ranges form together the great semicircular mountain-chain, known as the anti-Dacian system, through which the Danube finds a passage at the Iron Gates. The other mountain-systems display great complexity of formation; beginning with the Dinaric Alps and the parallel ranges of Bosnia, they run, as a rule, from north-west to south-east: the great chain of Rhodope traverses the centre of the Peninsula, throwing out spurs towards the Black Sea and the Ægean; farther west are the lofty Shar Dagh and the mountains of Montenegro and Albania, continued by the Pindus range and the heights of Akarnania and Ætolia. The principal summits are Liubotrn in the Shar Dagh (3050 metres), Olympus, overlooking the Gulf of Salonika (2985 m.), Musallá (2924 m.), and Popova Shapka (2699 m.), both in the Rhodope system; Elin, in the Perin Planina (2681 m.); and Kiona in Ætolia (2511 m.). The geological formation has hitherto been imperfectly studied, especially in the districts under Turkish rule. Owing to the distribution of the mountain-chains the principal rivers flow in an easterly or south-easterly direction: the Danube falls into the Black Sea; the Maritza, Mesta, Struma (Strymon), Vardar, and Salambria into the Ægean. The only considerable rivers flowing into the Adriatic are the Narenta, Drin, and Viossa. The principal lakes are those of Okhrida, Prespa, Scutari, and Iannina. The climate is more severe than that of the sister peninsulas, and the temperature is liable to sudden changes. The winter, though short, is often intensely cold, especially in the Danubian plain and in Thrace, the rigorous climate of which is frequently alluded to by the Latin poets. Bitter north-easterly winds prevail in the spring, and snow is not uncommon even in the low-lying districts of Greece.

(For further details with regard to the physical features, &c., see TURKEY, ninth edition, vol. xxiii. p. 653, and the articles there quoted; also BULGARIA in the present supplement.)

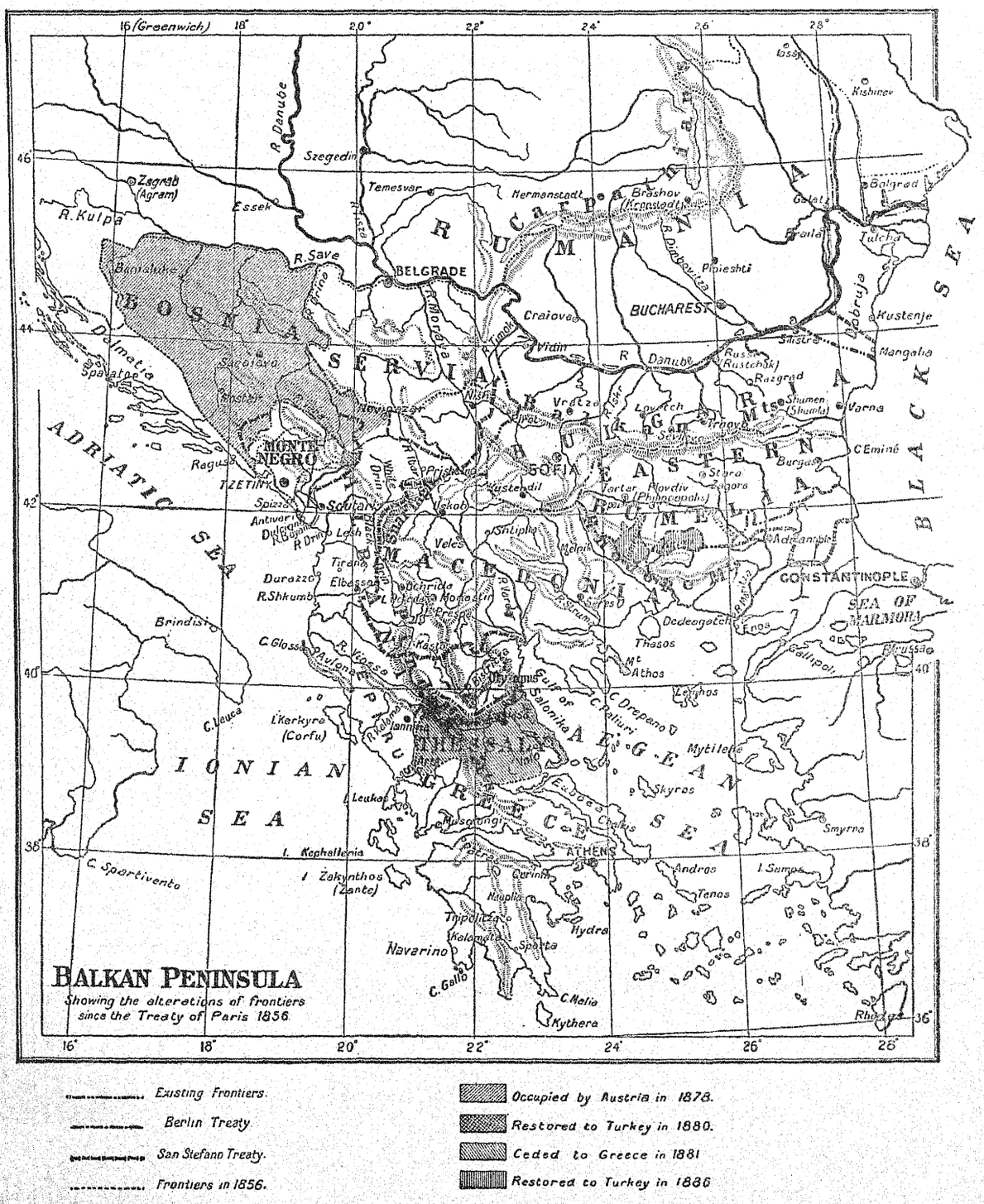
The following figures show the area and population of the various political divisions of the Balkan Peninsula. Among these it is customary to include the kingdom of Rumania, of which, however, only a small portion (the Dóbruja, pop. about 110,000) lies within the generally accepted limits.

	Area. sq. kilo.	Population.	Pop. per sq. kilo.
Turkish possessions (excluding Crete)	162,550	5,812,300	34
Rumania	131,020	5,417,249	41
Bulgaria (including Eastern Rumelia)	95,704	3,310,713	34·5
Servia	48,303	2,384,205	49
Montenegro	9,080	227,841	25
Greece	65,119	2,433,806	37
Bosnia and Herzegovina (under Austrian administration)	51,028	1,568,092	31
Novi-bazar (with three Austrian garrisons)	7,350	153,000	21
Dalmatia (Austro-Hungarian monarchy)	12,835	527,426	41
	582,989	21,834,632	37·4

Races.

The Peninsula is inhabited by a great variety of races, whose ethnological limits are far from corresponding with the existing political boundaries. The Turkish population, descended in part from the Ottoman invaders of the 14th and 15th centuries, in part from colonists introduced at various epochs from Asia by the Turkish Government, has considerably declined during the past century, especially in the countries withdrawn from the Sultan's authority. It is diminishing in Thessaly; it has entirely disappeared in the rest of Greece, almost entirely in Servia, and continues to decrease in Bulgaria notwithstanding the efforts of the authorities to check emigration. It is nowhere found in compact masses except in north-eastern Bulgaria and the region between Adrianople, the Black Sea, and the Sea of Marmora. Elsewhere it appears in separate villages and isolated districts, or in the larger towns and their immediate neighbourhood. The total Turkish population of the Peninsula scarcely exceeds 1,800,000. The Slavonic population, including the Serbs and Bulgars, is by far the most numerous; its total aggregate approaches 9,000,000. The Serbs, whose progenitors entered the Peninsula in the 6th century, inhabit Bosnia, Herzegovina, Montenegro, the kingdom of Servia, and the north-western portion of Macedonia, known as Old Servia. Their numbers, exclusive of the Serbo-Croats of Dalmatia (about 300,000), may be estimated at 4,500,000. The Bulgars, who descend from a fusion of the Slavonic element with a later Ugro-Finnish immigration, inhabit the principality of Bulgaria (including Eastern Rumelia), the Dóbruja, and the greater part of Macedonia, except Old Servia and the Ægean littoral. Apart from their colonies in Bessarabia and elsewhere, they may be reckoned at 4,100,000. Only a portion of the widely-spread Ruman or Vlakh race, which extends over a great part of Transylvania, the Banat, and Bessarabia, as well as the Rumanian kingdom, falls within the limits of the Peninsula. It is found in numerous detached settlements in Macedonia, Albania, and northern Greece, and in colonies of recent date in Servia and Bulgaria. The nomad Vlakhs or Tzintzars of these countries call themselves *Arumani* or "Romans": they are either a remnant of the native Latinized population or descendants of Daco-Roman refugees, who fled southwards after the abandonment of Dacia by Aurelian. The entire Ruman population of the Balkan countries may be set down approximately at 5,600,000, of which 5,000,000 belong to the Rumanian kingdom. The Albanians, who call themselves *Shkipetar* or *Arber*, are the representatives of the primitive Illyrian population; they inhabit the Adriatic littoral from the southern frontier of Montenegro to the northern boundary of Greece, and are found in considerable numbers in the latter country. They have shown a tendency to advance in a north-easterly direction towards the Servian frontier, and the movement has been encouraged for

political reasons by the Turkish Government. The whole Albanian nation possibly numbers from 1,500,000 to 1,600,000. The Greeks, whose immigration from Asia Minor took place in pre-historic times, are, next to the Albanians, the oldest race in the Peninsula. Their maritime and commercial instincts have led them from the earliest times to found settlements on the sea-coast and the islands. They inhabit the Black Sea littoral from Varna to the Bosphorus, the shores of the Sea of Marmora and the Ægean, the archipelago of the latter sea, the mainland of Greece, Epirus, and the western islands as far north as Corfu. In Constantinople they probably



SKETCH MAP OF THE BALKAN PENINSULA.

exceed 300,000. They are seldom found in large numbers at any great distance from the sea except in the principal towns and commercial centres, such as Adrianople, Braila, Galatz, and Philippopolis, and in detached colonies at Melnik, Stanimaka, Kavakli, Negush, and elsewhere. The Greek inhabitants of the Peninsula and adjacent islands probably number 4,500,000. The remainder of the population is for the most part composed of Armenians, Jews, and gypsies. The Armenians, like the Greeks, congregate in the principal centres of trade, especially at Constantinople; their numbers were greatly reduced by the massacres of 1896. The Jews are most numerous in the Rumanian towns and at Salonika, where they form half the population: the Rumanian Jews belong to the Ashkenazim, the Macedonian and Bulgarian to the Sephardim. The gypsies are scattered widely throughout the Peninsula; they

are found not only in wandering troops, as elsewhere in Europe, but in settlements or cantonments in the neighbourhood of towns and villages.

Owing to the numerous conversions to Islam which followed the Turkish conquest, the Mahommedan population of the Peninsula is largely in excess of the purely Turkish element. More than half the Albanian nation and about two-fifths of the Serbs of Bosnia and Herzegovina adopted the creed of the conquering race. Among the Bulgars and Greeks the conversions were less numerous. The Bulgarian Mahommedans, or Pomaks, who inhabit the valleys of Rhodope and certain districts in northern Bulgaria, are numerically insignificant; the Greek followers of Islam are almost confined to Crete. The whole Moslem population of the Peninsula is about 3,300,000. The great bulk of the Christian population belongs to the Orthodox Church, of which the Œcumenical Patriarch at Constantinople is the nominal head, having precedence over all other ecclesiastical dignitaries. The Rumanian, Bulgarian, Servian, Montenegrin, and Greek churches are, however, in reality autocephalous. The Bulgarian church enjoys an exceptional position, inasmuch as its spiritual chief, the Exarch, who resides at Constantinople, controls the Bulgarian prelates in European Turkey as well as those in the principality of Bulgaria. On the other hand, the Greek prelates in Bulgaria are subject to the Patriarch. Religious and political questions are intimately connected in Eastern Europe. The heads of the various religious communities are the only representatives of the Christian population recognized by the Turkish Government; they possess a seat in the local administrative councils, and supervise the Christian schools. The efforts of the several branches of the Orthodox Church to obtain a separate organization in the Turkish dominions are to be attributed exclusively to political motives, as no difference of dogma divides them. The Serbo-Croats of Dalmatia, some of the Gheg tribes in Albania, a small proportion of the Bosnian Serbs, a still smaller number of Bulgarians in the Principality and Macedonia, and a few Greeks in the islands belong to the Catholic Church. A certain number of Bulgars at Kukush in Macedonia and elsewhere form a "uniate" church, which accepts the authority and dogma of Rome, but preserves the Orthodox rite and discipline. The Armenians are divided between the Gregorian and Uniate-Armenian churches, each under a patriarch. The other Christian confessions are numerically inconsiderable. The Gagaüsi in Eastern Bulgaria, a Turanian and Turkish-speaking race, profess Christianity.

Religions.

Until comparatively recent times Turkish and Greek were the only languages systematically taught or officially recognized in the Balkan lands subject to Turkish rule. The former, the speech of the conquering race, was the official language; the latter, owing to the intellectual and literary superiority of the Greeks, their educational zeal, and the privileges acquired by their church, became the language of the upper classes among the Christians. The Slavonic masses, however, both Servian and Bulgarian, preserved their language, which saved these nationalities from extinction. The Serb dialect, extending into regions which escaped the Turkish yoke, enjoyed certain advantages denied to the Bulgarian: in free Montenegro the first Slavonic printing-press was founded in 1493; at Ragusa, a century later, Serb literature attained a high degree of excellence. The Bulgarian, for nearly four centuries, ceased to be a written language except in a few monasteries: a literary revival in recent times was the first symptom of returning national consciousness. In Rumania the Roman tongue of Trajan's colonists and the Latinized Dacians gave way in the Middle Ages to Slavonic under the rule of the Bulgarian Tsars; it revived under the Wallachian and Moldavian princes, but was not introduced into the liturgy and state documents till the middle of the seventeenth century. The Rumanian and the two Slavonic languages have borrowed largely from the Turkish in their vocabularies, but not in their structural forms, and have adopted many words from the Greek. The modern Greek has also a large number of Turkish words which are rejected in the artificial literary language. The revival of the various Balkan nationalities has in every case been accompanied or preceded by a literary movement; in Servian literature, under the influence of Obradovitch and Vuk Karajitch, the popular idiom, notwithstanding the opposition of the priesthood, superseded the ecclesiastical Russian-Slavonic; in Bulgaria the eastern dialect, that of the Sredna Gora, prevailed; in Rumania an artificial reconstruction on the Latin model with an elimination of all foreign elements was attempted and abandoned. Among the Greeks, whose literature never suffered a complete eclipse, a similar effort to restore the classical tongue has resulted in a kind of compromise; the conventional literary language, which is neither ancient nor modern, differs widely from the vernacular. The Albanian, the only surviving remnant of the ancient Thraco-Illyrian speech, affords an interesting study to philologists. It undoubtedly belongs to the Indo-Germanic family, but its earlier forms cannot, unfortunately, be ascertained owing to the absence of literary monuments. Certain remarkable analogies between the Albanian and the other languages of the Peninsula, especially the Bulgarian and Rumanian, have been supposed to point to the influence exercised by the primitive speech upon the idioms of the immigrant races.

Languages.

At the beginning of the 19th century the whole Peninsula, with the exception of Dalmatia, Montenegro, and the Ionian Islands, formed a portion of the Ottoman Empire. The period of Turkish decadence had begun a century before, and the process of disintegration now set in. Owing to the uncompromising character of the Mahommedan religion and the contemptuous attitude of the dominant race, the subject nationalities underwent no process of assimilation during the four centuries of Turkish rule; they retained not only their language but their religion, manners, and peculiar characteristics, and when the power of the central authority waned they still possessed the germs of a national existence. The independence of Greece was acknowledged in 1829, that of Servia (as a tributary principality) in 1830. No territorial changes followed the Crimean war except the restoration to Moldavia of Southern Bessarabia, which Russia had annexed in 1812; but the continuance of the weakened authority of the Porte tended indirectly to the independent development of the various nationalities. The Ionian Islands were ceded by England to Greece in 1864. The great break-up came in 1878. The abortive Treaty of San Stefano, concluded in that year, reduced the Turkish possessions in the Peninsula to Albania, Epirus, Thessaly, and a portion of southern Thrace. A large Bulgarian Principality was created extending from the Danube to the Ægean and from the Black Sea to the river Drin in Albania; it received a considerable coast-line on the Ægean, and abutted on the Gulf of Salonika under the walls of that town. At the same time the frontiers of Servia and Montenegro were enlarged so as to become almost contiguous, and the latter State received the ports of Antivari and Dulcigno on the Adriatic. From a strategical point of view the Bulgaria of the San Stefano treaty threatened Salonika, Adrianople, and Constantinople itself; and the Great Powers, anticipating that the new state would become a Russian dependency, refused their sanction to that instrument. The Treaty of Berlin followed, which limited the Principality to the country between the Danube and the Balkans, created the autonomous province of Eastern Rumelia south of the Balkans, and left the remainder of the proposed Bulgarian state under Turkish rule. The Montenegrin frontier laid down at San Stefano was considerably curtailed, Dulcigno, the district north-east of the Tara, and other territories being restored to Turkey; in addition to Nish, Servia received the districts of Pirot and Vranye on the east instead of the Ibar valley on the west; the Dóbruja, somewhat enlarged, was ceded to Rumania, which surrendered southern Bessarabia to Russia. Bosnia and Herzegovina were handed over to Austrian administration; under a subsequent convention with Turkey, Austria sent troops into the sanjak of Novi-bazar. The complete independence of the principalities of Servia, Rumania, and Montenegro was recognized. The claims of Greece, ignored at San Stefano, were admitted at Berlin; an extension of frontier, including Epirus as well as Thessaly, was finally sanctioned by the Powers in 1880, but owing to the tenacious resistance of Turkey the latter province only, together with the district of Arta, was acquired by Greece in 1881. Rumania was proclaimed a kingdom in that year, Servia in 1882. In 1880, after a naval demonstration by the Powers, Dulcigno was surrendered to Montenegro in compensation for the districts of Plava and Gusinye restored to Turkey. In 1886 the informal union of Eastern Rumelia with Bulgaria was sanctioned by Europe, the districts of Tumrush (Rhodope) and Krjali being given back to the Sultan. In 1897 Crete was withdrawn from Turkish administration,

Political changes.

and the Greco-Turkish war of that year was followed by the cession to Turkey of a few strategical points on the Thessalian frontier.

A Balkan confederation.

The liberation of the Balkan nationalities has in most cases been effected by the aid of one or more of the Great Powers, but their growth and independent development has, on the other hand, been retarded by the international jealousies arising from the Eastern Question. The possibility of the young states entering into a combination which would enable them to offer a united resistance to foreign interference while simultaneously effecting a compromise in regard to their national aims, has at various times occupied the attention of Balkan politicians. Among the earliest advocates of this idea was Ristitch, the Servian statesman. During the reaction against Russia which followed the war of 1877 informal discussions were conducted with this object, and it was even suggested that a reformed or constitutional Turkey might find a place in the confederation. The movement was favourably regarded by King Charles of Rumania and Prince Alexander of Bulgaria. But the revolt of Eastern Rumelia, followed by the Servo-Bulgarian war and the coercion of Greece by the Powers, embittered the rivalry of the various races, and the project was laid aside. It was revived in a somewhat modified form in 1891 by Tricoupis, who suggested an offensive alliance of the Balkan states, directed against Turkey and aiming at a partition of the Sultan's possessions in Europe. The scheme, which found favour in Servia, was frustrated by the opposition of Stambuloff, who denounced it to the Porte. In 1897 a Bulgarian proposal for joint pacific action with a view to obtaining reforms in Macedonia was rejected by Greece.

See Ami-Boué. *La Turquie d'Europe.* Paris, 1840.—Lejean. *Ethnographie de la Turquie d'Europe.* Gotha, 1861.—Mackenzie and Irby. *Travels in the Slavonic Provinces of Turkey.* London, 1866.—Ruffer. *Die Balkanhalbinsel und ihre Völker.* Bautzen, 1869.—Emile de Laveleye. *La Péninsule des Balkans.* Paris, 1888.—Hertzlet. *The Map of Europe by Treaty* (especially Vol. iv.) London, 1891.—Bourchier. "A Balkan Confederation." *Fortnightly Review.* London, September 1891.—Miller. *The Balkans.* London, 1896.—Lamouche. *La Péninsule Balkanique.* Paris, 1899. (J. D. B.)

Balkh, a city of Afghanistan, about 100 miles E. of Andkhoi and some 46 miles S. of the Oxus, in 37° N. lat. and 67° E. long. It comprises about 500 houses of Afghan settlers, a colony of Jews, and a small bazaar, set in the midst of a waste of ruins and many acres of débris. Entering by the west (or Akcha) gate, one passes under three arches, which are probably the remnants of a former Jamá Masjid. The outer walls (mostly in utter disrepair) are about 6½ to 7 miles in perimeter, and on the south-eastern borders are set high on a mound, or rampart, indicating a Mongol origin. The fort and citadel to the north-east are built well above the town on a barren mound, and are walled and moated. There is, however, little left but the remains of a few pillars. The Masjid Sabz, with its green-tiled dome, is said to be the tomb of a Khwaja, Abul Narsi Parsar. Nothing but the arched entrance remains of the Madrasa, which is traditionally not very old. The earlier Buddhist constructions have proved more durable than the Mahommedan buildings. The Top-i-Rustam is 50 yards in diameter at the base and 30 yards at the top, circular, and about 50 feet high. Four circular vaults are sunk in the interior, and four passages have been pierced below from the outside, which probably lead to them. The base of the building is constructed of sun-dried bricks about 2 feet square and 4 or 5 inches thick. The Takht-i-Rustam is wedge-shaped in plan, with uneven sides. It is apparently built of pisé mud (*i.e.*, mud mixed with straw and puddled). It is possible that in these ruins we may recognize the Nan Vihara of the Chinese traveller Hwen Thsung. There are the remains of many other topes (or stupas) in the neighbourhood. The mounds of ruins on the road to Mazar probably represent the site of a city yet older than those on which stands the modern Balkh. The town is garrisoned by a few hundred kasidars, the regular troops of Afghan Turkestan being cantoned at Takht-i-Pul, near Mazar. The gardens to the north-east contain a caravanserai, which is fairly well kept and comfortable. It forms one side of a courtyard, which is shaded by a group of magnificent chenar trees. (T. H. H.*)

Balkhash (Kirghiz, *Ak-* or *Ala-Denghiz*), a great lake of Russia, in the Kirghiz Steppes, between the provinces of Semipalatinsk and Semiryechensk, in 45° to 47° N. and 74° to 78° E., about 550 miles to the east of Lake Aral. It is fourth in size in Eurasia, and has an area of 8610 square miles, and an altitude of 900 feet. It has the shape of a broad crescent, about 280 miles long from W.S.W. to E.N.E., having its concave side turned southwards; its width is 55 miles in the west, narrowing to 10 miles eastward. Its north-western shore is occupied by a dreary plateau, known as the Famine Steppe (*Bekyak-dala*) in its southern portion. The south-east shore is, on the contrary, low, and bears traces of a former much greater extension of the lake in that direction. Its desiccation proceeds rapidly, a lowering of the level of three feet having been noticed in the course of fourteen or fifteen years. The chief tributary of the lake is the Ili, which rises in the high Khan-tengri group of the Tian Shan. The Karatal, the Aksu, and the Lepsa also enter the lake from the south-east, and the Ayaguz from the north-east. In their lower courses the first three rivers make their way with difficulty through the sands and rushes, which at a quite recent time were covered by the lake; while it also undoubtedly extended farther east so as to include the group of lakes Sasyk-kul and Ala-kul. The water of the lake is salter along its north-western than along its south-eastern shores. It freezes for four and a half months every year. Its greatest depth, 135 feet, is also along the north-west shore. The fauna of the lake and of its tributaries—explored by Nikolsky—is more akin to the fauna of the rivers of the Tarim basin than to that of the Aral; it also does not contain the common frog. It seems, therefore, probable that Lake Balkhash stood formerly in communication—through the lakes Ebi-nor, Ayar, &c., with the lake that formerly filled the Lukchun depression, but researches show that a connexion with Lake Aral—at least, at a recent time—was improbable.

Ball, John (1818-1889), Irish politician, naturalist, and Alpine traveller, son of an Irish judge, was born at Dublin, 20th August 1818. He was educated at Oscott and Christ's College, Cambridge. He showed in early years a taste for natural science, particularly botany; and after leaving Cambridge he travelled in Switzerland and elsewhere in Europe, studying his favourite pursuits, and contributing papers on botany and the Swiss glaciers to scientific periodicals. In 1846 he was made an assistant poor-law commissioner, but resigned in 1847, and stood unsuccessfully as a parliamentary candidate for Sligo. In 1849 he was appointed second poor-law commissioner, but resigned in 1852 and successfully contested the county of Carlow in the Liberal interest. In the House of Commons he attracted Lord Palmerston's attention by his abilities, and was made under-secretary for the colonies, a post which he held for two years. At the Colonial Office he had great influence in furthering the cause of natural science, particularly in connexion with the equipment of the Palliser expedition in Canada, and with Sir W. Hooker's efforts to obtain a systematic knowledge of

the colonial floras. In 1858 he stood for Limerick, but was beaten, and he then gave up politics and devoted himself to natural history. He was first president of the Alpine Club (founded 1857), and it is for his work as an Alpinist that he is now remembered, his well-known *Alpine Guide* (1863-68) being the result of innumerable climbs and journeys and of careful observation recorded in a clear and often entertaining style; he wrote the article ALPS in the ninth edition of the *Ency. Brit.* He also travelled in Morocco (1871) and South America (1882), and recorded his observations in books which were recognized as having a scientific value. He died 21st October 1889.

Ballance, John (1839-1893), New Zealand statesman, eldest son of Samuel Ballance, farmer, of Glenavy, Antrim, Ulster, was born on 27th March 1839. He was educated at a national school, and, on leaving, was apprenticed to an ironmonger at Belfast. Thereafter he was clerk in a wholesale ironmonger's house in Birmingham, and migrated to New Zealand, intending to start in business there as a small jeweller. After settling at Wanganui, however, he took an opportunity, soon offered, of founding a newspaper, the *Wanganui Herald*, of which he became editor, and remained chief owner for the rest of his life. During the fighting with the Maori chief Titokowaru, in 1867, Ballance was concerned in the raising of a troop of volunteer horse, in which he received a commission. Of this he was deprived owing to the appearance in his newspaper of articles criticizing the management of the campaign. He had, however, behaved well in the field, and, in spite of his dismissal, was awarded the New Zealand war medal. He entered the colony's parliament in 1875 and, with one interval (1881-84), sat there till his death. Ballance was a member of three ministries, that of Sir George Grey (1877-79); that of Sir Robert Stout (1884-1887); and that of which he himself was premier (1891-93). His alliance with Grey ended with a notorious and very painful quarrel. In the Stout government his portfolios were those of lands and native affairs; but it was at the Treasury that his prudent and successful finance made the chief mark. As native minister his policy was pacific and humane, and in his last years he contrived to adjust equitably certain long-standing difficulties relating to reserved lands on the west coast of the North Island. He was resolutely opposed to the sale of Crown lands for cash, and advocated with effect their disposal by perpetual lease. His system of State-aided "village settlements," by which small farms were allotted to peasants holding by lease from the Crown, and money lent them to make a beginning of building and cultivation, has been on the whole successful. To Ballance, also, was due the law reducing the life-tenure of legislative councillors to one of seven years. He was actively concerned in the advocacy of woman suffrage. But his best known achievement was the imposition, in 1891, of the progressive land-tax and progressive income-tax still levied in the colony. As premier he brought together the strong experimental and progressive party which in 1901 still held office in New Zealand. In office he showed debating power, constructive skill, and tact in managing men; but in 1893, at the height of his success and popularity, he died at Wellington of an intestinal disease after a severe surgical operation. Quiet and unassuming in manner, Ballance, who was a well-read man, always seemed fonder of his books and his chessboard than of public bustle; yet his loss to his party was great, and the mark he left on New Zealand politics bids fair to be enduring. A statue has been erected to his memory in front of Parliament House, Wellington. (W. P. R.)

Ballantine, William (1812-1887), English barrister, was born 3rd January 1812, being the son of a London police-magistrate. He was educated at St. Paul's School, and called to the Bar in 1834. He began in early life a varied acquaintance with dramatic and literary society, and his experience, combined with his own pushing character and acute intellect, helped to obtain for him very soon a large practice, particularly in criminal cases. He became known as a formidable cross-examiner, his great rival being Serjeant Parry. The three great cases of his career were his successful prosecution of the murderer Franz Müller in 1864, his skilful defence of the Tichborne claimant in 1871, and his defence of the Gaekwar of Baroda in 1875, his fee in this last case being one of the largest ever known. Ballantine became a serjeant-at-law in 1856. He died on 9th January 1887, having previously published more than one volume of reminiscences. Serjeant Ballantine's private life was decidedly Bohemian; and though he earned large sums, he died very poor.

Ballantyne, Robert Michael (1825-1894), Scottish writer of fiction, was born at Edinburgh on 24th April 1825, and came of the same family as the famous printers and publishers. When sixteen years of age he went to Canada, and was for six years in the service of the Hudson Bay Company. He returned to Scotland in 1847, and next year published his first book, recording his experiences in the "Wilds of North America." For some time he was employed by Messrs Constable, the publishers, but in 1856 he gave up business for the profession of literature, and began the series of enjoyable stories of adventure for the young with which his name is popularly associated. *The Coral Island*, *The World of Ice*, *The Young Fur-Traders*, *Ungava*, *The Dog Crusoe*, *The Lighthouse*, *Deep Down*, *The Pirate City*, *Erling the Bold*, *The Settler and the Savage*, and other books, to the number of upwards of a hundred, followed in regular succession, his rule being in every case to write as far as possible from personal knowledge of the scenes he described. His stories had the merit of being thoroughly healthy in tone, with considerable graphic force. Ballantyne was also no mean artist, and exhibited some of his water-colours at the Royal Scottish Academy. He lived in later years at Harrow, and died on 8th February 1894, at Rome, where he had gone to attempt to shake off the results of overwork.

Ballarat and BALLARAT EAST, a city and a town of Victoria, Australia, in the county of Grenville, 74 miles by rail W.N.W. of Melbourne, divided by the Yarrowee creek. The former is the second city and chief goldfield town of the state. These municipalities are in the centre of the richest alluvial goldfields ever opened up, but the yield has greatly declined, and gold is now chiefly obtained by quartz crushing, the deep levels giving a fair return. The total output of gold for the district in 1899 was 208,920 ozs. It is an important railway centre, from which six lines branch, and has iron foundries, woollen mills, and other factories. There are several recreation grounds, including the Botanic Gardens. Connected with the latter is a lake of 600 acres, where pisciculture is carried on with great success. Altitude, 1438 feet. Mean temperature for the year, 55·2° F.; for January, 66·7° F.; July, 43·5° F.; rainfall (17 years), 27 inches. The population of the city of Ballarat was in 1901, 25,448; of the town of Ballarat East in 1901, 18,262.

Ballet. See SPECTACLE.

Ballia, a town and district of British India, in the Benares division of the North-West Provinces. The town

is situated on the left bank of the Ganges, below the confluence of the Lesser Sarju. It is really an aggregate of rural villages. Population about 16,500; municipal income in 1897-98, Rs.10,482.

The district of BALLIA, constituted in 1879, occupies an angle at the junction of the Gogra with the Ganges, being bordered by two districts of Behar. It contains an area of 1170 square miles. The population in 1891 was 995,325, being 936 persons per square mile; Hindus numbering 926,358, Mahommedans 68,952, Christians 15, of whom 7 were Europeans. In 1901 the population was 949,966, showing a decrease of 5 per cent. Land revenue and rates were returned as Rs.8,75,449, the incidence of assessment (which is permanently settled) being Rs.0:14:3 per acre; the number of police was 2740. There are no canals and no railways. Out of a total cultivated area in 1896-97 of 510,828 acres, 157,443 were irrigated from wells, tanks, &c. The principal crops are rice, barley, other food-grains, pulse, sugar-cane, and opium. There are no manufactures, except that of sugar; and trade is almost entirely carried on by the two bordering rivers.

Ballina, a maritime town, urban sanitary district of county Mayo, Ireland, on the river Moy and the Midland Great Western Railway. In population and trade it is the first town in the county. Salmon fisheries gave employment in 1898 to 547 persons. A light railway now runs from Ballina to Killala. Population, 4846.

Ballinasloe, an inland town and urban sanitary district in the province of Connaught, county of Galway, Ireland, on the river Suck, 91 miles W.S.W. of Dublin by the Midland Great Western Railway. In 1898 the portion in Roscommon was added to Galway. The number of sheep offered for sale at the great October fair in 1900 was 28,360, and of horned cattle, 11,294. Population about 4700.

Balloons, Military.—When, in 1783, Montgolfier first caused a balloon to rise in the air, and to lift a man to a considerable height, whence an extensive view of the surrounding country could be obtained, military authorities were not slow to recognize the immense benefits which the employment of such a contrivance might confer in war. Within the next ten years the French Government made trials, resulting in the establishment of a company of "Aërostiers," suitably equipped with several balloons, and these proved of great service during the campaigns of that period. In June 1794, Captain Coutelle made an ascent at Maubeuge. At the battle of Fleurus the balloon was up all day and valuable observations were made from it. A second company of "Aërostiers" was then formed, and frequent ascents were made. At the siege of Mayenne in 1799, Coutelle ascended during a very strong wind, but was able to gain important information. Balloon observations were also made at Ehrenbreitstein, Bonn, Frankfort, Würzburg, and at the siege of Liége. It may seem curious that after such an apparently successful début military ballooning should have died out of fashion. With the exception of an ascent at the siege of Antwerp in 1815, and one at Solferino in 1859, balloons were not again used in war until the Federals brought them into requisition in the American civil war of 1861. Much valuable information was thus gained of the enemy about Richmond and in other places. Though during the Franco-German war in 1870 balloons were occasionally used, no regular organization was instituted, nor were important results obtained until the siege of Paris, when the French made great use of them for sending out letters and carrier pigeons. Sixty-four large balloons were sent off, taking nearly a ton of letters. Yet it may be said that ballooning as a recognized military science only dates back to about the year 1883 or 1884, when most of the powers organized regular balloon establishments. In 1884-85 the French found balloons very useful during their campaign in Tongking; and the British Government also despatched balloons with the Bechuanaland expedition and also with that to Suakin in those years. During the latter campaign several ascents were made in the presence of the enemy, on whom it was said that a great moral effect was produced. In the war against the Spaniards in Cuba the United States again used a balloon, but it was carried so close to the enemy's lines that it was soon shot down, after drawing the enemy's fire upon the troops. Balloons were employed in the South African war of 1899-1902 with useful results.

Apparatus.—We may briefly describe the apparatus used in military operations. The French in the campaigns of the last century used varnished silk balloons of about 10,000 cubic feet capacity. The Americans in the civil war used much larger ones, those of 26,000 cubic feet being found the most suitable. These were also of varnished silk. In the present day most nations use balloons of about 20,000 cubic feet, made of varnished cambric; but the British war balloons, made of goldbeater skin, are usually of comparatively small size, the normal capacity being 10,000 cubic feet, though others are also used of 7000 and 4500 cubic feet, the latter two sizes having been used at Suakin. The usual shape is spherical; but since 1896 the Germans, and now other nations, have adopted a long, cylindrical-shaped balloon, so affixed to its cable as to present an inclined surface to the wind and thus act partly on the principle of a kite.

Though coal-gas and even hot air may occasionally be used for inflation, hydrogen gas is on account of its lightness far preferable. In the early days of ballooning this had to be manufactured in the field, but nowadays it is almost universally carried compressed in steel tubes. About 100 such tubes, each weighing 75 lb, are required to fill a 10,000-feet balloon. New tubes of greater capacity have also been tried.

The transport for a British balloon section consists of 6 four-horsed waggons, 1 carrying the balloon with its steel wire captive rope, 4 for gas tubes, and 1 for equipment. The *personnel* consists of 3 officers and 25 rank and file. These all belong to the Royal Engineers.

The balloon is almost always used *captive*. If allowed to go free it will usually be rapidly carried away by the wind, and the results of the observations cannot easily be transmitted back. Occasions may occur when such ascents will be of value, but the usual method is to send up a captive balloon to a height of somewhere about 1000 feet. With the standard British balloon two officers are sent up, one of whom has now particularly to attend to the management of the balloon, while the other makes the observations.

With regard to observations from captive balloons much will depend on circumstances. In a thickly wooded country, such as that in which the balloons were used in the American civil war, no very valuable information is, as a rule, to be obtained; but in fairly open country all important movements of troops should be discernible by an experienced observer at any point within about four or five miles of the balloon. The circumstances, it may be mentioned, are such as would usually preclude one unaccustomed to ballooning from affording valuable reports. Not only is he liable to be disturbed by the novel and apparently hazardous situation, but troops and features of the ground often have so peculiar an appearance from that point of view, that a novice will often have a difficulty in deciding whether an object be a column of troops or a ploughed field. Then again, much will depend on atmospheric conditions. Thus, in misty weather a balloon is well-nigh useless; and in strong winds, with a velocity of anything over 20 miles an hour, efficient observation becomes a matter of difficulty. When some special point has to be reported on, such as whether there is any large body of troops behind a certain hill or wood, a rapid ascent may still be made in winds up to 30 miles an hour, but the balloon would then be so unsteady that no careful scouting could be made. It is usually estimated that a successful captive ascent can only be made in England on half the days of the year. As a general rule balloon ascents would be made for one of the following objects, viz.: to examine the country for an enemy; to reconnoitre the enemy's position; to ascertain the strength of his force, number of guns, and exact situation of the various arms; also to note the plan of his earthworks or fortifications. During an action the aërial observer would be on the look-out for any movements of the enemy and give warning of flank attacks or surprises. Such an observer could also keep the general informed as to the progress of various detached parties of his own force, as to the advance of reinforcements, or to the conduct of any fighting going

on at a distance. Balloon observations are also of especial aid to artillery in correcting their aim.

The vulnerability of a captive balloon to the enemy's fire has been tested by many experiments with variable results. One fact undoubtedly is that the range of a balloon in mid-air is extremely difficult to judge, and, as its altitude can be very rapidly altered, it becomes a very difficult mark for artillery to hit. A few bullet holes in the fabric of a balloon make but little difference, since the size of the perforation is very minute as compared with the great surface of material, but on the other hand, a shrapnel bursting just in front of it may cause a rapid fall. It is therefore considered prudent to keep the balloon well away from an enemy, and two miles are laid down as the nearest approach it should make habitually.

Besides being of use on land for war purposes, balloons have also been tried in connexion with the naval service. In France especially regular trials have been made of inflating balloons on board ships, and sending them aloft as a look-out; but it is now generally contended that the difficulties of storing the gas and of manœuvring the balloon are so great on board ship as to be hardly worth the results to be gained.

A very important development of military ballooning—which, however, has not yet passed the experimental stage—is that of the navigable balloon. If only a balloon could be sent up and driven in any required direction, and brought back to its starting-point, it is obvious that it would be of the very greatest use in war. The French, here again, were the first to make practical efforts to accomplish this end. Giffard, a civil engineer, as long ago as 1852, ascended in an elongated balloon with a steam engine to work a screw propeller. The speed attained was, however, not sufficient to be of any practical use, since, of course, the rate of progress must be greater than that of the wind in order to make certain of returning to the point of departure. Dupuy de Lôme, constructor to the French navy, undertook further experiments in this line for the Government in 1872, but without much more satisfactory results. In 1884, however, Captains Renard and Krebs, of the military balloon establishment at Meudon, succeeded in making and working a balloon, called "La France," with electric engines, which on several occasions attained a speed of about 14 miles an hour; and this was sufficient, so long as the wind was very light, to enable it to travel some miles and return to its point of departure. Though there have been frequent rumours of this balloon having been improved upon, nothing definite seems to have really resulted. Several further attempts to solve the problem have been made in Germany and other countries without much success. Count Zeppelin's air-ship in 1900 promised better results. Having a capacity of over 350,000 cubic feet, it could carry about thirty men, and was estimated to travel at the rate of 22 miles an hour. (See also AERONAUTICS.) This huge vessel was kept distended by an aluminium framework, and was driven by two benzine motors of 15 horse-power each, rotating four screw propellers placed at the sides of the vessel. (B. F. S. B.-P.)

Ballot.—The history of the ballot in the United Kingdom, generally, was treated in the ninth edition of this work, but it is desirable here to give further particulars concerning its use in the United States. At the first elections in America voting was *viva voce;* but several of the colonies early provided for the use of written or printed ballots. By 1775 ballots were used in the New England states, in Pennsylvania, Delaware, North Carolina, and South Carolina; they were introduced in New Jersey in 1776 and in New York in 1778, so that, at the time the Constitution of the United States was adopted, *viva voce* voting prevailed at public elections only in Maryland, Virginia, and Georgia. Of the new states which later entered the Union, only Illinois, Kentucky, Missouri, and Arkansas did not have a ballot system when they became states. During the first half of the 19th century, Maryland, Georgia, Arkansas (1846) and Illinois (1848) adopted the ballot. In Missouri ballot voting was introduced to some localities in 1845, but not until 1863 was it generally adopted in that state. Virginia did not provide for voting by ballot until 1869, and in Kentucky *viva voce* voting continued until 1891. But while the use of ballots was thus required in voting, and most of the states had laws prescribing the form of ballots and providing for the count of the vote, there was no provision making it the duty of any one to print and distribute the ballots at the polling places on election day. In the primitive town meetings ballots had been written by the voters, or, if printed, were furnished by the candidates. With the development of elections, the task of preparing and distributing ballots fell to political committees for the various parties. The ballot tickets were thus prepared for party lists of candidates, and it was not easy for any one to vote a mixed ticket, while, as the voter received the ballot within a few feet of the polls, secrecy was almost impossible, and intimidation and bribery became both easy and frequent.

Soon after the adoption of the Australian ballot in Great Britain, it was introduced in Canada, but no serious agitation was begun for a similar system in the United States until 1885. In 1887 bills for the Australian ballot were actively urged in the legislatures of New York and Michigan, although neither became law. A Wisconsin law of that year, regulating elections in cities of over 50,000 population, incorporated some features of the Australian system, but the first complete law was enacted by Massachusetts in 1888. This Massachusetts statute provided for the printing and distribution of ballots by the state to contain the names of all candidates arranged alphabetically for each office, the electors to vote by marking the name of each candidate for whom they wished to vote. At the Presidential election of 1888 it was freely alleged that large sums of money had been raised on an unprecedented scale for the purchase of votes, and this situation created a feeling of deep alarm which gave a powerful impetus to the movement for ballot reform. In 1889 new ballot laws were enacted in nine states: two states bordering on Massachusetts, Connecticut and Rhode Island; four states in the middle-west, Indiana, Michigan, Wisconsin, and Minnesota; two southern states, Tennessee and Missouri; and Montana, in the far west. The Connecticut law, however, marked but little improvement over former conditions, since it provided only for official envelopes in which the unofficial party ballots should be voted. The Indiana law provided for a single or "blanket" ballot, but with the names of candidates arranged in party groups, and a method of voting for all of the candidates in a party group by a single mark. Michigan and Missouri also adopted the party group system. The other states followed the Massachusetts law providing for a blanket ballot with the candidates arranged by offices.

The new ballot system had its first practical demonstration at the Massachusetts election of 1889, and its success led to its rapid adoption in many other states. In 1890 ballot laws were passed in seven states: Vermont, Mississippi, Wyoming, and Washington provided for the Massachusetts plan, although Vermont afterwards adopted the system of party groups, which Maryland used from the first. The New York and New Jersey laws of 1890, however, only provided for official ballots for each party, and allowed ballots obtained outside of the polling booths to be used. In 1891 seventeen additional states and two territories adopted the Australian ballot system. All of these provided for a blanket ballot; but while the Massachusetts arrangement was adopted in Arkansas, Nebraska, New Hampshire, North and South Dakota, Kentucky, Texas, and Oregon, the system of party groups was followed in Colorado, Delaware, Illinois, Maine, Ohio, Pennsylvania, and West Virginia. California had the Massachusetts arrangement of names, but added on the ballot a list of party names, by marking one of which a voter would cast his vote for all of the candidates of that party. Pennsylvania placed all the candidates not in a party group in alphabetical order.

Iowa adopted the Australian ballot system in 1892; Alabama and Kansas in 1893; Virginia in 1894; Florida

in 1895; and in 1896 Louisiana and Utah. In 1895, too, New York adopted the blanket ballot in place of separate party ballots, but arranged the names of candidates in party columns. The only state to abandon the Australian ballot after once adopting it has been Delaware, which in 1898 returned to the system of separate ballots, with no provision for booths where the ballot might be marked in secret. Up to 1901 four other states had not yet adopted the Australian ballot, viz., North Carolina, South Carolina, Georgia, and Nevada.

Owing to the large number of officials chosen at one time in American elections, the form and appearance of the ballot used is very different from that in Great Britain. At the quadrennial presidential election in New York state, for example, the officers to be voted for by each elector are thirty-six presidential electors, one congressman, state governor, lieutenant-governor, and five other state officers, a member for each house of the state legislature, several judges, a sheriff, county clerk, and other county officers. The column with the list of the candidates of each party for all of these offices is two to three feet in length; and as there are often eight to ten party tickets in the field, the ballot paper is usually from 18 to 20 inches in width. Each voter receives one of these "blanket" ballots on entering the polling place, and retires to a booth to mark either a party column or the individual candidates in different columns for whom he wishes to vote. Where, as in Massachusetts, the names of candidates are arranged by offices instead of in party lists, every voter must mark the name of each individual candidate for whom he wishes to vote. Connecticut, New Jersey, and Delaware continue to use the system of separate party ballots, the voter selecting the ballot he wishes to vote, on which he can write any changes he may wish to make. (See also the article Voting Machine.)

(J. A. Fa.)

Ballston Spa, capital of Saratoga county, New York, U.S.A., situated in the eastern part of the State, in 43° 00′ N. lat., and 73° 51′ W. long., on the Delaware and Hudson Railway, at an altitude of 294 feet. It contains fine chalybeate springs, which attract a large number of visitors every summer. Population (1880), 3031; (1890), 3527; (1900), 3923.

Ballycastle, a seaport and watering-place in the county of Antrim, Ireland, on a bay of the same name opposite Rathlin Island. The town is now connected with Ballymoney by a light railway. In 1899, 134 vessels were registered in the fishing district, employing 284 hands. Population (1891), 1481; (1901), 1476.

Ballymena, an inland town and urban sanitary district in the county of Antrim, Ireland, on the river Braid and the Belfast and Northern Counties Railway, 33 miles N.N.W. of Belfast. The value of brown linens alone produced annually averages £1,000,000. There are frequent markets and fairs. Light railways now run from Ballymena to Larne, 23 miles distant, and to Parkmore, 13 miles distant. Population (1901), 10,880.

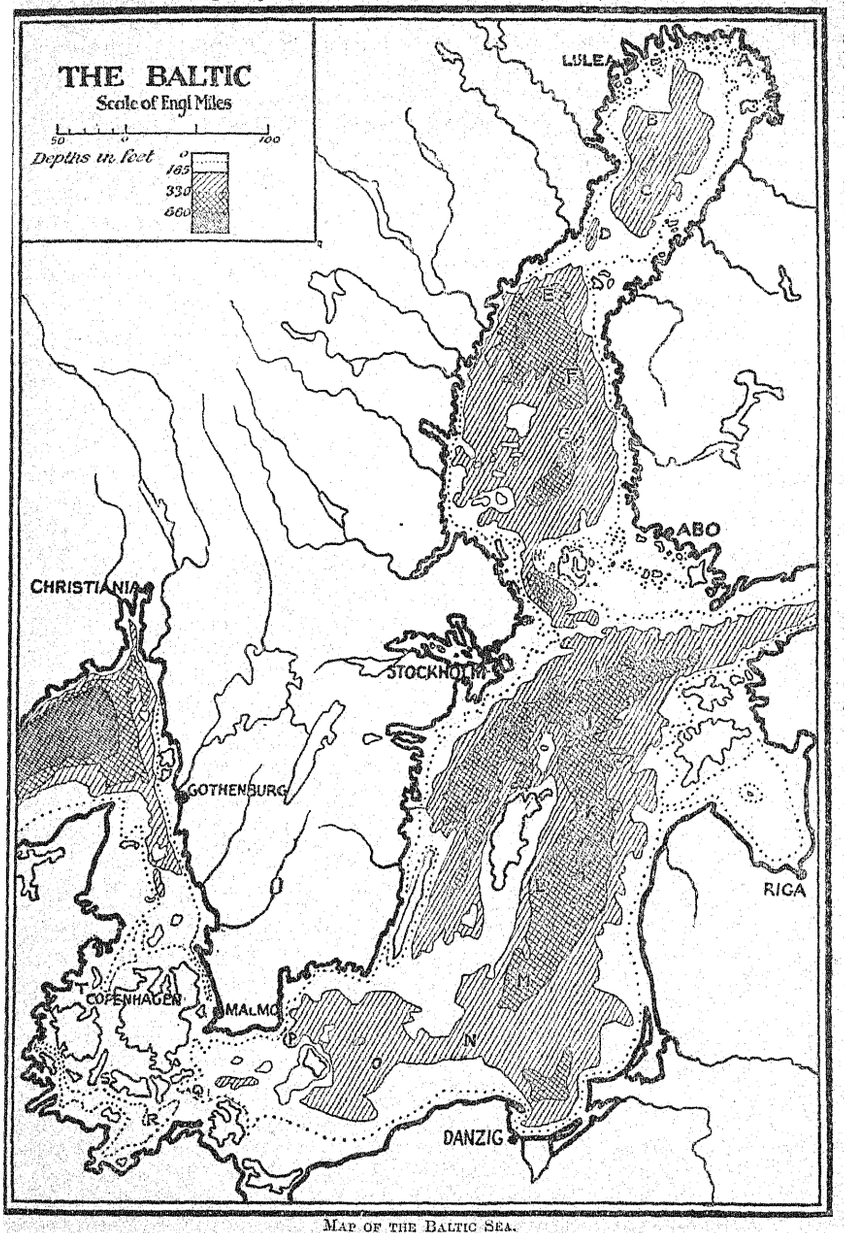
Balmaceda, Jose Manuel (1838-1891), President of the republic of Chile, was born in Santiago in 1838. His parents were wealthy, and in his early days he was chiefly concerned in industrial and agricultural enterprise. In 1865 he was one of the representatives of the Chilian Government at the general South American congress at Lima, and after his return took an active part in the proceedings of the National Assembly, obtaining great distinction as an orator. After discharging some diplomatic missions abroad he became successively minister of foreign affairs and of the interior under the presidency of Señor Santa Maria, and in the latter capacity carried compulsory civil marriage and several other legislative measures highly obnoxious to the clergy. In 1886 he was elected president. It soon appeared that he was irreconcilably at variance with the majority of the Assembly, and refusing to accept the alternative "se soumettre ou se demettre," prescribed by Gambetta to Marshal MacMahon, on 1st January 1891 he sought to terminate an intolerable situation by the desperate remedy of a *coup d'état*, refusing to convoke the Assembly, and ordering the continued collection of the taxes on his own authority. A week afterwards the navy revolted almost *en masse*, and the unprecedented spectacle was seen of the legal representatives of the nation huddled together in a small port at the northern extremity of the republic—safe, however, under the protection of the fleet,—while the executive retained the allegiance of the army, and was apparently obeyed throughout the rest of the country. So matters continued until August, when the party of the Assembly, having completed their preparations, disembarked at Coquimbo, and with some assistance from treachery overthrew Balmaceda's troops in the two desperate battles of Conchon, 21st August, and Placilla, 28th August. The unfortunate president, abandoned by all, committed suicide on 18th September, the anniversary of his elevation. Seldom has there been a more forcible illustration of the maxim that the master of the sea is also master of the land; and the contest is further memorable as definitively establishing the parliamentary régime in Chile. Balmaceda was a capable and probably a well-intentioned man, but his imperious character disqualified him for the first place in a free state. (See also Chile.) (R. G.)

Balrampur, a town of British India, in the Gonda district of Oudh, which gives its name to one of the largest *talukdari* estates in the province. The raja was conspicuously loyal during the Mutiny, and was rewarded with accessions of territory and hereditary privileges. His death gave rise to prolonged litigation, and the estate was recently under the court of wards. The income is estimated at Rs.18,00,000, paying a revenue of Rs.7,00,000. Numerous schools and hospitals are supported. The town of Balrampur is situated in 27° 25′ N. lat. and 82° 13′ E. long., near the river Rapti, 28 miles from Gonda; railway station. Population about 15,000; municipal income (1897-98), Rs.5756. Balrampur contains a large palace, handsome new temple, an Anglo-vernacular school, and a printing-press.

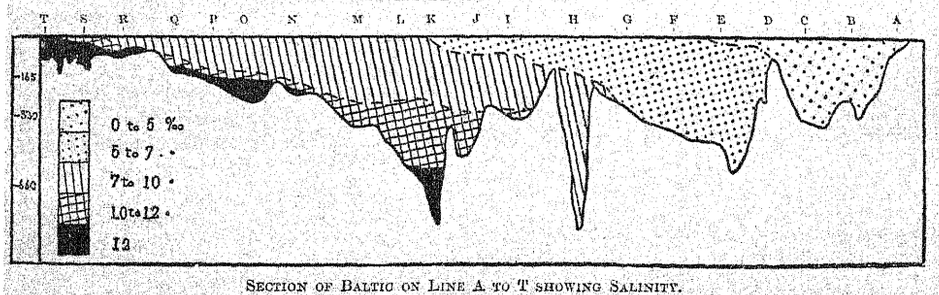
Baltic Sea.—The Baltic Sea (*Ostsee* of the Swedes, Danes, and Germans, *Baltiiskoye Morye* of the Russians) lies between 54° and 66° N. lat., and 9° and 30° E. long.; it is surrounded by the territories of Sweden, Russia, Germany and Denmark. Its greatest length is about 960 miles; greatest breadth, about 400 miles; and length of coast-line, 5000 miles. Its central axis runs approximately from south-west to north-east. The Baltic is connected with the North Sea by the winding channel between the south of Scandinavia and the Cimbrian peninsula. This channel is usually included in the Baltic. The part of it west of a line joining the Skaw with Christiania fjord receives the name of Skagerrak; east of this line the channel is called the Kattegat. At its southern end the Kattegat is blocked by the Danish islands, and it communicates with the Baltic proper by narrow channels called the Sound, the Great Belt, and the Little Belt. The real physical boundary between the North Sea and the Baltic is formed by the plateau on which the islands Zealand, Funen, and Laaland are situated, and its prolongation from the islands Falster and Möen to the coasts of Mecklenburg and Rügen.

East of this line the Baltic proper forms a series of

ollows or troughs. The first, or Bornholm deep, lies east f the island of Bornholm, and is separated from the next, "Gothland" deep, by the "Middelbank." Beyond the "Middelbank" the "Danziger Tiefe," an isolated depression, lies to the south-east, while to the north-east the Gothland basin, the largest and deepest of all, extends north-eastwards to the Gulf of Finland. Along the Swedish coast a deep channel runs northward from outside the island of Öland; this is entirely cut off to the south and east by a bank which sweeps eastward and northward from near Karlskrona, and on which the island of Gothland stands, but it communicates at its northern end with the Gothland deep, and near the junction opposite Landsort is the deepest hole in the Baltic (420 metres = 230 fathoms).



Map of the Baltic Sea.



Section of Baltic on Line A to T showing Salinity.

An unbroken ridge, extending from Stockholm to Hangö in Finland, separates the Baltic basin proper from the depression between Sweden and the Åland Isles, to which the name Åland Sea has been given. North of the Åland Sea a ridge defines the southern edge of another depression, the Bothnian Sea, which in turn is separated from the most northerly division, the Gulf of Bothnia, by a ridge across the narrow Quarken Strait. The Gothland deep may be said to extend directly into the Gulf of Finland, an arm of the Baltic, running eastwards for about 250 miles, and separating Finland from Esthonia. Between Esthonia and Courland is the Gulf of Riga, a shallow inlet of roughly circular form, about 100 miles in diameter, and nowhere more than 27 fathoms deep.

According to recent computations the total area of the Baltic, including the Skagerrak and Kattegat, is 430,970 sq. km. (= 166,397 sq. m.), and its volume 28,732 cub. km. (= 6907 cub. m.), giving a mean depth of 36 fathoms, which is markedly less than that of any other arm of the sea of similar area.

In the deeper hollows in the south part of the Baltic the bottom consists almost invariably of either soft brown or gray mud or hard clay, while on the shallow banks and near the low coasts fine sand —of white, yellow, or brown colour —with small pebbles, is usually found.

Geomorphology. At the time of the last great subsidence, in glacial times, an arm of the sea extended across Sweden, submerging a great part of the littoral up to the Gulf of Bothnia, and including the present lakes Wener, Hjelmar, and Mälar. During this period the waters of the northern Baltic were sufficiently salt for oysters to flourish. The subsequent upheaval restricted direct communication with the open sea to the Danish channels, and the Baltic waters became fresher: the oyster disappeared, but a number of cold salt-water fishes and crustaceans, and even seals, became acclimatized. It has been suggested that the presence of the remains of these animals indicates a communication to the north with the Arctic Ocean; but in view of the severe climatic conditions

still prevailing at the time, this seems an unnecessary assumption. In the next stage of its history the Baltic is transformed by further elevation into a vast freshwater lake, the *Ancylus* lake of De Geer (named from the remains of the mollusc *Ancylus fluviatilis*), which is supposed to have covered an area of about 570,000 sq. km. (220,000 miles), including the whole of the present Baltic area and a large part of Finland, with Lake Ladoga. Then followed a subsidence, which not only re-established communication through the Danish channels, but allowed the Baltic to become sufficiently salt for such forms as *Cardium edule* and *Littorina littorea*. At this time the Gulf of Bothnia must have suffered greater depression than the Baltic proper, for the deposits of that epoch show a thickness of 100 metres (328 feet) near Hernösand, but of only 25 metres (82 feet) in the neighbourhood of Gothland. After this period of subsidence the process of elevation set in which gave the Baltic its present form and physical condition, and appears to be still in progress. Dr Sieger has traced a series of isobasic lines, or lines of equal rate of elevation, for portions of Sweden and Finland; these indicate that the movement is now almost *nil* along the axial lines of the Baltic and the Gulf of Finland, but increases in amplitude northwards to the Gulf of Bothnia and in the direction of the main ridge of the *massif* of southern Sweden. At Stockholm the rate of elevation is approximately 0·47 m. (=1·54 feet) in a century.

The drainage area of the Baltic is relatively large. According to the measurements of Murray it extends to 461,450 square sea miles (=611,700 square English miles). The largest river basin included in it is that of the Neva in the east, and next in size come the Vistula and the Oder in the south. The narrow parallel troughs, at right angles to the coast, which form the drainage system of Sweden and western Finland, are a remarkable feature.

The coast of the Baltic is rocky only in the island-studded region at the head of the Baltic basin proper—a submerged lake-district—and the littoral generally is a typical morainic land, the work of the last great Baltic glacier. The southern margin of the Baltic is of peculiar interest. From Schleswig eastwards to Lübeck Bay the coast is pierced by a number of narrow openings or *Fohrde*, the result of encroachment of the sea caused by subsidence. East of Lübeck, as far as the mouth of the Oder, these give place to *Bodden*, ramified openings studded with islands: the structure here resembles that of Scania in southern Sweden, a region once joined to both Denmark and Pomerania by an isthmus which was severed by tectonic movements. Beyond the Oder the coast-line is unbroken as far as the Gulf of Danzig. It is then cut into by the estuaries of the Vistula, the Pregel, and the Memel. Here the westerly winds have full play, and the coast is rimmed by a continuous line of dunes, which cut off the two great lagoons of the *Frisches Haff* and *Kurisches Haff* by sand-spits or *Nehrunge*.

Levellings from Swinemünde show that the mean level of the surface of the Baltic at that point is 0·093 metres (=·305 feet) below the surface of the North Sea at Amsterdam, and 0·066 metres (=·216 feet) below its level at Ostend. A line of levels from Swinemünde through Eger to the Adriatic showed the mean level of the surface of the Baltic to be 0·499 metres (1·6 feet) above that of the Adriatic Sea. The mean level of the surface of the Baltic rises about 0·5 metres (1·6 feet) from the coast of Holstein to Memel, probably as a result of the prevailing westerly winds; this mean difference is exceeded with strong westerly winds, and disappears or is reversed with easterly winds. The waves of the Baltic are usually short and irregular, often dangerous to navigation. Destructive waves, probably caused by distant earthquakes, called *Seebären* (*cf.* English "bores") have been recorded.

The range of the tides is about one foot at Copenhagen; within the Baltic proper ordinary tides are scarcely perceptible. There is, however, a distinctly marked annual rise and fall due to meteorological influences having a mean range of about 11·4 cm. (0·37 feet) at Travemünde, and 13·9 cm. (0·46 feet) at Swinemünde, the maximum occurring at the end of the summer rainy period in August.

Circulation. The circulation of water in the Baltic proper must be considered apart from the circulation in the channels connecting it with the North Sea; and in this relation the ridge connecting the islands Falster and Möen with the coasts of Mecklenburg and Rügen must be taken as the dividing line. In the great basins and hollows from Rügen to the Gulfs of Bothnia and Finland the upper layers of water, from 30 to 70 metres (16 to 38 fathoms) in thickness, have almost the same salinity throughout. In these waters a vertical circulation is kept up by convection currents. Beneath these layers are masses of salter water, through which a thermal wave of small amplitude is slowly propagated to the bottom by conduction. These strata are practically stagnant, deficient in oxygen, and surcharged with carbonic acid. Their salter waters must have been originally derived from outside, and must therefore have passed over the ridge between Falster and Mecklenburg, but their horizontal extension is checked by the ridges separating the deep hollows in the Baltic from each other. The inflow to the deep basins is intermittent, probably with a long period of flux and reflux.

The circulation in the channels connecting the Baltic proper with the North Sea is of a complex character. It is necessary in the first place to distinguish clearly between outflowing and inflowing waters, and in practice this is easily done, because the outflowing water always contains less than 30 *pro mille* of salt, and the inflowing water more than 32 *pro mille*. Since the Baltic receives much more water by rainfall, discharge of rivers, etc., than it loses by evaporation, a surplus must be got rid of by an outflowing current which may be named the "Baltic Stream." The following general laws may be laid down with regard to this:—

1. That the Baltic Stream must be a surface current, because it originates from a redundancy of fresh water.

2. That, on account of the earth's rotation, the main part of the Baltic Stream must keep close to the coast of the Scandinavian peninsula.

3. That it must be a periodic stream, because the discharge of the rivers into the Baltic varies with the season of the year. In spring and summer the water from the Baltic is sufficiently abundant to inundate the whole surface of the Kattegat and Skagerrak, but in winter the sources of the Baltic current are for the most part dried up by the freezing of the land water.

All the waters which enter the Skagerrak or Kattegat as undercurrents can be found at the surface of the North Sea (see NORTH SEA). They may be divided according to their origin and salinity as follows:—

(*a*) *Ocean water* of 35 *pro mille* salinity or more.

(*b*) *North Sea water*, the predominant water in the North Sea area, of 34 to 35 *pro mille* salinity.

(*c*) *Bank water*, 32 to 34 *pro mille*, which forms a broad edging covering the coast banks of Holland, Germany, Denmark, and Norway.

The deepest water stratum in the Skagerrak is certainly of oceanic origin; it has been found to suffer changes of long period, and it is probably not always composed of water derived from the same part or the same depth of the North Atlantic; this water is, as a rule, deficient in oxygen. The "North Sea" water, of 34-35 *pro mille* salinity, does not appear at the surface in the Skagerrak, except as a strip along part of the coast of Jutland, but it is always found as an undercurrent overlying the oceanic water. It enters into all the deep coast channels, and into the Christiania fjord, but it is not always found in the deep channels of the Kattegat. The principal time of inflow of North Sea water is during spring and summer. The bank-water of 32 to 34 *pro mille* salinity is found all along the continental coast of the North Sea and North Atlantic, and it may therefore enter the Skagerrak either from the North Sea or from the north along the coast of Norway. It is probable indeed that an influx of this water occurs from both directions—in August and September from the south, and in the late winter and early spring from the north. The seasonal changes in the distribution of the bank-waters in different parts of the coast are too complex to be briefly explained; their relations to the times of occurrence of various fisheries of the region present many remarkable features, which have been investigated in recent years by the Swedish Commission.

On the west and south coasts of Sweden, and in the Skagerrak south-east of Norway, navigation is interfered with by ice only in severe winters, and then the ice is usually drifting, compact sea-ice being very rare. Between Stockholm and Wisby navigation usually ceases at the end of December and begins again about 10th April. During very severe winters the Åland Sea is covered with thick ice available for traffic. The south part of the Gulf of Bothnia is covered with ice every winter along the coasts, but rarely, if ever, in its central part. Navigation is interrupted by drifting ice from about the middle of November to the beginning of May, though the port of Hernösand has been known to remain open during a whole winter. The northern Quarken is covered with traversable ice every third or fourth year. The northern part of the Gulf of Bothnia is frozen every winter. In the Gulf of Finland the sea is closed to navigation by ice for about 150 days in the year; but navigation is now rendered possible throughout the winter by the use of ice-breakers.

See references to different parts of the subject in the standard books of PENCK, DE LAPPARENT, SUESS, and others. Also CREDNER. *Die Entstehung der Ostsee.* Leipzig, 1895.—DE GEER. *Om Skandinaviens nivåförändringar under quartärperioden.* Stockholm, 1888.—SIEGER. *Seenschwankungen und Strandverschiebungen in Skandinavien.* Berlin, 1893.—PETTERSSON. "Review of Swedish Hydrographic Research," *Scottish Geographical Magazine,* 1894.—N. EKHOLM. *Om klimatets ändringar i geologisk och historisk tid. Ymer.* Stockholm, 1899. (H. N. D.)

Baltic and Black Sea Canal. See CANALS.

Baltimore, in Maryland, one of the chief cities

of the United States of America, situated on the north side of the Patapsco river, about 14 miles above its entrance into Chesapeake Bay, 38 miles N.E. of Washington, and 97 miles S.W. of Philadelphia. Its latitude is 39° 17′ N. and longitude 76° 36′ W. The harbour is defended by Fort M'Henry. (It was during the bombardment of this fort in 1814 that Francis Scott Key, a prisoner on one of the British ships, wrote "The Star-Spangled Banner.") The area of Baltimore was about doubled by an extension made in 1888. The region annexed extends to a line 2 miles north of the old northern boundary, and about 2 miles west of the old western boundary. The present area is about 32 square miles. Population (1880), 332,313; (1890), 434,439; (1900), 508,957. The death-rate in 1890 was 22·9, and in 1900, 21·0; of the whites (1900), 19·0, and of the coloured, 31·1. The coloured population was (1880) 53,716, (1900) 79,739 (79,258 negroes). Of the total population in 1900, 243,280 were males, 265,677 females, 440,357 native-born, 68,600 foreign-born. Out of 141,271 males 21 years of age and over, 10,152 were illiterate (unable to write), of whom 1261 were native whites, 2921 foreign whites, and 5785 negroes. Baltimore was among the earliest American cities to be provided with a general system of electric car-lines; and since 1890 there has been a rapid suburban growth, Roland Park to the north and Walbrook to the north-west being two of the principal new suburbs. In 1899 the total assessed valuation of real and personal property was $388,242,020, the tax-rate $21.58 per $1000, and the net public debt $32,928,106. The water-supply of Baltimore was very greatly increased in 1881 by the introduction of water from the Gunpowder River (in addition to the old supply from Jones Falls), the source of supply being at a point about 11 miles north of the city. The cost of the work, including the building of three new reservoirs, was about $4,000,000. The entire water system of Baltimore is now capable of furnishing about 200,000,000 gallons daily. To the park system was added, in 1895, Clifton Park, acquired through the purchase from the trustees of the Johns Hopkins University of Clifton, the handsome estate of the late Johns Hopkins, comprising 252 acres. The parks are maintained from the proceeds of a tax of 9 per cent. on the gross receipts of the street railways (with certain exemptions as to the annexed district), which tax now amounts to nearly $300,000 annually. The new court-house, completed in 1899, is a building of great beauty, chaste and dignified. In it all the courts (except the United States courts), the land records, the library of the Bar Association, &c., are accommodated. Opposite the court-house is the post-office, a large granite building, completed in 1890. Congress has also made provision for a handsome custom-house.

An event of the first importance in education, not only to Baltimore but to the whole United States, was the foundation of Johns Hopkins University, which opened its doors in 1876. Its endowment, under the will of Johns Hopkins, a Baltimore merchant and financier, who died in 1873, was valued at more than $3,000,000. The devotion of the revenue thus placed in the hands of the trustees chiefly to the establishment of advanced university studies, somewhat on the plan of the German universities, constituted a new departure of the first importance in the history of higher education in America. (See JOHNS HOPKINS UNIVERSITY.) In 1888 was opened the Woman's College of Baltimore, an institution endowed and controlled by Methodists, but non-sectarian in its spirit. The Bryn Mawr School, founded by Miss Mary E. Garrett in 1885, and the Latin School of the Woman's College are important girls' schools preparatory to college. The number of public schools is now 183, with 1802 teachers, an enrolment of about 65,000 pupils, and an annual expenditure of about $1,400,000. In 1900 there were in the city 160,379 persons of school age (5 to 20 years inclusive). Baltimore has a number of medical schools, of which the most important are that of the Johns Hopkins University, that of the University of Maryland (founded in 1807), the College of Physicians and Surgeons, and the Baltimore Medical College. The chief law school is that of the University of Maryland. Among the dental schools is the Baltimore College of Dental Surgery, chartered in 1839, the oldest dental college in the world. The Maryland Institute maintains a very meritorious school of design, covering drawing, painting, and sculpture. The Peabody Institute carries on an important conservatory of music.

The Walters Art Gallery, although a private collection, is thrown open to the public during part of the year. Of the important foundations instituted in Baltimore, outside the field of education, the most noteworthy is the Johns Hopkins Hospital, for the endowment of which the founder bequeathed half his fortune. The principal (about $3,000,000) of the fund has not been trenched upon, the buildings having been erected out of the income. The hospital was planned and constructed under the advisory supervision of Dr John S. Billings, of the United States Army Medical Corps. It provides clinical facilities for the medical school of the Johns Hopkins University, for the accommodation of which it also has extensive laboratories. The buildings are situated upon a tract of 12 acres, and are twenty in number; the beds numbered 320. It maintains a training school for nurses of the highest order. The Sheppard Asylum for the curative treatment of the insane was opened in 1890 upon the basis of a bequest made by Moses Sheppard in 1857. The endowment was more than doubled in 1898, through the bequest of Enoch Pratt, a Baltimore merchant and financier, the bequest being coupled with the condition that the name be changed to Sheppard and Enoch Pratt Hospital. It is now the most richly endowed hospital for mental diseases in the United States. Other notable institutions inaugurated within the past two or three decades are the M'Donogh School, the Samuel Ready Asylum for Female Orphans, and the Wilson Sanitarium for children. Baltimore was without a free circulating library until 1886, when the Enoch Pratt Free Library was opened. This institution has a central building and seven branches, and possesses about 200,000 volumes. Mr Pratt gave the buildings and the sum of $833,333.33, upon condition that the city expended $50,000 annually upon it.

The growth of manufactures in Baltimore has been rapid; the capital invested in manufacturing has risen from $38,500,000 in 1880 to $92,700,000 in 1890; the number of employees from 56,300 in 1880 to 83,700 in 1890; the annual amount of wages from $15,000,000 in 1880 to $36,000,000 in 1890. It is estimated that the amount of capital invested is now more than $150,000,000. The Abbott Iron Works have been abandoned and the sugar-refining industry has ceased to exist; on the other hand, the steel works of the Maryland Steel Company have been established at Sparrow's Point, representing an investment of about $8,000,000. The export trade has steadily increased. The total of exports for the fiscal year ending 30th June 1901 was $106,239,081. During the preceding year the exports of breadstuffs amounted to $37,997,080; sheep and cattle, $5,139,864; copper, $16,656,875; cotton, and its manufactures, $8,360,193; provisions (meat and dairy products), $20,304,582; and tobacco, $6,797,534. The imports are much smaller, the

aggregate for the year ending 30th June 1901 being $18,899,473.

The Baltimore and Ohio railway tunnel was completed in 1895. It is one mile and two-thirds in length, passes under the city from north to south, and is so equipped that trains can be run through it by electricity. Baltimore trust companies have taken a very active part in the financing of southern railway and other enterprises. It is estimated that the city has more than $100,000,000 invested in the south. Connected with this financial business has been the growth of the bonding companies taking the place of individual bonds. Baltimore is probably the chief centre of this business for the United States. The bonding and trust companies of the city have an aggregate capital of $21,650,000 and a surplus of $17,502,000, or a total of capital and surplus of over $39,000,000. The national banks of the city have an aggregate capital of $11,758,260 and a surplus of $4,479,275. Deposits in the savings banks amount to over $50,000,000.

The political history of Baltimore in recent years has been peculiarly interesting. Shortly after the Civil War the Democratic party regained control of the city and organized a "machine" which for twenty-eight years held unshaken control of the government. The struggle to overthrow the machine began in earnest in 1875, when a coalition was made between the reform element in the Democratic party (under the able leadership of Severn Teackle Wallis) and the Republican party. The attempt was renewed at frequent intervals, the chief obstacle encountered being the fraud and violence in elections, until it culminated in the victory of 1895. A new election law of the most thoroughgoing kind was then enacted by the legislature, under which the old evils have been completely removed. The Republican mayor elected in 1895, in his desire to govern the city properly, encountered strong opposition from the city council, which passed an ordinance taking away from the mayor the power of appointment and vesting it in themselves, and carried it by a three-fourths vote over the mayor's veto. Upon a test case, the Maryland Court of Appeals decided that the council had exceeded its powers. The affair led to the passing of a new charter, some of the salient features of which are as follows:—Doubling of the terms of mayor and city councillors; appointment by the mayor of the heads of executive departments, and of subordinate officials by these heads; mayor's appointments subject to confirmation by the second branch of the city council only; this branch made a small body of eight men, each chosen from the whole of a section, including one-fourth of the city; the president of the second branch elected by the city as a whole; a board of estimates and a board of public improvements, each made up of heads of the appropriate executive departments (together with the president of the second branch), exercising supervision and control of appropriations, &c., and a school board consisting of nine persons appointed from the city at large by the mayor. The new school board replaced a board of twenty-two members, one from each ward, who were nominally elected by the first branch of the city council, but were practically chosen for political reasons, each by the councillor from his ward, and were, as a rule, obviously unfit for school management. The characteristic features of the events here sketched have been the effectiveness of the reform movement and the recognition of the power of the independent element. (F. Fr.)

BALUCHISTAN.

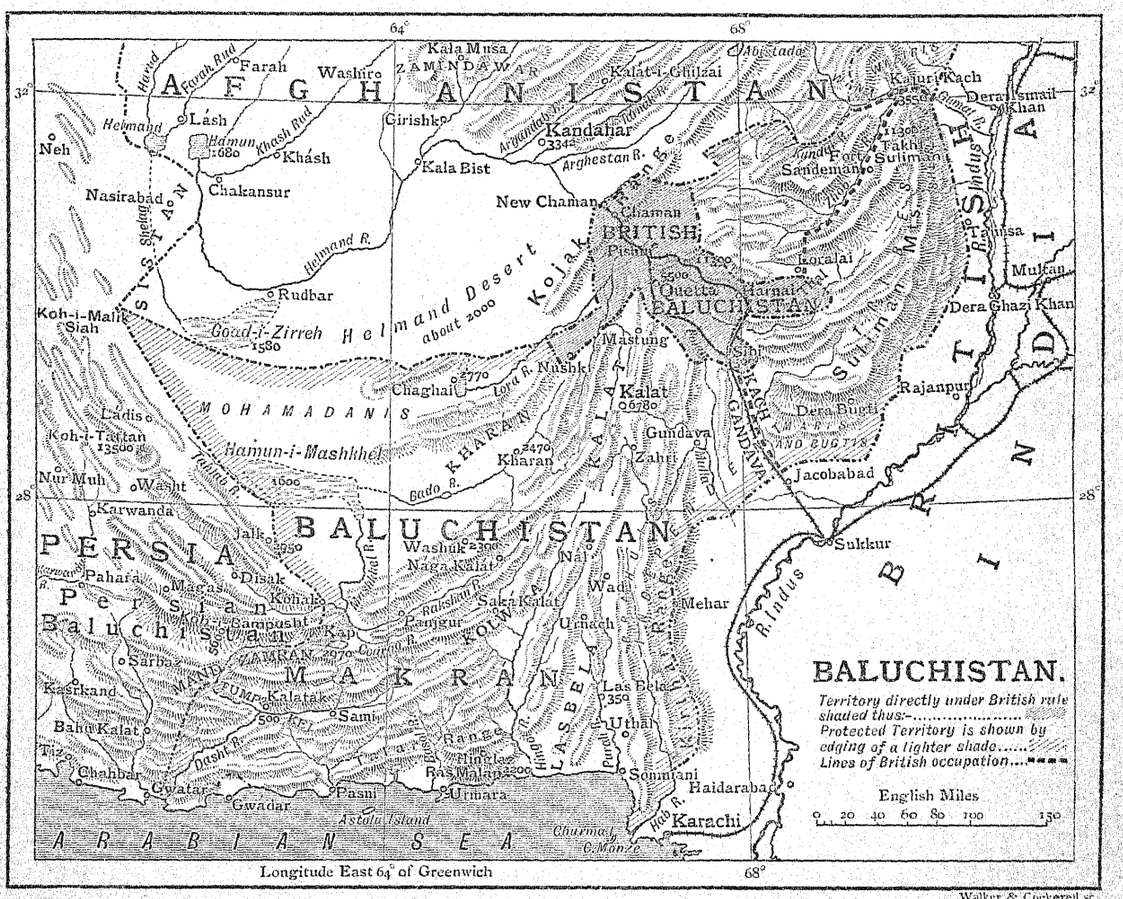
BALUCHISTAN, a country which, like Afghanistan, derives its name from the dominant race of its inhabitants, extends from the Gomul (or Gumal) river to the Arabian Sea, and from the borders of Persia and Afghanistan to those of the Punjab and Sind. Three hundred miles of its mountain walls facing the Indus are south of the railway from the Indus to Quetta, and about 250 north of it. The railway with the passes and plains about it, and the dominant hills which surround Quetta, divide Baluchistan into two distinct parts. North of the railway line, hedged in between Afghanistan and the plains of the Indus, stretch the long ridges of rough but picturesque highlands, which embrace the central ranges of the Sulimani system (the prehistoric home of the Pathan highlander), where vegetation is often Alpine, and the climate clear and bracing and subject to no great extremes of temperature. The average breadth of this northern Pathan district is 150 miles, but it narrows to less than 100 miles on the line of the Gomul, and expands to more than 200 miles on the line of the railway. Here all the main drainage runs either northwards to the Gomul, passing through the uplands that lie west of the Sulimani range; or it gathers locally in narrow lateral valleys at the back of these mountains, and then bursts directly eastwards through the limestone axis of the hills, making for the Indus by the shortest transverse route. South of the railway lies a square block of territory, measuring roughly 300 miles by 300, primarily the home of the Brahui and the Baluch; but within that block are included almost every conceivable phase of climate and representatives of half the great races of Asia. Here, throughout the elevated highlands of the Kalat plateau which are called Jalawan, the drainage gathers into channels which cut deep gorges in the hills, and passes eastwards into the plains of Sind. Beyond and south of the hydrographical area of the Jalawan highlands the rivers and streams of the hills either run in long straight lines to the Arabian Sea, north of Karachi, or, curving gradually westwards, they disappear in the inland swamps which form so prominent a feature in this part of South-West Asia. A narrow width of the coast districts collects its waters for discharge into the Arabian Sea direct. This section includes Makrán. Baluchistan thus becomes naturally divided into two districts, north and south, by an intervening space which contains the Sind-Pishin railway. This intervening space comprises the wedge-shaped desert of Gandava (Kach Gandava), which is thrust westwards from the Indus as a deep indentation into the mountains, and, above it, the central uplands which figure on the map as "British Baluchistan"—where lies Quetta. All Baluchistan has now been surveyed. From the great Indus series of triangles bases have been selected at intervals which have supported minor chains of triangulation reaching into the heart of the country. These again have been connected by links of more or less regularity, so that, if the Baluchistan triangulation lacks the rigid accuracy of a "first-class" system, it at least supports good topography on geographical scales.

Northern.

From Domandi, at the junction of the Gomul and Kundar rivers, the boundary between Baluchistan and Afghanistan follows the Kundar stream for about 40 miles to the south-west. It then leaves the river and diverges northwards, so as to include a section of the plain country stretching away towards Lake Abistada, before returning to the skirts of the hills. After about 100 miles of this divergence it strikes the Kadanai river, turning the northern spurs of the Toba plateau (the base of the Kojak range), and winds through the open plains west of the Kojak. Here, however, the boundary does not follow the river. It deserts it for the western edge of the Toba plateau (8000 feet high at this point), till it nears the little railway station of New Chaman. It then descends to the plains, returns again to the hills 40 miles south of Chaman, and thenceforward is defined by hill ranges southwards to Nushki. The eastern boundary of this northern section of Baluchistan is the "red line" at the foot of the frontier hills, which defines the border of British India. This part of Baluchistan thus presents a buffer system of independent tribes between the British frontier and Afghanistan. But the independence of the Pathan people south of the Gomul is not as the independence of the Pathans (Waziris, Afridis, &c.) who live north of it. It is true that the Indian Government interferes as little with the internal jurisdiction of the tribal chiefs amongst the Pathans of the Sulimani range as it does with that of the northern chiefs; but the occupation of a line of posts on the Zhob river, which flanks that range almost from end to end on the west, places the doors of communication with Afghanistan in British hands, and gives command of their hills. It thus tends to the maintenance of peace

and order on the southern frontier to a degree that does not exist in the north.

The central range of the Sulimanis is the dominant feature in the geography of Northern Baluchistan. The central line or axis of the range lies a little east of the meridian of 70° E., and it is geologically composed of one or more great folds of the Cretaceous series. Towards the northern extremity of the range occur a group of peaks, which together form an oblong block or "massif" amongst the neighbouring ridges known as "Kaisargarh" amongst the Sherani clansmen who occupy it, and as the "Takht-i-Suliman" (Solomon's throne), generally, on the frontier, from the fact of a celebrated shrine of that name existing near its southern abutment. The massif of the Takht is a high tableland (about 8000 feet above sea-level), bounded on its eastern and western edges by high, rugged, and steep parallel ridges. The western ridge culminates on the north in the peak of Kaisargarh (11,300 feet), and the eastern in a block, or detached headland, on the south, where rests the immortal "ziarat" or shrine (11,070 feet). This tableland is formed by a huge cap of coral limestone, estimated by Griesbach at from 4000 to 5000 feet in thickness. At each end the tableland is rent by gorges which deepen, amidst stupendous precipices, to the channel of the Draband or "Gat" on the north, and of the Dhana on the south. These two channels carry the rush of mountain streams from the western slopes of the massif right



MAP OF BALUCHISTAN.

across the axis of the mountains and through the intervening barrier of minor ridges to the plains of the Indus. The plateau is covered with a fairly thick growth of the chilghosa or "edible" pine, and a sprinkling of juniper, on the higher slopes. It was ascended and surveyed for the first time in 1883.

From the summit of the Kaisargarh peak a magnificent view is obtained which practically embraces the whole width of Northern Baluchistan. Westwards, looking towards Afghanistan, line upon line of broken jagged ridges and ranges, folds in the Cretaceous series overlaid by coarse sandstones and shales, follow each other in order, preserving their approximate parallelism until they touch the borders of Baluchistan. Immediately on the west of the Kaisargarh there towers the Shingarh mountain, a geological repetition of the Kaisargarh ridge, black with pines towards the summit, and crowned with crags of coral limestone. Beyond it are the gray outlines of the close-packed ridges which enclose the lower reaches of the Zhob and the Kundar. As they pass away southwards this gridiron formation strikes with a gentle curve westwards, the narrow enclosed valleys widening out towards the sources of the rivers, where ages of denudation have worn down the folds and filled up the hollows with fruitful soil, until at last they touch the central water-divide, the key of the whole system, on the Quetta plateau. Thus the upper parts of the Zhob valley are comparatively open and fertile, with flourishing villages, and a cultivation which has been greatly developed under British rule, and are bounded by long sweeping gentle spurs clothed with wild olive woods containing trees of immense size. The lower reaches of the Zhob and Kundar are hemmed in by rugged limestone walls, serrated and banded with deep clefts and gorges, a wilderness of stony desolation. Looking eastwards from the Kaisargarh, one can again count the backs of innumerable minor ridges, smaller wrinkles or folds formed during a process of upheaval of the Sulimani mountains, at the close of a great volcanic epoch which has hardly yet ceased to give evidence of its existence. On the outside edge, facing the Indus plains, is a more strictly regular, but higher and more rugged, ridge of hills which marks the Siwaliks. The Baluch Siwaliks afford us strange glimpses into a recent geological past, when the same gigantic mammals roamed along the foot of these wild hills as once inhabited the tangled forests below the Himalaya. Between the Takht mountain and the Siwaliks, the intervening belt of ridge and furrow has been greatly denuded by transverse drainage—a system of drainage which we now know to have existed before the formation of the hills, and to have continued to cut through them as they gradually rose above the plain level. Where this intervening band is not covered by recent gravel deposits, it exhibits beds of limestone

clays, and sandstone with fossils, which, in age, range from the Lower Eocene to the Miocene. Beyond the Siwaliks, still looking eastwards, are the sand waves of the Indus plain; a yellow sea broken here and there with the shadow of village orchards and the sheen of cultivation, till it rests against the long black sinuous line which denotes the fringe of trees bordering the Indus. Such is the scene which Solomon is said to have invited his Indian bride to gaze upon for the last time, as they rested on the crags of the southern buttress of the Takht—where his shrine exists to this day. To that shrine thousands of pilgrims, Mahommedans and Hindus alike, resort on their yearly pilgrimages, in spite of its dangerous approach. All this country, so far, is independent Baluchistan within the jurisdiction of the Baluchistan Agency, with the exception of certain clans of the Shermis on the eastern slopes of the Takht-i-Suliman, north of the Vihowa, who are under Punjab administration.[1] Wedged in between the railway and the Indus, but still north of the railway, is a curious mass of rough mountain country, which forms the southern abutment of the Sulimani system. The strike of the main ridges forming that system is almost due north and south till it touches 30° N. lat. Here it assumes a westerly curve, till it points north-west, and finally merges into the broad land of mountains which hedge in the Quetta and Pishin uplands on the north and east.

At this point, as might be expected, are some of the grandest peaks and precipices in Baluchistan. Khalifat on the east of Quetta, flanking the Harnai loop of the Sind-Pishin railway; Takatu to the north; Chahiltan on the south-west; and the great square-headed Murdar to the south—all overlook the pretty cantonment from heights which range from 10,500 to 11,500 feet. Lying in the midst of them, on an open plain formed by the high-level tributaries of the Lora (which have also raised the Pishin valley to the north), 5500 feet above the sea, is Quetta. Quetta was founded in 1873, and has now grown into one of the most popular, as it is one of the most picturesque, of Indian military stations. The mass of twisted flexures, the curved wrinkles that end the Sulimani system, is occupied by true Baluchis, the Mari and Bugti sections of the great Rind confederation of tribes owning an Arabic origin. There are no Pathans here. To the north of them are the Bozdars, another Rind clan; and these Rind tribes form the exception to the general rule of Pathan occupation of Northern Baluchistan. Amongst the Pathans, the Kakurs and Dumurs of Pishin, with the Mando Khel of Zhob, are the most prominent tribal divisions.

The curved recession of the Sulimani ranges to the north-west leaves a space of flat alluvial desert to the south, which forms a sort of inlet or bay striking into the Baluchistan mountain system. The point of this desert inlet receives the drainage of two local basins, the Bolan and the Nari. Both drain south-eastwards from the central Quetta-Pishin plateau, and both have served for railway alignment. Being fed by tributaries which for the most part drain narrow valleys where gradual denudation has washed bare the flat-backed slopes of limestone ridges, and which consequently send down torrents of rapidly accumulating rainfall, both these central lines of water-course are liable to terrific floods. The drainage of the Bolan and Nari finally disappears in the irrigated flats of the alluvial bay (Kach Gandava), which extends 130 miles from the Indus to Sibi at the foot of the hills, and which offers (in spite of periodic Indus floods) an opportunity for railway approach to Baluchistan such as occurs nowhere else on the frontier. Kach Gandava, whilst its agricultural development has in no way receded, is now rivalled by many of the valleys of the highlands. Its climate debars it from European occupation. It is a land of dust-storms and poisonous winds; a land where the thermometer never sinks below 100° F. in summer, and drops below freezing-point in winter; where there is a deadly monotony of dust-coloured scenery for the greater part of the year, with the minimum of rain and the maximum of heat. The Quetta and Pishin plateau to which it leads is the central dominant water-divide of Baluchistan and the base of the Kandahar highway.

Central.

An irregularly-shaped block of upland territory, which includes all the upper Lora tributaries, and the Toba plateau beyond them; resting on the Kojak range (with an advanced loop to include the Chaman railway terminus) on the west; reaching south through Shorarud to Nushki; including the basins of the Bolan and Nari as far as Sibi to the south-east; stretching out an arm to embrace the Tal Chotiali valley on the east, and following the main water-divide between the Zhob and Lora on the north, is called British Baluchistan. It is leased from Kalat, and forms a distinctive province, being brought under the ordinary forms of civil administration in British India. Beyond it, north and south, lies independent Baluchistan, but this independence is not that of Afghanistan—hardly that of the native states of the Indian peninsula. Instead of being subject to civil administration, independent Baluchistan is under political control; and its administrative staff is more distinctly military than that of the assigned districts of British Baluchistan. The degree of independence enjoyed by the various districts of Baluchistan may be said to vary in direct proportion to their distance from Quetta. No part of Baluchistan is beyond the reach of the political officer, but there are many parts where he is not often seen. The governor-general's agent at Quetta is invested with supreme authority. The climate of British Baluchistan is dry and bracing—even exhilarating—but the extremes of temperature lead to the development of fever in very severe forms. On the whole it is favourable to European existence.

British.

South-west of the dividing railway lies the great block of Southern Baluchistan. Within this area the drainage generally trends south and west, either to the Arabian Sea, or to the central swamps of Lora and Mashkel. The Hab river, which forms the boundary west of Karachi; the Puráli (the ancient *Arabis*), which drains the low-lying flats of Las Bela; the Hingol (the ancient *Tomeros*) and the Dasht, which drain Makrán, are all considerable streams, draining into the Arabian Sea, and forming important arteries in the network of internal communication. An exception to the general rule is found in the Mulla, which carries the floods of the Kalat highlands into the Gandava basin, and which forms one of the most important of the ancient highways from the Indus plains to Kandahar. The fortress of Kalat is situated about midway between the sources of the Bolan and the Mulla, near a small tributary of the Lora (the river of Pishin and Quetta), about 6800 feet above sea-level, on the western edge of a cultivated plain in the very midst of hills. (See KALAT.) To the north are the long sweeping lines of the Sarawán ridges, enclosing narrow fertile valleys, and passing away to the south-west to the edge of the Kharán desert. East and south are the rugged bands of Jalawán, amongst which the Mulla rises, and through which it breaks in a series of magnificent defiles in order to reach the Gandava plain. Routes which converge on Kalat from the south pass for the most part through narrow wooded valleys, enclosed between steep ridges of denuded hills, and, following the general strike of these ridges, they run from valley to valley with easy grades. Kalat is the "hub" or centre, from which radiate the Bolan, the Mulla, and the southern Lora affluents; but the Lora drains also the Pishin valley on the north; the two systems uniting in Shorawak, to lose themselves in the desert and swamps to the west of Nushki, on the road to Sistán. Sixty miles south of Kalat, and beyond the Mulla sources, commences another remarkable hydrographic system which includes all Southern and South-Western Baluchistan. To the west lies the Kharán desert, with intermittent river channels enclosed and often lost in sand-waves ere they reach the Mashkel swamps on the far borders of Persia. To the south-west are the long sweeping valleys of Rakshán and Panjgur, which, curving northwards, likewise discharge their drainage into the Mashkel. Directly south are the beginnings of the meridional arteries, the Hab, the Puráli, and the Hingol, which end in the Arabian Sea, leaving a space of mountainous seaboard (Makrán) south of the Panjgur and west of the Hingol, which is watered (so far as it is watered at all) by the long lateral Kej stream and several smaller mountain nullahs. Thus Southern Baluchistan comprises four hydrographical sections. First is the long extension from Kalat, southwards, of that inconceivably wild highland country which faces the desert of Sind, the foot of which forms the Indian frontier. This is the land of the Brahui, and the flat wall of its frontier limestone barrier is one of the most remarkable features in the configuration of the whole line of Indian borderland. For the first 60 miles from the sea near Karachi the Hab river is the boundary of Sind, and here, across the enclosing desolation of outcropping ridges and intervening sand, a road may be found into Makrán. But from the point where the boundary leaves the Hab to follow the Kirthar range not a break occurs (save one) in 150 miles of solid rock wall, rising many thousands of feet straight from the sandy plain. The one break, or gorge, which allows the Kej waters to pass only forms a local gateway into a mass of impracticable hills. Secondly, to the west of this mountain wilderness, stretching upwards from the sea in a wedge form between the Brahui highlands and the group of towering peaks which enclose the Hingol river and abut on the sea at Malan, are the alluvial flats and delta of the Puráli, forming the little province of Las Bela, the home of the Las Rajput. In this hot and thirsty corner of Baluchistan, ruled by the Jam or Cham, there is a fairly wide stretch of cultivation, nourished by the alluvial detritus of the Puráli, and well irrigated. In a little garden to the south of the modern town of Las Bela (the ancient *Armabel*) is the tomb of Sir Robert Sandeman, who spent the best part of an energetic and active life in the making of Baluchistan.

Southern.

Westward of the Hingol, and fringing the Arabian Sea, stretching to the Persian frontier (here defined by the Dasht river), is the maritime province of Makrán, the home of many mixed races, amongst which the Arab Rind predominates. The long lateral valley of Kej is usually associated with Makrán in early geographical records. The Kej-Macorán of Marco Polo is the Makrán of to-day. Behind a stretch of sandy foreshore, which is broken on the coast-line by the magnificent cliffs of Malán, the

Makrán.

[1] Now included within the limits of the lately formed frontier province.

hammer-shaped headlands of Urmara and Gwadur, and the precipitous cliffs of Jebel Zarain, near Pasni, lies the usual frontier band of parallel ridges, alternating with narrow furrows or valleys. Amongst them the ranges called Talána and Talur are conspicuous by their height and regular configuration. The normal conformation of the frontier is somewhat emphasized in Makrán. Here the volcanic action which preceded the general upheaval of recent strata and the folding of the edges of the interior highlands, is still in evidence in occasional boiling-mud volcanoes on the coast-line. It is repeated in the blazing summit of the Koh-i-taftán (the burning mountain of the Persian frontier), which is the highest active volcano in Asia (13,000 feet), and probably the farthest inland. Evidence of extinct mud volcanoes exists through a very wide area in Baluchistan and Sistan. Probably the Miri, or fort, at Quetta represents one of them. The coast is indented by several considerable harbours. Urmara, Khor Khalmat, Pasni, and Gwadur are all somewhat difficult of approach by reason of a sand-bar which seems to extend along the whole coast-line, and which is very possibly the last evidence of a submerged ridge; and they are all subject to a very lively surf under certain conditions of wind. Of these the port of Gwadar (which belongs to Muscat and is therefore foreign territory) is the most important. They all are (or were) stations of the Indo-Persian telegraph system which unites Karachi with Bushire. With the exception of the Kej valley, and that of the Bolida, which is an affluent of the Kej, there are no considerable spaces of cultivation in Makrán. These two valleys seem to concentrate the whole agricultural wealth of the country. They are picturesque, with thick groves of date palms at intervals, and are filled with crops and orchards. They are indeed exceedingly beautiful; and yet the surrounding waste of hills is chiefly a barren repetition of sun-cracked crags and ridges with parched and withered valleys intersecting them, where a trickle of salt water leaves a white and leprous streak amongst the faded tamarisk or the yellow stalks of last season's grass. Makrán is the home of remnants of an innumerable company of mixed people gathered from the four corners of Asia and Eastern Africa. The ancient Dravidians, of whom the Brahui is typical, still exist in many of the districts which are assigned to them in the works of Herodotus. Amongst them there is always a prominent Arab element, for the Arabs held Makrán even before they conquered Sind and made the Kej valley their trade highway to India. There are negroes on the coast, bred from imported slaves. The Meds of the Indus valley still form the greater part of the fishing population, representing the Ichthyophagi of Arrian's history. The old Tajak element of Persia is not so evident in Makrán as it is farther north; and the Karak pirates, who gave their name to Karachi, and whose depredations led to the invasion of India and the conquest of Sind, seem to have disappeared altogether. The fourth section includes the valleys formed by the Rakshán and Mashkel, which, sweeping downwards from the Kalat highlands and the Persian border east and west, unite to break through the intervening chain of hills northward to form the Mashkel swamps, and define the northern limits of Makrán. In these valleys are narrow strips of very advanced cultivation, the dates of Panjgur being famous and generally reckoned superior even to those of the Euphrates. The great Mashkel swamp, and the Kharán desert to the east of it, mark the flat phase of Southern Baluchistan topography. It is geologically part of an ancient inland lake or sea which included the present swamp regions of the Helmund, but not the central depression of the Lora. The latter is buttressed against hills at a much higher elevation than the Kharán desert, which is separated from the great expanse of the Helmund desert within the borders of Afghanistan by a transverse band of serrated hills forming a distinct watershed from Nushki to Sistán. Here and there these jagged peaks appear as if half overwhelmed by an advancing sea of sand. They are treeless and barren, and water is but rarely found under the edges of their foot-hills. The Koh-i-Sultan, at the western extremity of the northern group of these irregular hills, is over 6000 feet above sea-level, but the general level of the surrounding deserts is only about 2000 feet, sinking to 1500 feet in the Mashkel Hamun and the Gaod-i-Zirreh.

The boundary between Baluchistan and Afghanistan, starting from Nushki, cuts across the Lora Hamún, leaving the frontier post of Chagai to Baluchistan, and from this point to the Malik Siah Koh it is based partly on the central mountainous water-divide already referred to, and partly runs in straight lines through the desert south of the salt swamps of the Gaod-i-Zirreh. It thus passes 50 miles to the south of the Helmund, entirely shutting off that valley, and the approach to Sistán between the Helmund and the Gaod-i-Zirreh (the only approach from the east in seasons of flood) from Baluchistan. But it leaves a connected line of desert route between Nushki and Sistán, which is open in all ordinary seasons, to the south, and this route has been largely developed, posts or serais having been established at intervals, and wells having been dug. There is already a promising Khafila traffic along it. Within the Baluchistan half of the desert are to be found scattered tribes of nomads, called Rekis (or desert people), of which the Mohamadani are the most numerous. They are probably of Arab origin. This central desert is the Kir, Kej, Katz, or Kash Kaián of Arabic mediæval geography and a part of the ancient Kaiáni kingdom; the prefix Kej or Kach always denoting low-level flats or valleys, in contradistinction to mountains or hills. The Mohamadani nomads occupy the central mountain region, to the south of which lie the Mashkel and Kharán deserts, inhabited by a people of quite different origin, who possess something approaching to historical records. These are the Naoshirwanis, a purely Persian race, who passed into Baluchistan within historic times, although the exact date is uncertain. The Naoshirwanis appear to be identical with the Tahuki or Tahukáni, who are to be found in Perso-Baluchistan. Tahuki is mentioned by Nearkos, by Strabo, and by Ptolemy. They are a fine manly race of people, in many respects superior to their modern compatriots of Iran. If left to themselves it is probable that the Naoshirwanis would displace the Brahuis as the dominant race in Baluchistan. Between the Naoshirwanis of the Kharán desert and Mashkel, and the fish-eating population of the coast, enclosed in the narrow valleys of the Rakshán and Kej tributaries, or about the sources of the Hingol, are tribes innumerable, remnants of races which may be recognized in the works of Herodotus, or may be traced in the records of recent immigration. Equally scattered through the whole country, and almost everywhere recognizable, is the underlying Persian population (Tajak), which is sometimes represented by a locally dominant tribe, but more frequently by the agricultural slave and bondsman of the general community. Such are the Dehwars or Dehkans, and the Durzadas (*Derusiæ* of Herodotus), who extend all through Makrán, and, as slaves, are called Nakibs. The Arabs have naturally left their mark most strongly impressed on the ethnography of Baluchistan. All Rind tribes claim to be of Arab origin and of Khoreish extraction. As the Arabs occupied all Southern Baluchistan and Sistán from a very early date, and finally spread through the Sind valley, where they remained till the 12th century, their genealogical records have become much obscured, and it is probable that there is not now a pure Arab in the country. It is as builders or engineers that they have established their most permanent records, Makrán being full of the relics of their irrigation works constructed in times when the climatic conditions of Baluchistan must have been very different from what they are now. Lower Sind also contains a great wealth of architectural remains, which may be found to the west of the Indus as well as in the delta. One particular tribe (the Kalmats), who left their name on the Makrán coast and subsequently dominated Bela and Sind, west of the Indus, for a considerable period, exhibit great power of artistic design in their sepulchral monuments. The Dravidian races (Brahuis), who are chiefly represented by the Kambaranis and Mingals, or Mongals (the latter are doubtless of Tartar origin), spread through Southern Baluchistan as well as the eastern hills, and are scattered irregularly through the mountain tracts south of Kharán. The ancient Oritæ mentioned by Arrian are probably represented by the tribe of Hot, who, as original masters of the soil, are exempt from taxation. The name Brahui is (according to Bellew) but a corruption of Ba-rohi, (or "hillmen") in a language derived from Sanscrit which would represent the same term by Parva-ka. So that the "Parkanai" of Arrian may be recognized as surviving in the Brahui, and in the name (Parkán) of a mountain-bred stream which is a tributary of the Hingol. Amongst other aboriginal tribes to whom reference is made by very early writers are the Bolédi, who give their name to the Bolida valley, a tributary of the Kej. The Boledi were once the ruling race of Southern Baluchistan, which was originally called Boledistan, and it seems possible that this may be the real origin of the much-disputed name of the country generally. Bola was an Assyrian term for Bael or Bel, the god of the Phœnicians and Druids. The Bolédi ruling family are at present represented by but one living member, a lady, who is a Government pensioner. The fast-diminishing Sajidis (Sajittæ) and Saka (Sacæ) are others of the more ancient races of Baluchistan easily recognizable in classical geography. Most recent of all are the Gichkis. The Gichkis derive from a Rajput adventurer who flourished in the early part of the 17th century. They are now the dominant race in Panjgur and Kej, from whence they ousted the Boledis. For three generations they remained Hindus; since then there has arisen amongst them a strange new sect called Zikari, with exceedingly loose notions of morality. The sect, however, appears to be fast merging into orthodox Mahommedanism. A Baluch (or rather Makrán) race which deserves attention is that of the Gadaras, who once gave the name Gadrosia to Southern Baluchistan. According to Tate, the Gadaras are now represented by Sidi half-castes—those Makráni "boys" who are so well known in the mercantile marine as stokers and firemen. It seems unlikely that this modern admixture of Asiatic and African blood represents the "Asiatic Ethiopian" of Herodotus, which was more probably a direct connexion of the Himyaritic Arab builders of "bunds" and revetments who spread eastwards from Arabia (see ARABIA). Bellew finds in the Gadara the Garuda (eagles) of Sanskrit, who were ever in opposition to the

Races.

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An irregularly-shaped block of upland territory, which includes all the upper Lora tributaries, and the Toba plateau beyond them; resting on the Kojak range (with an advanced loop to include the Chaman railway terminus) on the west; reaching south through Shorarud to Nushki; including the basins of the Bolan and Nari as far as Sibi to the south-east; stretching out an arm to embrace the Tal Chotiali valley on the east, and following the main water-divide between the Zhob and Lora on the north, is called British Baluchistan. It is leased from Kalat, and forms a distinctive province, being brought under the ordinary forms of civil administration in British India. Beyond it, north and south, lies independent Baluchistan, but this independence is not that of Afghanistan—hardly that of the native states of the Indian peninsula. Instead of being subject to civil administration, independent Baluchistan is under political control; and its administrative staff is more distinctly military than that of the assigned districts of British Baluchistan. The degree of independence enjoyed by the various districts of Baluchistan may be said to vary in direct proportion to their distance from Quetta. No part of Baluchistan is beyond the reach of the political officer, but there are many parts where he is not often seen. The governor-general's agent at Quetta is invested with supreme authority. The climate of British Baluchistan is dry and bracing—even exhilarating—but the extremes of temperature lead to the development of fever in very severe forms. On the whole it is favourable to European existence.

British.

South-west of the dividing railway lies the great block of Southern Baluchistan. Within this area the drainage generally trends south and west, either to the Arabian Sea, or to the central swamps of Lora and Mashkel. The Hab river, which forms the boundary west of Karachi; the Purali (the ancient *Arabis*), which drains the low-lying flats of Las Bela; the Hingol (the ancient *Tomeros*) and the Dasht, which drain Makrán, are all considerable streams, draining into the Arabian Sea, and forming important arteries in the network of internal communication. An exception to the general rule is found in the Mulla, which carries the floods of the Kalat highlands into the Gandava basin, and which forms one of the most important of the ancient highways from the Indus plains to Kandahar. The fortress of Kalat is situated about midway between the sources of the Bolan and the Mulla, near a small tributary of the Lora (the river of Pishin and Quetta), about 6800 feet above sea-level, on the western edge of a cultivated plain in the very midst of hills. (See KALAT.) To the north are the long sweeping lines of the Sarawán ridges, enclosing narrow fertile valleys, and passing away to the south-west to the edge of the Kharán desert. East and south are the rugged bands of Jalawán, amongst which the Mulla rises, and through which it breaks in a series of magnificent defiles in order to reach the Gandava plain. Routes which converge on Kalat from the south pass for the most part through narrow wooded valleys, enclosed between steep ridges of denuded hills, and, following the general strike of these ridges, they run from valley to valley with easy grades. Kalat is the "hub" or centre, from which radiate the Bolan, the Mulla, and the southern Lora affluents; but the Lora drains also the Pishin valley on the north; the two systems uniting in Shorawak, to lose themselves in the desert and swamps to the west of Nushki, on the road to Sistán. Sixty miles south of Kalat, and beyond the Mulla sources, commences another remarkable hydrographic system which includes all Southern and South-Western Baluchistan. To the west lies the Kharán desert, with intermittent river channels enclosed and often lost in sand-waves ere they reach the Mashkel swamps on the far borders of Persia. To the south-west are the long sweeping valleys of Rakshán and Panjgur, which, curving northwards, likewise discharge their drainage into the Mashkel. Directly south are the beginnings of the meridional arteries, the Hab, the Purali, and the Hingol, which end in the Arabian Sea, leaving a space of mountainous seaboard (Makrán) south of the Panjgur and west of the Hingol, which is watered (so far as it is watered at all) by the long lateral Kej stream and several smaller mountain nullahs. Thus Southern Baluchistan comprises four hydrographical sections. First is the long extension from Kalat, southwards, of that inconceivably wild highland country which faces the desert of Sind, the foot of which forms the Indian frontier. This is the land of the Brahui, and the flat wall of its frontier limestone barrier is one of the most remarkable features in the configuration of the whole line of Indian borderland. For the first 60 miles from the sea near Karachi the Hab river is the boundary of Sind, and here, across the enclosing desolation of outcropping ridges and intervening sand, a road may be found into Makrán. But from the point where the boundary leaves the Hab to follow the Kirthar range not a break occurs (save one) in 150 miles of solid rock wall, rising many thousands of feet straight from the sandy plain. The one break, or gorge, which allows the Kej waters to pass only forms a local gateway into a mass of impracticable hills. Secondly, to the west of this mountain wilderness, stretching upwards from the sea in a wedge form between the Brahui highlands and the group of towering peaks which enclose the Hingol river and abut on the sea at Malan, are the alluvial flats and delta of the Purali, forming the little province of Las Bela, the home of the Las Rajput. In this hot and thirsty corner of Baluchistan, ruled by the Jam or Cham, there is a fairly wide stretch of cultivation, nourished by the alluvial detritus of the Purali, and well irrigated. In a little garden to the south of the modern town of Las Bela (the ancient *Armabel*) is the tomb of Sir Robert Sandeman, who spent the best part of an energetic and active life in the making of Baluchistan.

Southern.

Westward of the Hingol, and fringing the Arabian Sea, stretching to the Persian frontier (here defined by the Dasht river), is the maritime province of Makrán, the home of many mixed races, amongst which the Arab Rind predominates. The long lateral valley of Kej is usually associated with Makrán in early geographical records. The Kej-Macorán of Marco Polo is the Makrán of to-day. Behind a stretch of sandy foreshore, which is broken on the coast-line by the magnificent cliffs of Malán, the

Makrán.

[1] Now included within the limits of the lately formed frontier province.

hammer-shaped headlands of Urmara and Gwadur, and the precipitous cliffs of Jebel Zarain, near Pasni, lies the usual frontier band of parallel ridges, alternating with narrow furrows or valleys. Amongst them the ranges called Talána and Talur are conspicuous by their height and regular configuration. The normal conformation of the frontier is somewhat emphasized in Makrán. Here the volcanic action which preceded the general upheaval of recent strata and the folding of the edges of the interior highlands, is still in evidence in occasional boiling-mud volcanoes on the coast-line. It is repeated in the blazing summit of the Koh-i-taftán (the burning mountain of the Persian frontier), which is the highest active volcano in Asia (13,000 feet), and probably the farthest inland. Evidence of extinct mud volcanoes exists through a very wide area in Baluchistan and Sistan. Probably the Miri, or fort, at Quetta represents one of them. The coast is indented by several considerable harbours. Urmara, Khor Khalmat, Pasni, and Gwadur are all somewhat difficult of approach by reason of a sand-bar which seems to extend along the whole coast-line, and which is very possibly the last evidence of a submerged ridge; and they are all subject to a very lively surf under certain conditions of wind. Of these the port of Gwadar (which belongs to Muscat and is therefore foreign territory) is the most important. They all are (or were) stations of the Indo-Persian telegraph system which unites Karachi with Bushire. With the exception of the Kej valley, and that of the Bolida, which is an affluent of the Kej, there are no considerable spaces of cultivation in Makrán. These two valleys seem to concentrate the whole agricultural wealth of the country. They are picturesque, with thick groves of date palms at intervals, and are filled with crops and orchards. They are indeed exceedingly beautiful; and yet the surrounding waste of hills is chiefly a barren repetition of sun-cracked crags and ridges with parched and withered valleys intersecting them, where a trickle of salt water leaves a white and leprous streak amongst the faded tamarisk or the yellow stalks of last season's grass. Makrán is the home of remnants of an innumerable company of mixed people gathered from the four corners of Asia and Eastern Africa. The ancient Dravidians, of whom the Brahui is typical, still exist in many of the districts which are assigned to them in the works of Herodotus. Amongst them there is always a prominent Arab element, for the Arabs held Makrán even before they conquered Sind and made the Kej valley their trade highway to India. There are negroes on the coast, bred from imported slaves. The Meds of the Indus valley still form the greater part of the fishing population, representing the Ichthyophagi of Arrian's history. The old Tajak element of Persia is not so evident in Makrán as it is farther north; and the Karak pirates, who gave their name to Karachi, and whose depredations led to the invasion of India and the conquest of Sind, seem to have disappeared altogether. The fourth section includes the valleys formed by the Rakshán and Mashkel, which, sweeping downwards from the Kalat highlands and the Persian border east and west, unite to break through the intervening chain of hills northward to form the Mashkel swamps, and define the northern limits of Makrán. In these valleys are narrow strips of very advanced cultivation, the dates of Panjgur being famous and generally reckoned superior even to those of the Euphrates. The great Mashkel swamp, and the Kharán desert to the east of it, mark the flat phase of Southern Baluchistan topography. It is geologically part of an ancient inland lake or sea which included the present swamp regions of the Helmund, but not the central depression of the Lora. The latter is buttressed against hills at a much higher elevation than the Kharán desert, which is separated from the great expanse of the Helmund desert within the borders of Afghanistan by a transverse band of serrated hills forming a distinct watershed from Nushki to Sistán. Here and there these jagged peaks appear as if half overwhelmed by an advancing sea of sand. They are treeless and barren, and water is but rarely found under the edges of their foot-hills. The Koh-i-Sultan, at the western extremity of the northern group of these irregular hills, is over 6000 feet above sea-level, but the general level of the surrounding deserts is only about 2000 feet, sinking to 1500 feet in the Mashkel Hamun and the Gaod-i-Zirreh.

The boundary between Baluchistan and Afghanistan, starting from Nushki, cuts across the Lora Hamún, leaving the frontier post of Chagai to Baluchistan, and from this point to the Malik Siah Koh it is based partly on the central mountainous water-divide already referred to, and partly runs in straight lines through the desert south of the salt swamps of the Gaod-i-Zirreh. It thus passes 50 miles to the south of the Helmund, entirely shutting off that valley, and the approach to Sistán between the Helmund and the Gaod-i-Zirreh (the only approach from the east in seasons of flood) from Baluchistan. But it leaves a connected line of desert route between Nushki and Sistán, which is open in all ordinary seasons, to the south, and this route has been largely developed, posts or serais having been established at intervals, and wells having been dug. There is already a promising Khafila traffic along it. Within the Baluchistan half of the desert are to be found scattered tribes of nomads, called Rekis (or desert people), of which the Mohamadani are the most numerous. They are probably of Arab origin. This central desert is the Kir, Kej, Katz, or Kash Kaián of Arabic mediæval geography and a part of the ancient Kaiáni kingdom; the prefix Kej or Kach always denoting low-level flats or valleys, in contradistinction to mountains or hills. The Mohamadani nomads occupy the central mountain region, to the south of which lie the Mashkel and Kharán deserts, inhabited by a people of quite different origin, who possess something approaching to historical records. These are the Naoshirwanis, a purely Persian race, who passed into Baluchistan within historic times, although the exact date is uncertain. The Naoshirwanis appear to be identical with the Tahuki or Tahukáni, who are to be found in Perso-Baluchistan. Tahuki is mentioned by Nearkos, by Strabo, and by Ptolemy. They are a fine manly race of people, in many respects superior to their modern compatriots of Iran. If left to themselves it is probable that the Naoshirwanis would displace the Brahuis as the dominant race in Baluchistan. Between the Naoshirwanis of the Kharán desert and Mashkel, and the fish-eating population of the coast, enclosed in the narrow valleys of the Rakshán and Kej tributaries, or about the sources of the Hingol, are tribes innumerable, remnants of races which may be recognized in the works of Herodotus, or may be traced in the records of recent immigration. Equally scattered through the whole country, and almost everywhere recognizable, is the underlying Persian population (Tajak), which is sometimes represented by a locally dominant tribe, but more frequently by the agricultural slave and bondsman of the general community. Such are the Dehwars or Dehkans, and the Durzadas (*Derusiæ* of Herodotus), who extend all through Makrán, and, as slaves, are called Nakibs. The Arabs have naturally left their mark most strongly impressed on the ethnography of Baluchistan. All Rind tribes claim to be of Arab origin and of Khoreish extraction. As the Arabs occupied all Southern Baluchistan and Sistán from a very early date, and finally spread through the Sind valley, where they remained till the 12th century, their genealogical records have become much obscured, and it is probable that there is not now a pure Arab in the country. It is as builders or engineers that they have established their most permanent records, Makrán being full of the relics of their irrigation works constructed in times when the climatic conditions of Baluchistan must have been very different from what they are now. Lower Sind also contains a great wealth of architectural remains, which may be found to the west of the Indus as well as in the delta. One particular tribe (the Kalmats), who left their name on the Makrán coast and subsequently dominated Bela and Sind, west of the Indus, for a considerable period, exhibit great power of artistic design in their sepulchral monuments. The Dravidian races (Brahuis), who are chiefly represented by the Kambaranis and Mingals, or Mongals (the latter are doubtless of Tartar origin), spread through Southern Baluchistan as well as the eastern hills, and are scattered irregularly through the mountain tracts south of Kharán. The ancient Oritæ mentioned by Arrian are probably represented by the tribe of Hot, who, as original masters of the soil, are exempt from taxation. The name Brahui is (according to Bellew) but a corruption of Ba-rohi, (or "hillmen") in a language derived from Sanscrit which would represent the same term by Parva-ka. So that the "Parkanai" of Arrian may be recognized as surviving in the Brahui, and in the name (Parkán) of a mountain-bred stream which is a tributary of the Hingol. Amongst other aboriginal tribes to whom reference is made by very early writers are the Bolédi, who give their name to the Bolida valley, a tributary of the Kej. The Boledi were once the ruling race of Southern Baluchistan, which was originally called Boledistan, and it seems possible that this may be the real origin of the much-disputed name of the country generally. Bola was an Assyrian term for Bael or Bel, the god of the Phœnicians and Druids. The Bolédi ruling family are at present represented by but one living member, a lady, who is a Government pensioner. The fast-diminishing Sajidis (Sajittæ) and Saka (Sacæ) are others of the more ancient races of Baluchistan easily recognizable in classical geography. Most recent of all are the Gichkis. The Gichkis derive from a Rajput adventurer who flourished in the early part of the 17th century. They are now the dominant race in Panjgur and Kej, from whence they ousted the Boledis. For three generations they remained Hindus; since then there has arisen amongst them a strange new sect called Zikari, with exceedingly loose notions of morality. The sect, however, appears to be fast merging into orthodox Mahommedanism. A Baluch (or rather Makrán) race which deserves attention is that of the Gadaras, who once gave the name Gadrosia to Southern Baluchistan. According to Tate, the Gadaras are now represented by Sidi half-castes—those Makráni "boys" who are so well known in the mercantile marine as stokers and firemen. It seems unlikely that this modern admixture of Asiatic and African blood represents the "Asiatic Ethiopian" of Herodotus, which was more probably a direct connexion of the Himyaritic Arab builders of "bunds" and revetments who spread eastwards from Arabia (see ARABIA). Bellew finds in the Gadara the Garuda (eagles) of Sanskrit, who were ever in opposition to the

Races.

Naga (snakes) of Scythic origin. Southern Baluchistan affords a most interesting field for the ethnographer. It has never yet been thoroughly explored in the interests of ethnographical science.

The Baluch character is influenced by its environment as much as by its origin, so that it is impossible to select any one section of the general community as affording a satisfactory sample of popular Baluch idiosyncrasies. The Rind, or Baluch Arab, is perhaps the dominant type, and as he is least affected by foreign influence he is usually selected as the representative Baluch. The Baluchis of Arab extraction exhibit their Semitic origin strongly in their features, and possess much of the courage and chivalry of the original stock. They are a manly, hardy, and physically well-developed race, following no priestly leading, and not given to fanaticism, but banded together in a sort of feudal confederation under their tribal chiefs, who are their leaders in council as they are in war. Their courage and their loyalty to their chiefs are noble characteristics; and they are characteristics which render them far more amenable to British control than is the republican Pathán. In war it leads them to attack in the open, and in council it places the conduct of negotiations in the hands of but a recognized few.

The strategical position of Great Britain in Baluchistan is a very important factor in the problem of maintaining order and good administration in the country. The ever-restless Pathan tribes of the Sulimanis are held in check by the occupation of the Zhob valley; whilst the central dominant position at Quetta safeguards the peace and security of Kalat, and of the wildest of the Baluch hills occupied by the Maris and Bugtis, no less than it bars the way to an advance upon India by way of Kandahar. Nominally all the provinces and districts of Baluchistan, with the exception of the ceded territory which we call British Baluchistan, are under the Khan of Kalat, and all chiefs acknowledge him as their suzerain. But it may be doubted if this suzerainty was ever complete, or could be maintained at all but for the assistance of the British Government. The Baluch is still essentially a robber and a raider (a trait which is common to all tribes), and the history of Baluchistan is nothing but a story of successful robberies, of lawless rapine and bloodshed for which plunder and devastation were accounted a worthy and honourable return.

Strategic interest.

Extensive changes have taken place in the climatic condition of the country—changes which are some of them so recent as to be noted by surveyors who have found the remains of forests in districts now entirely desiccated. Possibly the ordinary processes of denudation and erosion, acting on those recent deposits which overlie the harder beds of the older series, may have much to say to these climatic changes, and the wanton destruction of forests may have assisted the efforts of nature; but it is difficult to understand the widespread desiccation of large areas of the Baluch highlands, where evidences of Arab irrigation works and of cultivation still attest to a once flourishing agricultural condition, without appealing to more rapidly destructive principles for the change. There is ample proof throughout the country of alterations of level within recent geologic periods; and there have even been compressions, resulting in a relative rise of the ground, over the crests of anticlinal folds, within historic record. "Proof that this compression is still going on was given on 20th December 1892, when a severe earthquake resulted from the sudden yielding of the earth's crust along what appears to be an old line of fault, west of the Khojak range, whereby an adjustment took place indicated by a shortening of some 2½ feet on the railway line which crossed the fault."[1] Nor should the evidences of active volcanic agency afforded by the mud volcanoes of the coast be overlooked. It is probably to climatic changes (whatever their origin may have been), rather than to the effects of tribal disturbances, that the Arab's disappearance from the field of trade and agriculture must be attributed.

Climate.

Law and order, and with them prosperity, were revived for a short space by the treaty of 1854 between the Khan of Kalat and the British Government, but with the breaking of that treaty came a renewal of the old state of confusion to which it was intended to put an end. The chiefs of Las and Wad, the Maris and Bugtis, Kej and Makrán, all threw off their allegiance, and anarchy became so widespread that the British Government again interfered. The treaty of 1854 was renewed in 1876 by Lord Lytton (under Sandeman's advice), and the Khan received substantial aid from the Government in the form of an annual subsidy of a lakh of rupees, instead of the 50,000 previously assigned to him. The treaty of 1854 was a treaty of alliance offensive and defensive. The treaty of 1876 renewed these terms, but utterly changed the policy of non-intervention which was maintained by the former, by the recognition of the sirdars as well as the Khan, and by the appointment of the British Government as referee in cases of dispute between them. British troops were to be located in the Khan's country; Quetta was founded; telegraphs and railways were projected; roads were made; and the reign of law and order established. The nebulous claims of Afghanistan to Sibi and Pishin were disposed of by the treaty of Gandamak in the spring of 1879, and the final consolidation of the existing form of Kalat administration was effected by Sandeman's expedition to Kharán in 1883, and the reconciliation of Azad Khan, the great Naoshirwani chief, with the Khan of Kalat. British Baluchistan was incorporated with British India by the resolution of 1st November 1887, and divided into two districts—Quetta-Pishin and Tal Chotiali—to be administered by a deputy-commissioner and a regular staff.

Modern history.

In 1890 and 1891 were carried out that series of politico-military expeditions which resulted in the occupation of the Zhob valley, the foundation of the central cantonment of Fort Sandeman, and the extension of a line of outposts which, commencing at Quetta, may be said to rest on Wana north of the Gomul. The effect of these expeditions, and of this extension of military occupation, has been to reduce the independent Pathan tribes of the Sulimani mountains to effective order, and to put a stop to border raiding on the Indus plains south of the Gomul. In 1893 serious differences arose between the Khan of Kalat and Sir James Browne, who succeeded Sir Robert Sandeman as agent to the governor-general in Baluchistan, arising out of Mir Khuidad Khan's outrageous conduct in the management of his own court, and the treatment of his officials. Finally, the Khan was deposed, and his son Mir Mahommed Khan succeeded in November 1893. Since then the most important change in Baluch administration has been the perpetual lease and transfer of management to British agency of the Nushki district and Niábat, with all rights, jurisdiction, and administrative power, in lieu of a perpetual rent of 9000 rupees per annum. This was effected in July 1899. This secures the direct control of the great highway to Sistán which has been opened to Khafila traffic.

The revenues of the Khan of Kalat consist partly of subsidies and partly of agricultural revenue, the total value being about 500,000 rupees per annum. Since 1882 he has received 25,000 rupees as government rent for the Quetta district, besides 30,000 in lieu of transit duties in the Bolan; this has been increased lately by 9000 as already stated. In 1899 the total imports of Kalat were valued at 700,000 rupees, and the exports at 505,000.

AUTHORITIES.—Very little has been published of late years about Baluchistan, in spite of the comparative wealth of new information. This is due to the fact that the records of the surveys of India, both topographical and geological, together with the Gazetteers (all of which are confidential), absorb most of the information collected by Indian Government officials. This article has been compiled chiefly from the unpublished notes of the author.

The following are amongst the most accessible of recent works on Baluchistan which have been published since the Sistán Boundary Report of 1873 by Sir F. Goldsmid:—FLOYER. *Unexplored Baluchistan*, London, 1882.—THORNTON, T. *Life of Sandeman*, London, 1896.—TATE, G. P. *Kalat (a memoir)*, Calcutta, 1896.—HOLDICH, Sir T. "Ethnographic and Historical Notes on Makrán," Calcutta, 1892 (*Survey Report*); "Antiquities, Ethnography, &c., of Las Bela and Makrán," Calcutta, 1894 (*Survey Report*); "Ancient and Mediæval Makrán," vol. vii. *R.G.S. Journal*, 1896; "Perso-Baluch Boundary," vol. ix. *R.G.S. Journal*, 1897.—M'MAHON. "The Southern Borderland of Afghanistan," vol. x. *Journal R.G.S.* 1897. Notes on Sir R. Sandeman's tours in Baluchistan will be found in vols. v., xii., xiii., and xix. of the *R.G.S. Proceedings*.

(T. H. H.*)

Bambaraland. See SENEGAL.

Bamberg, a town and archiepiscopal see of Bavaria, Germany, district of Upper Franconia, on the Regnitz, 2 miles above its confluence with the Main, and 39 miles by rail N. from Nuremberg. The church of Our Lady, a Gothic structure of 1320-87, but rebuilt in the Rococo style in the 18th century, contains wood carvings by Veit Stoss. The Altenburg (1266 ft.) has been the fortalice of the prince bishops of Bamberg since 1251, but is of older origin. The former Benedictine monastery of St Michael contains the municipal picture gallery. The royal library has 300,000 vols. and more than 3000 MSS. There is a new astronomical observatory. Of the numerous bridges which span the arms of the Regnitz the principal is the Ludwig bridge, built in 1892. In 1880 the handsome Maximilian fountain, with bronze statues of kings, bishops, and the Emperor Henry II., was set up. Bamberg has developed into an important manufacturing centre, chiefly for cotton spinning and weaving, ropes, and brewing. There is a famous porcelain painting institute. Population (1885), 31,521; (1895), 38,940; (1900), 41,626.

[1] Oldham, *Journal R.G.S.* vol. iii. p. 184.

Bamberger, Ludwig (1823-1899), German economist and politician, was born on the 22nd of July 1823 at Mainz of Jewish parents. After studying at Giessen, Heidelberg, and Göttingen, he entered on the practice of the law. When the Revolution of 1848 broke out he took an active part as one of the leaders of the Republican party in his native city, both as popular orator and as editor of one of the local papers. In 1849 he joined the Free Corps, who attempted a Republican rising in the Palatinate and Baden; on the restoration of order he was condemned to death, but he had escaped to Switzerland. The next years he spent in exile, at first in London, then in Holland; in 1852 he went to Paris, where, by means of private connexions, he received an appointment in the bank of Bischoffheim and Goldschmidt, of which he became managing director, a post which he held till 1866. During these years he saved a competence, and gained a thorough acquaintance with the theory and practice of finance. This he put to account when the amnesty of 1866 enabled him to return to Germany. He was elected a member of the Reichstag, where he joined the National Liberal party, for like many other exiles he was willing to accept the results of Bismarck's work. In 1868 he published a short life of Bismarck in French, with the object of producing a better understanding of German affairs, and in 1870, owing to his intimate acquaintance with France and with finance, he was summoned by Bismarck to Versailles to help in the discussion of terms of peace. In the German Reichstag he was the leading authority on matters of finance and economics, as well as a clear and persuasive speaker, and it was chiefly owing to him that a gold currency was adopted and that the German Imperial Bank took its present form; in his later years he wrote and spoke strongly against bimetallism. He was the leader of the Free Traders, and after 1878 refused to follow Bismarck in his new policy of Protection, State Socialism, and colonial development; in a celebrated speech he declared that the day on which it was introduced was a *dies nefastus* for Germany. True to his Free Trade principles he and a number of followers left the National Liberal party and formed the so-called "Secession" in 1880. He was one of the few prominent politicians who consistently maintained the struggle against State Socialism on the one hand and Democratic Socialism on the other. In 1892 he retired from political life, and died in 1899. Bamberger was a clear and attractive writer, and was a frequent contributor on political and economic questions to the *Nation* and other periodicals. His most important works are those on the currency, on the French war indemnity, his criticism of socialism, and his apology for the Secession. An edition of his collected works (including the French life of Bismarck) was published in 1894 in five volumes. After his death in 1899 appeared a volume of reminiscences, which, though it does not extend beyond 1866, gives an interesting picture of his share in the Revolution, and of his life in Paris. (J. W. He.)

Bamián, a town in Afghanistan, some 80 miles north-west of Kabul. It was visited by Major Maitland and Capt. the Hon. M. G. Talbot during the progress of the Russo-Afghan boundary commission in November 1885. The height of the valley was fixed at about 8500 feet, and the country around it carefully surveyed. The two colossal standing figures carved from the face of the cliff (see ninth ed. ii. p. 307) were measured, and drawings made by a native artist. They proved to be 173 feet and 120 feet high respectively. The Buddhist nature of the figures, and of the caves with which they are surrounded, was verified by the observations of these officers, who discovered other Buddhist caves and excavations in the valleys of the Balkhab and Sarikol. Chahilburj, 28 miles from Zari, on the road to Balkh by the Balkhab, at the east end of the Sokhtagi valley; Shahr-i-Babar, about 45 miles above Chahilburj; and Gawargin, 6 miles above Shahr-i-Babar, are all fortified sites of about the same age as the relics at Bamián. At Haibak there is a very perfect excavation called the Takht-i-Rustam (a general name for all incomprehensible constructions amongst the modern inhabitants of Afghan Turkestan), which consists of an annular ditch enclosing a platform, with a small house about 21 feet square above it, all cut out of the solid rock. There are hundreds of caves in this neighbourhood, all pointing to a line of Buddhist occupation connecting Balkh with Kabul.

Talbot, Hon. M. G. "The Rock-cut Caves and Statues of Bamián," *Journal R. Austral. Soc.* vol. xviii. Part 3.

(T. H. H.*)

Bamra, a feudatory state of India, in the Chhattisgarh division of the Central Provinces. Its area covers 1988 square miles. The population in 1881 was 81,286; in 1891, 104,367; and in 1901, 123,289, showing a continuous increase. The estimated revenue is Rs.76,000; tribute, Rs.1500. Most of the country is forest, producing only timber and lac, but said to be rich in iron ore. The northern border is touched by the Bengal-Nagpur railway, with a station at Bamra town.

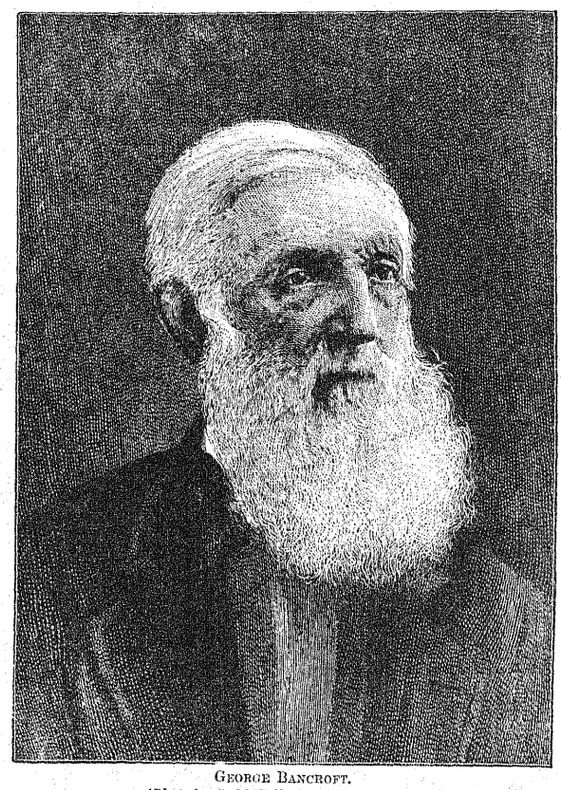
Banbury, a municipal borough (extended 1889) and market-town in the Banbury parliamentary division (since 1885) of Oxfordshire, England, on the river Cherwell, 77 miles N.W. of London by rail. Recent erections include a temperance hall, an institute, and a municipal secondary and technical school; the infirmary has also been enlarged. Population (1881), 12,072; (1891), 12,768; (1901), 12,967.

Banca (Dutch, *Banka*), an island off the east coast of Sumatra, from which it is separated by Banca Strait, and from Billiton (on its east) by Gaspar Strait. Area, 4458 square miles. Geologically it resembles the Malay Peninsula, its formations being mainly granite, Silurian and Devonian slate, frequently covered with sandstone, laterite (red ironstone clay) of small fertility, and alluvium. The granite extends from W.N.W. to S.S.E., forming the mountain chains (chief range the Maras). As these lie near the east coast, it follows that the rivers of the west coast are the longer. Another chain runs from west to east near Muntok, the chief town. There are no volcanoes on the island. The chief rivers (Jering, Kotta, and Waringin) are navigable nineteen miles from their mouths, and are used for the transport of tin. The rainfall, of great importance for the tin exploitation, is 120 inches yearly. It rains, on an average, 168 days. Politically the island is divided into nine mining districts, including 120 mines, under government control, with, in 1898-99, 12,000 workmen, producing 167,369 piculs of tin. The population in 1898 was 93,600, of whom 260 were Europeans, 32,187 Chinese, 209 Arabs, and about 60,937 natives. The natives cultivate rice, pepper, gambier, Liberia coffee, and palms, but they are chiefly occupied in fishing and in gathering in the produce of the forests. Industry (mining excepted) is as unimportant as trade. Muntok, the only town of any size, on Banca Strait, has 4000 inhabitants.

Zondervan. *Banka en Zijne bewoners.* Amsterdam, 1895 (with bibliography).—Posewitz. *Die Zinn-inseln im Indischen Ocean.* For geology and the tin mines, *Jaarboek vor het Mijnwezen in Ned. Ind.* Amsterdam, 1877-84.

Bancroft, George (1800-1891), American historian and statesman, was born in Worcester, Mass., 3rd October 1800, and died in Washington, D.C., 17th January 1891. His family had been in America since

1632, and his father, Aaron Bancroft, was distinguished as a revolutionary soldier, clergyman, and author. The son was educated at Phillips Academy, Exeter, at Harvard University, at Heidelberg, Göttingen, and Berlin. At Göttingen he studied Plato with Heeren, New Testament Greek with Eichhorn, and natural science with Blumenbach. His heart was in the work of Heeren, easily the greatest of historical critics then living, and the forerunner of the modern school; it was from this master that Bancroft caught his enthusiasm for minute painstaking erudition. He concluded his years of preparation by a European tour, in the course of which he received kind attention from almost every distinguished man in the world of letters, science, and art; among others, from Goethe, Humboldt, Schleiermacher, Hegel, Byron, Niebuhr, Bunsen, Savigny, Cousin, Constant, and Manzoni. Bancroft's father was a Unitarian, and he had devoted his son to the work of the ministry; but the young man's first experiments at preaching, shortly after his return from Europe in 1822, were unsatisfactory, the theological teaching of the time having substituted criticism and literature for faith. His first position was that of tutor in Harvard. Instinctively a humanist, he had little patience with the narrow curriculum of Harvard in his day and the rather pedantic spirit with which classical studies were there pursued. Moreover, he had brought from Europe a new manner, full of the affectations of ardent youth, and this he wore without ease in a society highly satisfied with itself; the young knight-errant was therefore subjected to considerable ridicule. A little volume of poetry, translations, and original pieces published in 1823 gave its author no fame. As time passed, and custom created familiarity, his style, personal and literary, was seen to be the outward symbol of a firm resolve to preserve a philosophic calm, and of an enormous underlying energy which spent itself in labour, "ohne Hast, aber auch ohne Rast." He found the conventional atmosphere of Cambridge uncongenial, and with a friend he established the Round Hill School at Northampton, Mass. This was the first serious effort made in the United States to elevate secondary education to the plane on which it belonged.



GEORGE BANCROFT.
(Photo by C. M. Bell, Washington, D.C.)

Although born into a Whig family, yet Bancroft's studies carried him irresistibly into the Democratic party. While a teacher in his own school he was elected to the State legislature as a Democrat, but under pressure from the family of his first wife, who were ardent Whigs, he refused to serve. In 1831 he likewise declined the nomination of the Massachusetts Democrats for secretary of state. By this time he was influential in the councils of his party, and President van Buren appointed him collector of the port of Boston, a position which he filled with success. Two of his appointees were Orestes Brownson and Nathaniel Hawthorne. In 1844 he was the Democratic candidate for the governorship, but he was defeated. In 1845 he entered Polk's Cabinet as secretary of the navy, serving until 1846, when for a month he was acting secretary of war. During this short period in the Cabinet he established the naval academy at Annapolis, gave the orders which led to the occupation of California, and sent Zachary Taylor into the debateable land between Texas and Mexico. He also continued his pleadings for the annexation of Texas, as extending "the area of freedom," and though a Democrat, took high moral ground as to slavery; he likewise made himself the authority on the North-Western Boundary question. In 1846 he was sent as minister to London, where he lived in constant companionship with Macaulay and Hallam. On his return in 1849 he withdrew from public life, residing in New York. In 1866 he was chosen by Congress to deliver the special eulogy on Lincoln; and in 1867 he was appointed minister to Berlin, where he remained until his resignation in 1874. Thenceforward he lived in Washington and Newport. His latest official achievements were the greatest. In the San Juan arbitration he displayed great versatility and skill, winning his case before the emperor with brilliant ease. The naturalization treaties which he negotiated successively with Prussia and the other North German States were the first international recognition of the right of expatriation, a principle since incorporated in the law of nations.

In spite of the exacting and severe routine of the Round Hill School, Bancroft contributed frequently to the *North American Review* and to Walsh's *American Quarterly;* he also made a translation of Heeren's work on *The Politics of Ancient Greece.* In 1834 appeared the first volume of the *History of the United States.* The second followed in 1837, and others as the exigencies of public life permitted. Supplementary to the first volume was an article published by him in the *North American Review* for 1835 on "The Documentary History of the Revolution." This article not merely brought the new method to the notice of the reading public, but revealed to it the wealth of material available. The nature and extent of his studies, the solidity of his work, and the philosophic spirit which animates both, explain the enthusiasm with which the earlier volumes of Bancroft were received. Their sale at home was very large; they were reprinted in England, and translated immediately into Danish, Italian, German, and French. The latest volumes were considered by all competent judges quite as important as their predecessors. When the author was preparing to return from Berlin, the Royal Academy made him their guest at a public dinner, an unprecedented honour; and the universities of Berlin, Heidelberg, and Munich united in a testimonial of regard. At Washington he was the confidential adviser of states-

men to the end of his life, and the unofficial dean of the best society.

Bancroft's historical creed is best set forth in the address he delivered on the semi-centennial of the New York Historical Society in 1854. In philosophy he found the basis for positing a collective human will, revealing in its activities the materials for determining ethical laws. Since there must be the same conservation of energy in morals as elsewhere, the eternal reason is the divine Logos. History, therefore, is God working in examples. It must be a unit, its forces constant, and its totality an organic whole. Within this the individual moves and acts with liberty and responsibility; for each, in will, affection, and intellect is consubstantial with the rest. Truth, morals, and justice are subject to no evolution; but the collective man evolves better forms of knowledge and behaviour. The organization of society, therefore, produces successive states, in each of which the principle of freedom is better established than in the antecedent. Permanency in republican government is, therefore, based upon corresponding experience and culture, and its possibilities grow ever stronger. The relation of American democracy to the systems which have preceded it forms the latest proof of these contentions. As Heeren's pupil, he laid enormous stress on the importance of original authorities. In dealing with documentary evidence he sought to apply very stringent rules:—(1) Carefully distinguish between original authority and historical memorials or aids; for example, between a fact recorded at first- or second-hand knowledge, and a decision of principle by authority. (2) Represent every man from his own standpoint; judge him from your own. His collections of original material were vast; beginning with his residence in England, he brought together at enormous pains and expense the authenticated copies of archives, family papers, and personal journals written by historic personages, which now constitute an invaluable treasure in the New York public library. They are from every land and from every people with which American origins are connected. His use of this material was not always according to accepted standards. To avoid dryness and prolixity he condensed quotations, and occasionally employed the Thucydidean method of abridgment or representation in place of fact catalogues. During his long life enormous strides were made by others in collecting the materials of American history, and while in the main he kept pace with them by ruthless revision, yet even the latest edition of his work disregards some minor facts which others knew for the insertion of much which the author alone knew.

Bancroft's imagination and enthusiasm were alike exuberant. His pages abound in fine and acute insight. His generalizations are vivid and enlightening. He spared no pains to acquire true style, frequently rewriting his chapters, and sometimes testing passages of philosophy and description in eight different forms. Yet to a certain extent he lacked the representative power and often failed to conceal his art, many pages ringing with artificial tones. But, after making all allowances, it remains true that he had a perfect sense of proportion, sound maxims, and thorough common-sense. He was of that greatest human type: a man of the present, valuing justly the past, and no dreamer. In the nature and extent of his studies, in the solidity of his work, and in the philosophic spirit which animated his life he ranks as the foremost historian of the United States, and as an American historian second to none of his European contemporaries in the same line. He displayed the heroic, epic value of American history, the unity of its course with the great central stream, and dispelled for ever the extravagant conceptions of a sentimental world just emerging from the visionary philosophy of the 18th century. (W. M. S.)

Bancroft, Hubert Howe (1832——), American historical writer, was born at Granville, Ohio, on the 5th of May 1832. From 1852 to 1868 he was a publisher in San Francisco. During this period he accumulated a great library of historical material, and at last gave up business in order to devote himself to the collection and publication of an extensive *History of the Pacific Coast of North America*. This work is comprised in no less than thirty-one octavo volumes, besides some subsidiary treatises, autobiographical data, &c., and includes ethnography, archæology, and history. As the compiler necessarily relied upon the labours of a corps of assistants, his work is, properly speaking, an encyclopædia rather than a unified history; but as a storehouse of material its value is great, and is likely to be enduring.

Bancroft, Sir Squire. See DRAMA.

Banda, a town and district of British India, in the Allahabad division of the North-West Provinces. The town is on the right bank of the river Ken, 95 miles south-west of Allahabad. The population is about 23,000; the municipal income in 1897-98 was Rs.26,531. The town possesses 66 mosques and 161 Hindu temples. It has also a church and an English high school. It is no longer a military cantonment.

The district of BANDA is the most barren and most backward portion of the province. It contains an area of 3060 square miles. The population in 1891 was 705,832, being 231 persons per square mile; Hindus numbering 664,810, Mahommedans 40,662, Christians 74, including 30 Europeans. In 1901 the population was 631,337, showing a decrease of 11 per cent., due to the effects of famine. Land revenue and rates were returned as Rs.7,06,341, the incidence of assessment being 10 annas per acre; the number of police was 2308. In 1896-97, out of a total cultivated area of 662,855 acres, only 5938 were irrigated. The principal crops are millet, other food-grains, pulse, rice, cotton, and oil-seeds. Banda cotton enjoys a high repute in the market. A branch railway from Manikpur to Jhansi traverses the length of the district, which is also crossed by the main line of the East Indian to Jubbulpur.

Banda Islands, a group of three chief and several lesser islands in the Banda Sea, south of Ceram (East Indian archipelago), forming, with Waru (the eastern portion of Ceram) and the islands of Ceram Laut and Goram, a district of the Dutch residency of Amboyna. The main islands are Great Banda or Lontor, Banda Neira to its north, Gunong Api (west of Banda Neira), Wai or Ai (still farther west), with Run on its south-west. The group (total area under 19 square miles) shows parts of a volcanic formation resembling that of Santorin (in the Ægean). The production of late years has amounted to 9600 piculs (a picul = 159 lb) nutmegs and 2400 piculs mace. The capital of the group is Banda (on B. Neira), seat of the Assistant Resident. Jalti or jatti wood is cultivated on the island of Rosingen. The total population of the islands is about 6000, descendants of the Javanese inhabitants of the neighbouring islands. They are Christians and Mahommedans.

Bander Abbási, a town of Persia, on the Persian Gulf, and now forming part of the administrative division of the "Persian Gulf ports," whose governor resides at Bushire. It has a population of about 10,000, an insalubrious climate, and very bad water.

Bander Abbási was called Gombrún (Gombroon, Gamaroon; Comron and Komoran of Portuguese writers) until 1622, when it received its present name in honour of the reigning shah, Abbás I. About 1740 Nadir Shah granted the town and district, with the fort of Shamíl and the town of Mínáb, together with the islands of

Kishm, Hormúz (Ormus), and Lárak to the Arab tribe of the Beni Ma'íni in return for payment of a yearly rent or tribute. About forty years later Sultán bin Ahmad, the ruler of Maskat, having been appealed to for aid by the Arab inhabitants of the place against Persian misrule, occupied the town and obtained a firman from the Persian Government confirming him in his possession, on the condition of his paying a yearly rent of a few thousand tomans. The islands were considered to be the property of Maskat. In 1852 the Persians expelled the Maskat authorities from Bander Abbási and its district, but retired when Maskat agreed to pay an increased rent. By a treaty concluded between Persia and Maskat in 1856 it was stipulated that Bander Abbási, town and district and the islands, were to be considered Persian territory, and leased to Maskat at an annual rent of 14,000 tomans. The treaty was to have been in force for twenty years, but in 1866 the Persian Government took advantage of the assassination of Sayyid Thuwaini, the sultan of Maskat, to install as governor of Bander Abbási and district a nominee of its own, who agreed to pay a rent of 20,000 tomans per annum. Further difficulties arising between Persia and Maskat, and the ruler of the latter, then in possession of a powerful fleet, threatening to blockade Bander Abbási, the Persian Government solicited the good offices of the British Government, and the lease was renewed for another eight years upon payment of 30,000 tomans per annum. This was in 1868. In the same year, however, the sultan of Maskat was expelled by a successful revolt, and the Persian Government, in virtue of a clause in the lease allowing them to cancel the contract if a conqueror obtained possession of Maskat, installed their own governor at Bander Abbási, and have retained possession of the place ever since (Curzon, *Persia*, ii. 424).

Bander Abbási has a lively trade, exporting much of the produce of Yezd and Kermán and Eastern Persia, and supplying imports to those districts and Khorassan. Bander Abbási has a British post office, and the mail steamers of the British India Steam Navigation Company call at the port weekly. The following table shows the value of the exports and imports from and to Bander Abbási in thousands of pounds sterling, and the shipping entered and cleared at the port in thousands of tons, according to British consular reports :—

Year.	Exports.		Imports.		Shipping.			
					Total.		British.	
	Total.	British.	Total.	British.	Entered.	Cleared.	Entered.	Cleared.
1887	278	136	323	307	103	103	...	...
1890	348	201	409	393	72	72	61	62
1895	325	237	478	435	No returns available.			
1896	180	125	364	341	107	104	88	87
1897	231	121	382	348	94	89	88	83
1898	187	112	449	422	87	86	79	79

Bander Lingah, a town of Persia, on the Persian Gulf, and about 300 miles by sea from Bushire, in 26° 33′ N. lat. and 54° 54′ E. long. It forms part of the administrative division of the "Persian Gulf ports," whose governor resides at Bushire, and has a population of about 10,000. The following table shows the value of the exports and imports from and to Bander Lingah, in thousands of pounds sterling, and the shipping, in thousands of tons, according to British consular reports. Nearly one-half of the exports and imports is in pearls, which pass Bander Lingah in transit from the fisheries on the Arab coast to Bombay :—

Year.	Exports.		Imports.		Shipping.			
					Total.		British.	
	Total.	British.	Total.	British.	Entered.	Cleared.	Entered.	Cleared.
1887	523	308	526	273	99	92	...	...
1890	592	362	665	381	187	203	157	175
1895	511	263	587	226	No returns available.			
1896	498	274	425	156	129	107	97	74
1897	548	270	582	288	115	92	93	73
1898	571	287	641	347	125	76	102	58
1899	552	269	612	344	125	68	99	48

Like many other Persian Gulf ports, Bander Lingah was for many generations a hereditary patrimony of the sheikh of an Arab tribe, in this case the Jovasmi tribe, and it was only in 1898 that the Arabs were expelled from the place by a Persian force. Bander Lingah is the chief port for the Persian province of Laristan, and has a thriving trade with Bahrein and the Arab coast. It has a British post office, and the British India Company's steamers call there weekly.

Banff, a royal and parliamentary burgh (Elgin group) and the county town of Banffshire, on Moray Firth, 50 miles N.N.W. of Aberdeen by rail. In 1888, 425 vessels of 37,377 tons entered; in 1898, 449 vessels of 43,772 tons. Coal and timber are the principal imports. (For statistics of the fishery district of which Banff is the centre see the following article.) Population of municipal burgh (1891), 3876; (1901), 3730; of parliamentary burgh, which includes Macduff (1891), 7578; (1901), 7148.

Banffshire, a maritime county of N.E. Scotland, bounded on the N. by the Moray Firth, on the E. and S. by Aberdeenshire, and on the W. by Elgin and Inverness shires.

Area and Population.—In 1891 the Aberdeen portion of the parish of Cabrach was placed in Banff; the Banffshire portions of Cairnie and King Edward were separated from the Aberdeen portions and transferred to other Banff parishes; Gartly, Glass, New Machar, Old Deer, and St Fergus were wholly transferred to Aberdeen. Of parishes divided between Banff and Elgin, Boharm, Inveravon, and Keith were placed wholly in the former, and Bellie and Rothes in the latter. According to the latest official estimate the area of the county is 405,432 acres, or about 633½ square miles. The population was in 1881, 62,736; in 1891, 64,190, or, on the above area, 61,684, of whom 29,547 were males and 32,137 females. On the old area, taking land only (410,112 acres or 640·8 square miles), the number of persons to the square mile in 1891 was 100, and the number of acres to the person 6·4, the county ranking fourteenth in Scotland in respect of density of population. In the registration county the population increased between 1881 and 1891 by 2·8 per cent. In 1901 the population was 61,487. Between 1881 and 1891 the excess of births over deaths was 9593, and the increase of the resident population 1713. The following table gives particulars of births, deaths, and marriages in 1880, 1890, and 1899 :—

Year.	Deaths.	Marriages.	Births.	Percentage of Illegitimate.
1880	1000	337	1873	16·0
1890	1055	318	1837	14·86
1899	1006	361	1797	13·4

The birth-rate, death-rate, and marriage-rate are all below the rates for Scotland. The following table gives the birth-rate, death-rate, and marriage-rate per thousand of the population for a series of years :—

	1880.	1881-90.	1890.	1891-98.	1899.
Birth-rate . .	31·37	32·16	30·06	29·10	28·42
Death-rate . .	16·75	16·30	17·26	15·37	15·91
Marriage-rate .	5·64	5·73	5·20	5·73	5·71

The number of Gaelic-speaking persons in the county in 1891 was 638, of whom 3 spoke Gaelic only, and there were 5 foreigners. Valuation in 1889-90, £242,149; in 1899-1900, £261,677.

Administration.—The county returns a member to parliament. Royal burghs are Banff (3730) and Cullen (4059), which belong to the Elgin group of parliamentary burghs, the parliamentary burgh of Banff having a population of 7578 in 1891. The chief police burghs are Buckie (6541), Keith (4753), and Macduff (3418). There are 22 civil parishes, most of which belong to the Buchan Combination, and the number of paupers and dependants in September 1899 was 1587. Banffshire forms a sheriffdom with Aberdeen and Kincardine shires, and there is a resident sheriff-substitute at Banff, who sits also at Keith, Buckie, and Dufftown.

Education.—Twenty-five school boards manage 73 schools, which had an average attendance of 10,378 in 1898-99, and 14 voluntary schools (6 Roman Catholic and 4 Episcopal) with an average attendance of 1157. Twenty-five schools earned grants in 1898 for giving higher education, and the county council out of the "residue" grant subsidizes classes in agriculture, navigation, veterinary science, and cookery and laundry work.

Agriculture.—The percentage of cultivated area was 36·9 in 1898. Barley grows well in most parts of the county, and the demand of

distillers tends to keep up the acreage, though the predominant crop is oats; the barley acreage was 11,725 in 1898 and 16,504 in 1899, and the oat acreage was 46,874 in the latter year. Cattle-feeding is, however, the staple agricultural industry. There is also a fair proportion of dairy farming. The following table gives the principal acreage at intervals of five years from 1880:—

Year.	Area under Crops.	Corn Crops.	Green Crops.	Clover.	Permanent Pasture.	Fallow.
1880	167,317	62,099	28,875	67,097	8,946	300
1885	168,595	62,457	27,978	65,558	12,299	273
1890	172,563	62,238	28,368	69,618	11,000	312
1895	160,240	57,810	25,508	62,801	13,959	140
1899	160,260	57,640	25,031	67,665	9,862	88

The following table gives particulars of the live stock in the same years:—

Year.	Total Horses.	Total Cattle.	Cows or Heifers in Milk or Calf.	Sheep.	Pigs.
1880	8127	40,259	12,548	49,128	2837
1885	8072	43,574	13,682	57,816	3920
1890	8381	45,216	13,970	68,262	4306
1895	8881	41,764	12,470	62,703	2461
1899	8915	44,561	13,377	71,400	2735

Of 3737 holdings in 1895, the date of the last return, the average size was 43 acres. The percentage under 5 acres was 20·84, between 5 and 50 acres 51·73, and above 50 acres 27·43. Farms between 50 and 100 acres numbered 556; between 100 and 300, 439; and over 300 acres, 30; only 2 being over 500 acres. There were 30,955 acres under wood in 1895. According to the census of 1891 there were 7139 men and 415 women engaged in agriculture.

Industries and Trade.—Woollen factories have spread to Dufftown, Rothiemay, and Gollachy, and engineering works in Banff, Portsoy, and Keith are of importance. There are seven harbours at which a miscellaneous and fish trade is done—Banff, Macduff, Buckie, Gardenstown, Portsoy, Cullen, and Port Gordon; and fishing is prosecuted at fourteen creeks or harbours along the Banffshire portion of the Moray Firth. The herring season lasts from June to September; white fishing is prosecuted all the year round. There are two fishery districts in the county centring respectively in Banff and Buckie, for which, conjointly, the following table gives statistics:—

Year.	Boats.			Value of Gear.	Resident Fishermen and Boys.	Total Value of all Fish.
	No.	Tons.	Value.			
1890	1221	17,101	£135,664	£129,872	5110	£125,852
1898	1161	21,714	£202,819	£152,676	3512	£80,926
1899	1197	23,064	£218,874	£387,023	5364	£79,692

The herring catch only was valued at £41,478 in 1899. The number of persons employed in the two districts in 1899 in connexion with the various branches of the sea fisheries was 5787. Banff contains large limestone deposits; 24,863 tons valued at £9385 were raised in 1895, and 38,355 tons valued at £5819 in 1899; there is also a little granite-quarrying, the output being 1470 tons in 1895 and 7438 tons in 1899. The total industrial population in 1891 was 5175 men and 1479 women. The Great North of Scotland and the Highland Railway Companies have together added 30 miles to the railway mileage of the county.

AUTHORITIES.—W. CRAMOND. *Annals of Banff.* (New Spalding Club) Aberdeen, 1891.—*The Guide to Cullen.* Cullen, 1896.—*The Guide to Buckie.* Buckie, 1898.—DR. GORDON. *Chronicles of Keith, Grange, &c.* Glasgow, 1880.—*Banffshire Year-Book.* Banff.—*Banff and the Neighbourhood.* Banff, 1879.—*Trans. of Banffshire Field Club.* Banff.—*Proceedings of the Soc. of Antiq. of Scotland.* Edinburgh.—*Ordnance Gazetteer of Scotland.* New edition. London.—Professor DICKIE. *Botanist's Guide to Aberdeen, Banff, &c.* Aberdeen, 1860.—W. CRAMOND. *Church of Boyndie.* Banff, 1886; and works by the same author on other churches in the county, mostly published at Banff. *Inventory of Charters of Cullen,* Banff, 1887; and *Inventory of Charters of Banff,* Banff. (W. WA.)

Bánffy-Hunyad, a market-town of the county of Kolozs in Hungary. In the neighbourhood rise the romantic castles of the noble families Bánffy and Barcsai. It is the centre of the Hungarian tribe of Kalotaszeg, famous for its picturesque dressing, old songs, and popular customs, but especially for its beautiful female handiwork, the so-called "Kalotaszegi varrottas." Population, about 4500.

Bangalore, a city of India, the capital of the native state of Mysore and also a British cantonment. It is 3113 feet above the sea, 216 miles west of Madras by rail. The total area is about 15 square miles. The total population in 1881 was 155,857, in 1891 it was 180,366, and in 1901 it was 159,030, showing a decrease of 12 per cent., due to the effects of plague. When the state of Mysore was restored to its raja in 1881, the civil and military station of Bangalore was permanently reserved under British jurisdiction as an "assigned tract." It has an area of 12·4 square miles, and had in 1881 a population of 93,540; in 1891 of 100,081, of whom 17,902 were Christians; and in 1901 of 159,030. The municipal income in 1897-98 was Rs.3,29,097; the number of boys at school was 5227, of girls 2610, giving a total of 7837, or 52 per cent. of the estimated population of school-going age; the registered death-rate in 1897 was 21·53 per thousand. Bangalore is the headquarters of a military district, with accommodation for a strong force of all arms and an arsenal in the old fort. A considerable number of European pensioners reside here. A new palace has been built for the Maharaja. There is an aided Roman Catholic college, besides many schools for Europeans. A permanent water-supply has been introduced, and a complete system of drainage is under consideration. Bangalore is an important railway centre. There are two cotton mills with 248 looms and 30,872 spindles, employing 1600 hands; four breweries, with an annual out-turn of 470,000 gallons. The city suffered severely from plague in 1899 and 1900.

The district of BANGALORE borders on the Madras district of Salem. Its area is 2559 square miles; its population in 1881 was 669,139, and in 1891 it was 802,994, showing an increase of 20 per cent., or an average density of 314 per square mile, being considerably the highest rate in Mysore; in 1901 the population was 877,927, showing a further increase of 9 per cent. The district is crossed by several lines of railway. Outside Bangalore city there is a woollen mill with 38 looms and 1088 spindles, employing 200 hands, which turns out blankets, cloth for greatcoats, and woollen stuffs to the annual value of Rs.2,51,600.

Banganapalle, a state of Southern India, surrounded by the Madras district of Kurnool. Area, 255 square miles; population (1891), 35,496; (1901), 32,279. Estimated revenue, Rs.2,23,000, of which a large portion is alienated in grants to junior branches of the family; no tribute; number of schools, 20, with 671 pupils in 1897-98. The town of BANGANAPALLE is situated in 15° 15′ N. lat. and 78° 20′ E. long., not far from the branch of the Southern Maratha Railway from Guntakal to Bezwara.

Bangkok, the capital of Siam, situated on the river Me Nam, in 100° 30′ E. long. and 13° 45′ N. lat., underwent great changes and developments within the last quarter, and especially during the last decade, of the 19th century. The main streets are now for the most part wide, well-made, well-policed, and lighted with electricity. The town is traversed by electric trams, and the river is crowded with steamers. The larger ships are specially built with flat bottoms for crossing the bar, where no improvement has yet been effected by the Government, and the maximum depth at high water does not exceed 15 feet. The more important European countries and the United States are now represented by a minister plenipotentiary and a consular staff, and the European colony has increased to over 600 in number, and includes representatives of many of the best-known firms in the East and of the more important banks. The town is connected with Paknam at the mouth of the river by a

steam tramway, and the railway to Korat, on the lower sections of which the traffic has been steadily increasing, was opened for traffic to that place towards the end of 1900. The affairs of the town were for a long time controlled by a Local Government Department. Latterly a Sanitary Board has been created, and has done excellent work, not before it was needed. In the near future a municipality will probably be formed in which the European residents will be represented in proportion to their interests, in which case it may be expected that the long-talked-of waterworks and drainage scheme will be effectively carried out. There are good dispensaries and hospitals, and French, Roman Catholic, and American Protestant missions. Steps are being taken to improve primary education by raising the efficiency of the monastery schools and bringing them under regular Government supervision. The population, though composed principally of Siamese and Chinese, includes representatives of every race to be found in Indo-China, as well as a large number of natives of India. The total has been variously estimated, and probably exceeds 400,000.

The climate, though enervating from the humidity of the atmosphere, is not one of extreme heat, owing to its proximity to the gulf, from which during the hot season (February to April) a strong sea-breeze blows nearly every day. 93° Fahr. is an exceptional maximum in the daytime, and at night the thermometer generally falls below 90°, and renders sleep possible. In the rainy season (May to October) there is a rainfall which seldom exceeds 50 inches. The cold season which follows is dry and pleasant, the temperature at night occasionally falling below 70° Fahr.

In 1888, 472 ships of 352,445 tons (396 of 300,247 tons, steam) cleared the port; in 1898 the total number was 524 of 453,341 tons (509 of 444,653 tons, steam). These figures do not include junks, of which from 200 to 300 enter the port from the Malay peninsula, Cambodian, and South China ports in the course of the year. For the ten years ending 1898 British shipping averaged 74 per cent. of the whole, and in value of cargoes carried reached an even higher percentage. The transference of both the Holt Singapore and Scottish Oriental Hongkong lines to the German flag in 1899, and the enterprise of the Danish East Asiatic Company, will effect a considerable reduction in these figures in the next few years. In 1889 the total exports were valued at £2,286,280, and in 1899 at £3,123,775; the value of the rice output in 1899 was £2,223,953, and of teak £323,867. The imports in 1889 were valued at £1,593,257, and in 1899 at £2,532,137, treasure being the largest item in both years, followed by cotton goods, opium, silk goods, gunny bags, iron, steel, and machinery.

For recent authorities, see SIAM. (H. W. SM.)

Bangor, a municipal (1883) and contributory parliamentary borough (Carnarvon district), seaport, and market town of Carnarvonshire, North Wales, at the north end of Menai Strait, 240 miles W. of London by rail. The Cathedral has been restored; there are three other churches and twenty-one Nonconformist chapels. The town council possess the gas and water works, electric light works, a fine promenade pier and ferries, fine (enclosed) open-air sea-water baths, museum and reading-room, infectious diseases hospital, and public cemetery. The University College of North Wales (1883) is located here, and a hall for female students has been provided. There are also the Independent and Baptist Colleges, the Normal College, the North Wales Training College, and two intermediate schools (boys and girls), two public halls, and an infirmary. Area of municipal borough, 1208 acres. Population (1881), 9005; (1901), 11,269.

Bangor, a city and seaport of Maine, U.S.A., capital of Penobscot county, situated in the southern part of the State, on the west bank of Penobscot river. Several branches of the Maine Central Railway have their termini here. Power for manufacturing is supplied by the Penobscot, and the city has large and varied manufactures. The lumber business is, however, still of the greatest importance, 175,000,000 feet of lumber being sawn annually. Population (1880), 16,856; (1900), 21,850.

Bangweulu, a shallow lake of Eastern Central Africa, roughly oval in shape, formed by the head stream of the Congo. It lies between 10° 48′ and 11° 31′ S. lat. and is cut by 30° E. long. Except on the west, its shores are fringed with marsh, overgrown with reeds and papyrus. The three islands Kirui, Kisi, and Mbawala much diminish the extent of open water, the channel between the two former being 3½ miles wide with a depth of 12½ feet, and that between Kisi and Mbawala nearly 5 miles with 15 feet in the centre. On the west shore a long narrow peninsula almost separates the lakelet Chifunawuli from the main body of water. The Chambezi, the most remote head stream of the Congo, enters the south-east corner through a mass of aquatic vegetation, while some 25 miles farther west the Luapula makes its exit through a vast marsh extending to 12° 20′ S. lat. Though heard of by the Portuguese traveller Lacerda in 1798, Bangweulu was first reached in 1868 by Dr Livingstone, who died six years later among the swamps to the south. It was partially surveyed in 1883 by the French traveller Giraud, and first circumnavigated by Mr Poulett Weatherley in 1896. Its altitude is about 3700 feet.

See *Geographical Journal*, vol. xii. p. 241; vol. xiv. p. 561.

Banjermasin (Dutch, *Bandjermasin*), a district in the south-east of Borneo, on the Barito, now, after much fighting and insurrection, the chief district in the residency of South and East Borneo. The seat of the Resident is at the town of Banjermasin, in 3° 18′ S., 114° 35′ E., on the left bank of the Barito, where its tributary, the Martapura, forms with it the small island of Tatas. As both these rivers are navigable for large vessels, the town is a trade-centre for the products of all the districts along their banks (benzoin, rattans, wax, gold, diamonds, iron, and weapons). The population in 1898 was 48,021, including 2230 Chinese, 882 Arabs, and 531 Europeans.

Bankim Chandra Chatterji (1838-1894), the greatest novelist of India in the 19th century, was born in the district of Twenty-four Parganas in Bengal in 1838. He received an English education, first in the Hugli College, and then in the Presidency College of Calcutta, and he was the first B.A. of the Calcutta University. Shortly after leaving college he published his first historical novel, the *Durges-Nandini*, or *The Chieftain's Daughter*. To Bankim Chandra is due the credit of creating in India a school of fiction after the modern European model. His first work, named above, and modelled upon the style of Sir Walter Scott, made a great sensation in Bengal. It was followed by the *Kapala-Kundala* and the *Mrinalini*, and established his fame as a writer, with a creative imagination and a power of delineation as yet unsurpassed in India. In 1872 he brought out his first social novel, the *Bisha-Brikkha*, or *The Poison Tree*, which was followed by others in rapid succession. For over twenty years the reading public in Bengal recognized and felt the power of the talented novelist, and Bengali ladies in the zenana read every new work of Bankim Chandra as it issued from the press. During all these years Bankim Chandra was serving the British Government as a deputy-magistrate in various districts of Bengal. His ability as a magistrate and as an official was appreciated, and on his retirement he was decorated and made a Companion of the Indian Empire. In his last years he wrote on Hindu religion, and died in 1894. Some of his novels have been

translated into English by Mrs Knight; and although numerous works of fiction are now annually produced in every province in India, Bankim Chandra still holds the first place. He gathered round him a number of literary men who have left their impress on the literature of Bengal. In his earlier years he served his apprenticeship in literature under ISWAR CHANDRA GUPTA, the chief poet and satirist of Bengal during the earlier half of the 19th century. Bankim Chandra's friend and colleague, DINA BANDHU MITRA, was virtually the founder of the modern Bengali drama. Another friend of his, HEM CHANDRA BANERJEA, was a poet of recognized merit and talent. And among the younger men who venerated Bankim Chandra, and benefited by his example and advice, may be mentioned two distinguished poets, NALEIN CHANDRA SEN and RABINDRA NATH TAGORE. (R. C. D.)

BANKING.

I. HISTORY AND STATISTICS.

British Banks.

THE following article is confined generally to the state of affairs at the present time, and with respect to the United Kingdom does not go back farther than to the date when Sir Robert Peel's Bank Acts of 1844-45 were passed. These Acts have greatly influenced the present position of banking in Great Britain and Ireland, and it is necessary to begin with them, although to render the history intelligible some references must be made to earlier events. The charter of the Bank of England was dated 27th July 1694. Originally established to advance the government a loan of £1,200,000, the management of the National Debt of the country has been confided to it ever since its foundation, and it has always remained the banker of the Government. The interest on the stock in which the debt is inscribed has always been paid by the bank, originally half-yearly, now quarterly, and the registration of all transfers of the stock itself is carried on by its officers. The bank also assumes the responsibility of the correctness of all the transfers. These circumstances and the monopoly granted to it from the date of its foundation till 1826, of being the one joint stock bank in England and Wales and also of issuing notes which, since 1833, have been legal tender in England and Wales everywhere except at the Bank of England itself, combined with the fact that besides being the banker of the Government it is the banker of the other banks of the country, and for many years had the control of far larger deposits than any one of them individually, gave it early a pre-eminence over all the other banks. This pre-eminence it still maintains, though more than one competitor now holds larger deposits, and though, collectively, the deposits of the other banks of the country which have offices in London many times overpass its own. In one sense the power of the Bank of England is greater now than ever. By the Act of 1844, regulating the note-issue of the country, the Bank of England became the sole source from which legal tender notes can be obtained, a power important at all times, but pre-eminently so in periods of pressure. The authority to supply the notes required, when the issue needs to overpass the limits of the Act of 1844, is given by the Government at the request of the bank. Hence the Bank of England becomes the centre of interest at the times when a "Treasury letter" is required, and holds then a power, the force of which can hardly be estimated. In the early days of the business in England, issuing notes formed, as Bagehot says in his *Lombard Street*, the introduction to the system of deposit banking—so much so, that a bank which had not the power of issuing notes could scarcely exist out of London, where traditional custom associated with the "Goldsmiths," who took deposits from the time of James I. onwards, had established "deposit banking" as early as the 17th century.

The Bank of England possessed a practical, though perhaps not an absolutely legal monopoly of issuing notes in London, and was gradually surrounded by a circle of private banks, some of considerable power. The purely city banks associated themselves at the "Clearing House" as early as 1776. The Bank of England has never formed a member of this body, though it "clears on one side,"—*i.e.*, its claim on the clearing bankers is made through the clearing house, but the claims of the clearing bankers on the Bank are forwarded direct to Threadneedle Street twice or thrice daily. Nor did the banks in Fleet Street or at Charing Cross ever belong to it. In 1858 the clearing of country cheques was added through the arrangements made by Sir John Lubbock (afterwards Lord Avebury). The "country clearing" is a great assistance to business, as it enables a cheque drawn on the most distant village in England to be dealt with as conveniently as a cheque on London. The Bank of England, as stated before, was incorporated by the Act of 1694. The position of the other banks at that time was defined by the Act of 1697, which declared that no bank, that is, no joint stock bank, was "to be established within England during the continuance of the Bank of England," and by the Act of 1708, which provided that "during the continuance of the Bank of England, no company or partnership exceeding six persons, in England" should "borrow, owe, or take up any sum or sums of money on their bills or notes, payable on demand, or at any less time than six months from the borrowing thereof." This was confirmed by the Act of 1800. No change of importance was made till the Act of 1826, which prohibited "bank notes under £5," and the second Banking Act of that year. This act allowed the establishment of co-partnerships of more than six persons, which necessarily were "Joint Stock Companies," "beyond 65 miles from London." The Act of 1833 allowed the establishment of joint stock banks within the 65-miles limit, and took away various restrictions of the amounts of notes for less than £50. But the power of issuing notes was not allowed to joint stock banks within the 65-miles radius. *History.*

As during the whole of the period from 1694 to 1826 and 1833 no bank could be formed with more than six partners, the majority of the banks throughout England and Wales, for more than a century, were necessarily small and usually isolated firms. Those in the country districts had frequently branches in the small market towns close to them, those in London had never more than one office. These banks were sometimes powerful, but absolute secrecy was preserved as to the particulars of their business, the amount of capital employed in it and of deposits held. This secrecy was preserved by many of the private banks as late as the year 1890. Messrs Glyn, of Lombard Street, who assumed the joint stock form with unlimited liability in 1885, took the lead in the movement for publishing accounts. It was some time before the practice became general. The restriction of partners in private banks to six continued till 1862. By an Act passed in that year they were allowed to be ten. This, however, did not extend to issuing banks, who were restricted to six as before. The power of increasing bank partnerships to ten has been but little made use of.

The difficulties of carrying on business on a large scale were augmented by certain legal technicalities which practically rendered large private banks impossible in ordinary circumstances. Hence banking business did not begin to assume its present form till almost half-way through the 19th century. The gradual change followed the passing of the Acts of 1826-33 and 1844-45. Incidentally the latter legislation had an unexpected influence in promoting the formation of large and powerful banks. The main features of the Act of 1844 are as follows:—By it the Bank of England was divided into two departments, one concerned with the issue and the other with the banking business; no new bank of issue whatever was allowed to be established; restrictions were placed on the English issuing banks. Private issuing banks with not more than six partners were allowed to remain, to amalgamate and retain their issues. The joint stock banks which possessed issues were also allowed to continue these, but when two joint stock banks amalgamated, the continuing bank only retained its issue. Also when a private issuing bank was formed into or joined a joint stock bank, the issue lapsed. All the larger provincial banks in England and Wales had practically been banks of issue up to 1844. The enactments of that year, besides separating the Issue Department from the Banking Department of the Bank, were arranged with the intention of concentrating the note issues on the Bank of England in order to secure the monopoly of that bank as the one issuer of notes in England and Wales. The result has been that nearly all the provincial banks in England had by 1901 lost the right of issue. Probably all will do so unless legislation is introduced to resuscitate the local issues in a form which will render them secure and enable them to be as useful to banking in England as the local issues have been to Scotland and Ireland. No security was ever provided for the local issues in the United Kingdom. The requirements of the Acts of 1844-45, which compel the Irish and Scottish banks to hold specie against the notes issued beyond the legal limit, do not appear to make the coin held a security for them. The legislation of 1879, which made them a first charge, with unlimited liability, on the total assets of the joint stock banks which accepted the principle of limited liability for the rest of their business, has been the only recognition of the duty to the note-holders of rendering them secure. It has been a real disadvantage to England that this duty has not been sufficiently recognized. A different policy was followed by Sir Robert Peel in Scotland and Ireland. By the Acts of 1844-45, the Scottish and Irish banks were allowed to exceed their authorized issue on holding specie to the amount of the excess and no restrictions were placed on amalgamations among banks in these countries. In Scotland, and also in Ireland, notes for less than £5 continued to be allowed. The result has been that the ten large banks in Scotland, and six of the nine banks in

BANK OF ENGLAND (*New Form*).

WEEK ENDING SATURDAY, 7TH SEPTEMBER 1844.

Issue Department.

Notes issued	£28,351,295	Government Debt	£11,015,100
		Other Securities	2,984,900
		Gold Coin and Bullion	12,657,208
		Silver Bullion	1,694,087
	£28,351,295		£28,351,295

Banking Department.

Proprietors' Capital	£14,553,000	Government Securities, including dead-weight annuity	£14,554,834
Rest	3,564,729	Other Securities	7,835,616
Public Deposits (including exchequer, savings banks, commissioners of national debt and dividend accounts)	3,630,809	Notes	8,175,025
Other Deposits	8,644,348	Gold and Silver Coin	857,765
Seven Day and other Bills	1,030,354		
Dated the 12th day of September 1844.	£31,423,240	M. MARSHALL, Chief Cashier.	£31,423,240

WEEKLY STATEMENT OF THE LIABILITIES AND ASSETS OF THE BANK OF ENGLAND, 7TH SEPTEMBER 1844 (*Old Form*).

Circulation—			Public Securities—		
London	£14,802,000		Advances on Exchequer Bills—		
Country	6,405,000		Deficiency	—	
	[1]	£21,207,000	Other Exchequer Bills	£870,000	
Deposits, Public, viz.—			Exchequer Bills purchased	311,000	
Exchequer Account	£2,198,000		Stock and Annuities	12,821,000	
For payment of Dividends	315,000				£14,002,000
Savings Banks, &c.	501,000		Private Securities—		
Other Public Accounts,	617,000		Bills discounted—		
		3,631,000	London	£113,000	
Deposits, Private, viz.—			Country	2,003,000	
Railways	£30,000				2,116,000
London Bankers	963,000		East India Bonds	£198,000	
East India Company	636,000		City Bonds	3,357,000	
Bank of Ireland, Royal Bank of Scotland, &c.	175,000		Mortgage	620,000	
Other Deposits	5,631,000		Advances—		
Deposits at Branches	1,209,000		Bills of Exchange	883,000	
		8,644,000	Exchequer Bills, Stock, &c.	661,000	
					5,719,000
					£21,837,000
			Bullion		15,209,000
		£33,482,000			£37,046,000

[1] This includes seven day and other bills.

Ireland, possess the power of issuing notes. The large proportion of local branches in these countries has been greatly assisted by this power.

Bank of England.

The immediate effect of the division of the Bank of England into the two departments—the issuing department and the banking department—is best shown by comparing the weekly statement of the liabilities and assets of the Bank of England of the 7th September 1844, the date when the first publication of accounts was made, according to the old and the new form. The figures are as given on page 75.

On examining the statement according to the "old form," it will be seen that the main difference between the two sides of the account

	Dr.	*Cr.*
	£33,482,000	£37,046,000
is the rest	3,564,000 (omitted in the "old," incorporated in	
	£37,046,000	the "new form").

The "Proprietors' Capital," £14,553,000, and the Government securities held against it, £14,554,834, are both omitted in the "old form," but the principal effect of the Act of 1844 is shown by the figures in the issue department shown in the "new form." It will be observed that against £14,000,000 of the notes issued, securities were held, principally Government securities, but the remainder of the issue was made against bullion. £8,175,025 of the notes are returned as in the banking department, which had accordingly that amount of specie at its disposal, or rather of notes against which specie was held. Hence, if through any circumstance the Bank of England were called on for a *larger* sum in notes or specie than the notes in its "banking department," now technically spoken of as the "reserve," amount to, permission has to be obtained from the Government to "suspend the Bank Act," in order to allow the demand to be met, whatever the amount of specie in its "issue department" may be. Three times since the passing of the Bank Act—during the crises of 1847, 1857, and 1866—authority has been given for its suspension. On one of these dates, in 1857, the powers of the Act had to be exceeded; on the other two occasions, the fact that the permission had been given stayed the alarm. It should be remembered, whenever the Act of 1844 is criticized, that since it came into force there has been no anxiety as to payment in specie of the note circulation; but the division of the specie held into two parts is an arrangement which is not without disadvantages. It appears to increase the liability to constant fluctuations in the rate of discount which is one main characteristic of the English money market. Between 1822 and 1844 a rise in the Bank rate above 4 per cent. was rare; 5 per cent. was occasionally charged, and 6 per cent. on 1st August 1839. Of late years the changes in the Bank rate have been constant, and the fluctuations, even in ordinary years, very severe. Thus in 1899 the rate was 4 per cent. on 9th May, and 7 per cent. on 19th December. From the day when the Act came into operation in 1844 to the close of the year 1900 there had been 400 changes in the rate. The other hopes which Sir R. Peel expressed in 1844, such as that after the Act came into force commercial crises would cease, have not been realized. There has been frequent discussion among bankers and occasionally with the Government as to the advantage it might be to grant the Bank of England an automatic power to augment the note issue on securities when required—similar to that possessed by the Bank of Germany (*q.v.*) One of the hindrances to the success of the plan has been that hitherto the Government, acting on the advice of the Treasury, has required an extremely high rate of interest, of which it would reap the advantage, to be paid on the advances made under these conditions. The object of the arrangement of the Bank of Germany is to prevent panic, hence only a rate of 5 per cent. has been generally charged, though in 1899 the rate was 7 per cent. for a short time. The proposal made by Mr Lowe (afterwards Lord Sherbrooke) in 1873 was to charge 12 per cent., a rate which presupposes panic. Hence the negotiations came to nothing. The Act of 1844 remains unaltered. The issue on securities, allowed by it to the Bank of England, was originally £14,000,000. This has since been increased under the provisions of the Act to £17,775,000 (3rd March 1900). Hence the notes issued by the Bank have less gold by £3,775,000 behind them than previously. Clause 3 of the Act of 1844 allowed silver to form part of the specie to be held against the issue to an extent "not exceeding one-fourth part of the gold coin and bullion" held, and it will be observed that £1,694,087 in "silver bullion" was held in the issue department—first return, 7th September 1844. This had been increased to £2,727,001 by the 3rd October 1846. After that date the amounts declined till 20th August 1853, when the last entry disappeared from the accounts of the bank.

The Bank of England had no branches before 1826. It has now offices at Birmingham, Bristol, Hull, Leeds, Liverpool, Manchester, Newcastle, Plymouth, Portsmouth, Western London (1 Burlington Gardens), Law Courts Branch (London, W.C.). Originally, besides the Bank of England, nearly all the provincial banks in England and Wales possessed the privilege of issue. By the Act of 1844, the maximum circulation of the English issuing banks was fixed at the average circulation of the twelve weeks before 27th April 1844.

The numbers were fixed at:—

207 Private banks with an authorized issue of	£5,153,417
72 Joint stock banks with an authorized issue of	3,478,230
	£8,631,647

and the actual circulation of the country in October 1844 was as follows:—

Notes in Circulation.—The monthly return of the circulation ending 12th October 1844 (Stamps and Taxes, 25th October).

England.	
Private banks	£4,674,162
Joint stock banks	3,331,516
Scotland.	
Chartered, private and joint stock banks	2,987,665
Ireland.	
Bank of Ireland	3,597,850
Private and joint stock banks	2,456,261
Total	£17,047,454

In January 1901 the number and amounts were reduced to:—

	Authorized issue.	Actual issue.
33 Private banks	£1,220,588	£344,760
27 Joint stock banks	1,541,735	825,009

The issues have gradually diminished under the provisions of the Act of 1844, designed, as mentioned before, to concentrate the note issue of England and Wales on the Bank of England.

The yearly average of notes in circulation of the Bank of England, of the banks of issue in England and Wales, and in Scotland and Ireland, and also bullion at the Bank of England was as follows:—

England and Wales.

	Bank of England.	Bullion in Bank.	Private Banks.	Joint Stock Banks.
1844	£21,030,000	£15,567,000	£4,880,000	£3,483,000

Scotland and Ireland.

	Banks in Scotland.	Bank of Ireland.	Irish Banks.	Total Great Britain and Ireland.
1844	£3,026,000	£3,523,000	£2,205,000	£38,147,000

We may compare this amount with the circulation, January 1901 :—

Bank of England	£29,795,599
Private banks	344,760
Joint stock banks	825,009
Total in England	£30,965,368
Scotland	8,565,743
Ireland	7,288,360
United Kingdom	£46,819,471

—an apparent increase of £8,800,000 since 1844. The decrease of the country circulation in England and the increase of the Scottish and Irish circulations may be set off against each other. The increase is practically in the notes of the Bank of England; in 1901 about £8,800,000 more than at the earlier date. It is probable that a large part of this amount is held in the reserves of the banks in England and Wales, and that the active note circulation of the United Kingdom is but little larger now than half-a-century since

The Government received from the note circulation in 1897, the latest statement to hand :—Bank of England, out of the profits of the issue, £175,065, 10s.; composition for duties on bills and notes, &c., £123,211, 9s. 3d.; and a small sum for bankers' licenses not exceeding £2500 a year.

With respect to the other banks in England, the London banks first claim our attention. In 1844 there were 49 banks in London, 26 connected with the Clearing House. At that time only private banks were allowed to be members. Gradually the joint stock banks made their way into that body, and in 1901 the numbers were 3 private banks and 16 joint stock banks who joined in the clearing,—19 banks in all. The diminution in the numbers of the banks has been mainly the result of amalgamations. In London, Child's Bank and Hoare's of Fleet Street, and among the provincial banks, Smith's of Nottingham, claim an antiquity greater than that of the Bank of England, the last claiming to have been founded in 1688. The old Bank of Bristol (Bailey, Cave and Co.) was founded in 1750. The business still exists amalgamated with Prescott and Co. Limited, of London. The Hull Old Bank (Pease and Co.) dated from 1754. This business also still continues (amalgamated, 1894, with the York Union Banking Co. Limited). The banks of Gurney and Co., in the eastern counties principally, established more than a century since, have with numerous other banks of similar standing amalgamated with the firm of Barclay and Co. Limited, of Lombard Street. Of recent years amalgamation has been active among English banks. The banks in England and Wales are believed to have been 350 in number in 1792. Those registered from 1826 to 1842 were :—

Other Banks.

	Private.	Joint Stock.
1826	554	—
1827	465	6
1833	416	35
1842	311	118

The effect of the panic of 1826 is shown by the reduced number in 1827. Since that date the diminution in the number of the banks has gone on regularly. At the present time the banking business of England is carried on practically by 22 private and 103 joint stock banks, some of which are more properly private firms under joint stock forms of organization. Though the number of banks has diminished the offices have increased greatly. In 1858 there were 2008 in the United Kingdom. In 1900 there were 6521, divided as follows :—

England and Wales	4741
Isle of Man	21
Scotland	1081
Ireland	678
	6521

In Scotland and Ireland a different form of organization from that in use in England has long prevailed. The private form of partnership in both countries gradually died out during the 19th century, and all existing banks there are now organized as joint stocks. The earliest was the Bank of Scotland in 1695. There are in Scotland at the present time 10 banks. All these banks possess the right of issuing notes. They are permitted by the Act of 1844 to issue £2,676,350 without any restriction on what was to be held against the notes in circulation and to any extent beyond on the deposit of bullion. The return of 17th March 1900 showed £7,286,709 circulation and £5,834,104 bullion held. In Ireland a very similar state of matters exists. The earliest bank was the Bank of Ireland, founded 1783. The same clause as in the case of the Bank of England, limiting the partners of any other bank to six, was inserted in the Act to the great disadvantage of Irish banking. This restriction was afterwards rescinded. At present six banks are allowed to issue £6,354,494 against securities and anything further that is required on bullion. On 17th March 1900 the return was £6,651,392 circulation and £3,200,385 bullion held.

Though the note circulation is the feature in banking which attracts most attention from those unacquainted with the real working of the business, it is virtually a trivial detail in comparison with the deposits. It is, unfortunately, impossible to give any trustworthy statistics of the position of banking in the United Kingdom extending back for any considerable time. It is only of recent years that any statement of these other than an estimate has been possible owing to the long-continued reluctance of banks to allow any publication of their balance sheets. A paper by the late Mr Newmarch, printed in the journal of the Statistical Society for 1851, supplies a basis for an estimate. According to this the total amount of deposits, including the Bank of England, in England and Wales, Scotland and Ireland, may have been at that date, from £250,000,000 to £360,000,000. The estimate in Palgrave's *Notes on Banking*, 1872, excluding deposits in discount houses and the capitals of the banks, was from £430,000,000 to £450,000,000. The corresponding amounts at the close of 1900 were, in round figures, including acceptances, etc., £920,000,000. The total resources, including capitals and reserves (in round figures, £130,000,000) and note circulation, were for 1900 :—

Banks in England and Wales (including Bank of England)	£844,259,000
Scotland	137,182,000
Ireland	67,988,000
Isle of Man	1,001,000
	£1,050,430,000

The progressive growth in bank deposits since it has been possible to keep a record of their amounts, affords some means for checking roughly the correctness of the estimates of 1851 and 1872. Broadly speaking, it may be said that the bank deposits of the United Kingdom have doubled since the latter date.

Practically at the present time every large transaction in the United Kingdom is settled by cheque, that is, by a series of ledger transfers, notes and specie being but the small change by which fractional amounts are settled. A large proportion of these are arranged through the operation of the London Clearing House. This is facilitated by

the fact that every bank in the United Kingdom has an agent in London. If we add to the returns of the London Clearing House those of the Clearing Houses in the large towns of England, in Ireland and Scotland, and the numerous exchanges which occur daily, and the large number which the different offices of banks with a great many branches settle among themselves and the number drawn by one customer of a bank and paid to another, we may form some notion of the vast amount of the yearly turnover of banks. This may roughly be estimated in all as at least twice as great as that registered by the London Clearing House. The earliest authentic statement as to the clearing is found in the *Appendix to Second Report, Committee of House of Commons, Banks of Issue*, 1841 :—

Turnover.

In 1839, the clearings were			£954,401,600,	29 banks.
In 1840,	,,	,,	,,	978,496,800, 28 banks.
In 1899,	,,	,,	,,	9,150,269,000, 19 banks.
In 1900,	,,	,,	,,	8,960,170,000, 19 banks.

Estimates have been made of the amount of business turnover which does not pass through the London Clearing House. This would include the large number of cheques drawn by one customer of a bank in favour of another customer of the same bank; of exchanges between banks in the same place; of the sums passed in the same way through the Clearing Houses in the larger cities, as Manchester, Birmingham, Liverpool, and other places in Scotland and in Ireland; and cheques paid in different manners. It is believed that these amounts may fully equal the sums paid through the London bankers' clearings. The increase in the clearings is striking; but it is on the deposits that attention must be fixed. The deposits are the mainstay of the banking of the United Kingdom. On the way they are employed and on their fluidity the prosperity of the country greatly depends. By the assistance they give, all the new business of the country has to be established as well as all the old business maintained.

In the year 1901 the most important requirement of banking in the United Kingdom was still the establishment of an efficient specie reserve. The reserve in the banking department of the Bank of England, which averaged £21,455,000 in 1900, £21,000,000 in 1899, £22,000,000 in 1898, provides but a narrow basis for the whole business requirements of the country. Though it is much larger than the reserve kept before 1893, which had for several years been completely inadequate, it cannot yet be considered sufficient. The gold held was actually less towards the close of 1900 than at the corresponding date in 1876. The figures were :—

1st November 1876 . . .	£32,190,735
7th November 1900 . . .	29,968,945

Beyond this there is the cash held by the other banks. Part of this is held in the form of balances at the Bank of England, and in notes of the Bank of England, and hence is not unlikely to be estimated twice over unless care is taken to separate these sums from the specie actually in the hands of other banks. The published figures on this point are meagre. Private inquiries, however, lead to the belief that an amount of about 10 per cent. of the deposits may be held in balances at the Bank of England, in specie and Bank of England notes. This would amount, if this belief is correct, to a sum of not less than £80,000,000. The subject is of such importance that it is to be hoped that authoritative figures will before long be published.

As regards the banks in which British interests are concerned in British colonies and other countries we can only speak briefly. It must not be overlooked that in the Dominion of Canada there are 14 large banks, managed much on the Scottish principle with capitals of over £15,000,000 and deposits of nearly £55,000,000. These banks have 431 offices. In Australia and New Zealand there are 18 banks with capitals of fully £25,000,000 and deposits of about £114,000,000. The number of offices is more than 1400. There are, including the 3 Presidency Banks, about 7 banks doing business mainly in India—in some cases connecting neighbouring countries and places like Bangkok, Hong Kong and Zanzibar. These banks have capitals of about £6,000,000 and deposits of £30,000,000 and 43 offices. There are at least 4 banks in South Africa with capitals of £4,380,000, deposits of £23,000,000, and 163 offices. There are 7 banks, principally in South America, with £6,410,000 capital, £37,000,000 deposits, and 56 offices. There are 4 large banks doing business principally in the East with more than £11,000,000 capital, £48,000,000 deposits, and 73 offices; and two other large banks, Barings and the Colonial Bank, with nearly £2,000,000 capital, £37,000,000 deposits,—the latter with 21 offices, doing business mainly with North and South America.

Colonial Banks.

In this statement we have only included the larger banks. These collectively wield about £70,000,000 of capital and more than £340,000,000 of deposits—in all more than £410,000,000 of resources operating at nearly 2200 different places as widely separated from each other in distance as California and Hong Kong, Constantinople and New Zealand. The resources of these banks, which are principally British in origin, may, though the districts in which they operate are generally far distant from the United Kingdom, be considered as supplementary to English banking.

France.

In France the first bank of issue was established in 1716 by John Law, the author of the *Mississippi Plan* and the *System*. Law's bank came to an end in 1721; an attempt at reconstruction was made in 1767, but the bank thus established was suppressed in 1793. Other banks, some issuing notes, then carried on operations with limited success, but these never attained any real strength. There were many negotiations on the subject of the establishment of a bank in 1796. The financial difficulties of the times prevented any immediate result, but the advice of those engaged in this plan was of great assistance to Napoleon I., who, aided by his minister Mollien, founded in 1800 the Bank of France, by far the most powerful financial institution in the country, to support the trade and industry of France and to supply the use of loanable capital at a moderate charge. These functions it has exercised ever since with great vigour, extending itself through its branches and towns attached to branches over the whole country. At its establishment the operations of the bank did not extend over the whole of France. Departmental banks, with the privilege of issue, had been formed under a law adopted in 1803. At the close of 1847 there were nine of these banks existing in as many of the larger towns. In 1848, however, they were absorbed into the Bank of France, which has since possessed an exclusive privilege of issue, and in 1863 took over the Bank of Savoy after that province was united to France. The Bank of France has successfully surmounted many political as well as financial troubles both during and since the times of Napoleon I. The overthrow of the government of Louis Philippe in 1848, the war with Germany in 1870, the many difficulties that followed when the Commune reigned in Paris in 1871, the payment of the war indemnity—completed in 1873—were all happily surmounted. Great pains, too, have been taken, especially of recent

Bank of France.

years, to render services to large and small businesses and to agricultural industry. In 1877 the offices of the Bank of France were 78 in number; in 1900 they were 392, including the towns "connected with the branches," —an arrangement which, without causing the bank the expense of opening a branch, gives the place connected many of the advantages which a branch confers. The commercial paper discounted has largely increased, and in 1900 amounted to £489,902,000. The advances on securities were in the same year £66,000,000. The rate of discount in Paris is, as a rule, lower than in London, and the number of alterations in it fewer. Bills as low as 4s. 2d. are admitted to discount, and since 27th March 1890, loans of as small an amount as £10 are granted. In most cases three "names" must be furnished for each bill, or suitable guarantees or security given, but these necessary safeguards have not to be furnished in such a manner as to hamper applicants for loans unduly. In this manner the Bank of France is of great service to the industry of the country. It has never succeeded, however, in attracting deposits on anything like the scale of the Bank of England or the banks of the English-speaking peoples, but it holds about £25,000,000 in deposits, and operates through its enormous note circulation (averaging in 1900 £161,400,000), by means of which most business transactions in France are carried on.

The limits of the circulation of the Bank of France and the dates when it has been extended are as follows:—

Dates.	Millions of Francs.	Converting the Franc as 25=£1.
15th March 1848	350	£14,000,000
27th April, 2nd May 1848	452	18,000,000
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12th August 1870	1,800	32,000,000
14th August 1870	2,400	96,000,000
29th December 1871	2,800	112,000,000
15th July 1872	3,200	128,000,000
30th January 1884	3,500	140,000,000
25th January 1893	4,000	160,000,000

The extension of the circulation of the Bank of France, now ten times as large as half-a-century since, is a sufficient proof of the assistance afforded by that institution to the business of the country.

Most business transactions in France are liquidated in notes of the Bank of France. These, owing to their convenience, are preferred to specie. This is accumulated in the vaults of the Bank of France, which in 1900 held £93,372,000 gold, and £44,000,000 silver. The gold held by the Bank of France is generally considerably larger in amount than that held by the Bank of England, which in the autumn of 1890 had to borrow £3,000,000 in gold from the Bank of France at the time of the Baring crisis. The large specie reserve of the bank has given stability to the trade of France, and has enabled the bank to manage its business without the numerous fluctuations in the rate of discount which are constantly occurring in England. The mass of the reserve in France is so great that the movements of the precious metals, when they are the result only of natural causes, are allowed to go on without corresponding movements in the discount rate. But it must be remembered that this large reserve is held in part against a gigantic note issue, and also that the trade activity and enterprise of the French people are less intense than in the United Kingdom or Germany, so that it is much easier for the Bank of France to maintain a steady rate of discount.

Besides the Bank of France, several great credit institutions carry on business, as the Crédit Lyonnais, the Comptoir National d'Escompte de Paris, the Société Générale pour favoriser le developpement du Commerce et de l'Industrie en France, and the Société Générale de Crédit Industriel et Commercial. Their principal figures are as follows:—

	Capital and Reserve.	Other Liabilities, Deposits, &c.	Branches.
Comptoir National d'Escompte de Paris	£4,000,000	£21,000,000	122 offices. 80 in France.
Crédit Lyonnais	10,400,000	46,000,000	173
Société Générale pour favoriser le developpement du Commerce et de l'Industrie en France	2,950,000	22,000,400	282 55 in France.
Société Générale de Crédit Industriel et Commercial	880,000	4,690,000	18

There is also the Crédit Foncier de France with a capital of nearly £13,500,000, but the business done is so largely that of mortgages that it can hardly be included among banks, though it carries on in some measure the business of banking.

Besides the four large joint stock banks mentioned above, there exist in France a very large number of country banks carrying on a very considerable business. Little is known as to their deposits, but their business appears to be conducted with great prudence and discretion. One hundred and eighty-two of these were members of the French Country Bankers' Association in 1898. They carry on business in 66 out of the 86 Departments. More than one of these banks has several offices — one possessing 18, including the head office. These branches are situated in the small towns in the vicinity. In this the business follows more the English method of small branches. The French Country Bankers' Association holds its meetings in Paris, where matters of interest to bankers are discussed. (See *Bankers' Magazine*, July 1898.)

The business of banking in France is carried on with great regularity and vigour. Little, comparatively, is heard of it in a general way beyond the boundaries of the country, but within those limits it exerts a very useful influence on the development of industrial progress and of agriculture.

Germany.

There are, together with the Reichsbank, to which reference will be made more particularly later, about 140 banks doing business in the states which form the German empire. These credit and industrial banks with their large resources have had an immense influence in bringing about the astonishing industrial development of the country. Six of these banks possess the right of uncovered note issue; these are—

Bank of Frankfort, with right of issue	£500,000
Bank of Saxony, ,,	838,550
Bank of Bavaria, ,,	1,600,000
Bank of Wurtemberg, ,,	500,000
Bank of Baden, ,,	500,000
Bank of South Germany, ,,	500,000
	£4,438,550

Besides these there are (to name only some of the more important of the credit and industrial banks) the following:—

Deutsche Bank (capital and reserve, deposits and acceptances)	£32,000,000
Disconto-Gesellschaft (capital and reserve, deposits and acceptances)	20,000,000
Dresdner Bank (capital and reserve, deposits and acceptances)	23,000,000
Bayerische Handelsbank (capital and reserve, deposits and acceptances) nearly	9,000,000
Bergisch Märkische Bank (capital and reserve, deposits and acceptances) more than	6,000,000
Berliner Handels-Gesellschaft (capital and reserve, deposits and acceptances) more than	11,000,000
National Bank für Deutschland (capital and reserve, deposits and acceptances) about	8,000,000

The capital and reserves of all these larger German banks, including those of the Bank of Germany, are fully

£130,000,000. This amount compares very closely with the amount of the capital of the banks of the United Kingdom, but the deposits do not bear in the least any close proportion to those held by the English banks. The deposits, however, are not the whole of the resources of the German banks. The banks make use, besides, of their acceptances in a manner which is not practised by the banks of other countries, and the average note circulation of the Reichsbank alone is between £50,000,000 and £60,000,000. The circulation of the other note-issuing banks does not appear to be up to the limit allowed.

A large proportion of the resources of the German banks is employed in industrial concerns, some of which are beyond the boundaries of the empire. The dangers of this practice have called forth many criticisms in Germany, among which we may quote the remarks of Mr Cæsar Strauss and of Dr R. Koch, the president of the Reichsbank. Dr Koch especially points out the need of the increase of powerful banks in Germany unconnected with speculative business of this kind. The object of employing their funds thus is the higher rate of interest to be obtained from these investments than from discounting bills or making loans at home. But such an employment of the resources of a bank is opposed to all regular rules of business and of banking tradition, which abstains from fixed investments of any large part of the resources of a bank. On the other hand, Dr Koch observes that the risks of the one "reserve system" mentioned by Bagehot are not to be feared in Germany.[1]

There are, besides the banks we have referred to, many private banking firms in Germany which do a considerable amount of business.

Reichsbank.

The Imperial Bank (Reichsbank), which is by far the most powerful banking institution in Germany, is managed by the Bank Directory appointed by the Chancellor of the empire. The shareholders join in the management through a committee, of which each member must be qualified by holding not less than three shares. The government exercises complete powers of control through the Chancellor of the empire. The influence of the Imperial Bank now permeates by means of its branches all the separate kingdoms of the empire—the uniformity of coinage introduced through the laws of 1871-73 rendering this possible. The Imperial Bank assists business principally in two ways. First through the clearing system (*Giro-Verkehr*), which it has greatly developed, and secondly through the facilities given to business by its note circulation. The Imperial Bank also receives deposits, and cheques are drawn against these, but in Germany notes are principally used in payments for ordinary business. Before the Reichsbank was established, Hamburg was the first, and for a long time the only example of a clearing in Germany. This was taken up by the Reichsbank when it established its office in Hamburg in the time-honoured building which had belonged to the Hamburg Clearing House. Similar business had long been undertaken by the Bank of Prussia. This was absorbed and developed by the Reichsbank in 1876. Through the "clearing system" money can be remitted from any of the 311 places in which there is an office of the Reichsbank, to any other of these places, without charge either to the sender or the receiver. It is sufficient that the person to whom the money is to be remitted should have an account at the bank. Any person owing him money in the remotest parts of the empire may go to the office of the bank which is most convenient to him and pay in the amount of his debt, which is immediately remitted, without charge, to the account of his creditor wherever he may reside. The impetus given to business by this arrangement has been very considerable. It practically amounts to a money-order system without charge or risk of loss in transmission. From Hamburg and Bremen to the frontiers of Russia, from the shores of the Baltic to the frontiers of Switzerland, Germany, for monetary purposes, is thus only one country. The note circulation is also a powerful factor of the business of the Reichsbank. It is governed by the law of 1875 and the amending law of 1899, corresponding in some degree to Peel's Act of 1844, which regulates the note circulation of the Bank of England. An uncovered limit, originally £12,500,000, increased to £14,811,450 by the lapse of the issues of other banks allowed to it, has been extended by the Act of 1899 to £22,500,000. Against the notes thus issued which are not represented by specie, treasury notes (*Reichskassenscheine*, the legal tender notes of the empire[2]), and notes of the other issuing banks which are allowed to be reckoned as specie, or discounted bills, must be held—maturing not later than three months after being taken—with, as a rule, three, but never less than two, good endorsements. There is also a provision that at least one-third of the notes in circulation must be covered by current German money, notes of the imperial treasury, and gold in bullion or foreign coin reckoned at £69, 12s. per pound fine. The Reichsbank is bound by law to redeem its notes in current German money. It is stated that this may be gold coin or silver thalers, or in bar gold at the rate of 1392 marks (£69, 12s., reckoning marks as 20 = £1)—the pound fine of gold. In practice, however, facilities are not always given by the Reichsbank for the payment of its obligations in gold, though the importance of this is admitted. In the balance sheet for 1899 the bills held amounted to £54,000,000, and the loans and advances to £8,500,000. The notes issued averaged for the year £57,000,000. The gold held amounted, 31st December 1899, to £23,450,000. If the condition of business requires that the notes in circulation should exceed the limits allowed by the law, the bank is permitted to do this on the payment of 5 per cent. on the surplus. In this respect the German Act differs from the English Act, which allows no such automatic statutory power of overpassing the limit of issue. Some good authorities consider that this arrangement is an advantage for the German bank, but recent experience makes it doubtful whether the system may not tend to encourage reckless speculation. Of late years the excess of issue of the Reichsbank has been annual and has become large—more than £6,800,000, on average, in 1899. It remains to be seen whether the increase of the uncovered limit will be sufficient to obviate the need for an excess of issue beyond the limit for the future.

The amendment to the banking law of Germany, passed in 1899, not only affects the position of the Reichsbank, but that of the six other note-issuing banks. The Bill of 1899 directed an increase of the capital of the Reichsbank, then £6,000,000, up to £9,000,000. Of the £3,000,000 new capital, half is to be emitted prior to 31st December 1901 and the other half before 31st December 1905. The reserve fund, then £1,500,000, is to be raised gradually out of surplus profits to a maximum of £3,000,000. The amending Act further diminishes the dividend receivable by the stock-holders of the Reichsbank

[1] *Vorträge und Aufsätze hauptsächlich aus dem Handels- und Wechselrecht*, von Dr R. Koch, pp. 163-4.

[2] The imperial treasury is bound to pay the State notes in cash at any time when this is required, but an independent fund of cash set apart for this purpose does not exist. *Handwörterbuch der Staatswissenschaften*, vol. v., art. "Papiergeld," p. 97, ed. 1893. Jena: Conrad and Elster, Lexis and Loening.

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There are, besides the banks we have referred to, many private banking firms in Germany which do a considerable amount of business.

Reichsbank.

The Imperial Bank (Reichsbank), which is by far the most powerful banking institution in Germany, is managed by the Bank Directory appointed by the Chancellor of the empire. The shareholders join in the management through a committee, of which each member must be qualified by holding not less than three shares. The government exercises complete powers of control through the Chancellor of the empire. The influence of the Imperial Bank now permeates by means of its branches all the separate kingdoms of the empire—the uniformity of coinage introduced through the laws of 1871-73 rendering this possible. The Imperial Bank assists business principally in two ways. First through the clearing system (*Giro-Verkehr*), which it has greatly developed, and secondly through the facilities given to business by its note circulation. The Imperial Bank also receives deposits, and cheques are drawn against these, but in Germany notes are principally used in payments for ordinary business. Before the Reichsbank was established, Hamburg was the first, and for a long time the only example of a clearing in Germany. This was taken up by the Reichsbank when it established its office in Hamburg in the time-honoured building which had belonged to the Hamburg Clearing House. Similar business had long been undertaken by the Bank of Prussia. This was absorbed and developed by the Reichsbank in 1876. Through the "clearing system" money can be remitted from any of the 311 places in which there is an office of the Reichsbank, to any other of these places, without charge either to the sender or the receiver. It is sufficient that the person to whom the money is to be remitted should have an account at the bank. Any person owing him money in the remotest parts of the empire may go to the office of the bank which is most convenient to him and pay in the amount of his debt, which is immediately remitted, without charge, to the account of his creditor wherever he may reside. The impetus given to business by this arrangement has been very considerable. It practically amounts to a money-order system without charge or risk of loss in transmission. From Hamburg and Bremen to the frontiers of Russia, from the shores of the Baltic to the frontiers of Switzerland, Germany, for monetary purposes, is thus only one country. The note circulation is also a powerful factor of the business of the Reichsbank. It is governed by the law of 1875 and the amending law of 1899, corresponding in some degree to Peel's Act of 1844, which regulates the note circulation of the Bank of England. An uncovered limit, originally £12,500,000, increased to £14,811,450 by the lapse of the issues of other banks allowed to it, has been extended by the Act of 1899 to £22,500,000. Against the notes thus issued which are not represented by specie, treasury notes (*Reichskassenscheine*, the legal tender notes of the empire[2]), and notes of the other issuing banks which are allowed to be reckoned as specie, or discounted bills, must be held—maturing not later than three months after being taken—with, as a rule, three, but never less than two, good endorsements. There is also a provision that at least one-third of the notes in circulation must be covered by current German money, notes of the imperial treasury, and gold in bullion or foreign coin reckoned at £69, 12s. per pound fine. The Reichsbank is bound by law to redeem its notes in current German money. It is stated that this may be gold coin or silver thalers, or in bar gold at the rate of 1392 marks (£69, 12s., reckoning marks as 20 = £1)—the pound fine of gold. In practice, however, facilities are not always given by the Reichsbank for the payment of its obligations in gold, though the importance of this is admitted. In the balance sheet for 1899 the bills held amounted to £54,000,000, and the loans and advances to £8,500,000. The notes issued averaged for the year £57,000,000. The gold held amounted, 31st December 1899, to £23,450,000. If the condition of business requires that the notes in circulation should exceed the limits allowed by the law, the bank is permitted to do this on the payment of 5 per cent. on the surplus. In this respect the German Act differs from the English Act, which allows no such automatic statutory power of overpassing the limit of issue. Some good authorities consider that this arrangement is an advantage for the German bank, but recent experience makes it doubtful whether the system may not tend to encourage reckless speculation. Of late years the excess of issue of the Reichsbank has been annual and has become large—more than £6,800,000, on average, in 1899. It remains to be seen whether the increase of the uncovered limit will be sufficient to obviate the need for an excess of issue beyond the limit for the future.

The amendment to the banking law of Germany, passed in 1899, not only affects the position of the Reichsbank, but that of the six other note-issuing banks. The Bill of 1899 directed an increase of the capital of the Reichsbank, then £6,000,000, up to £9,000,000. Of the £3,000,000 new capital, half is to be emitted prior to 31st December 1901 and the other half before 31st December 1905. The reserve fund, then £1,500,000, is to be raised gradually out of surplus profits to a maximum of £3,000,000. The amending Act further diminishes the dividend receivable by the stock-holders of the Reichsbank

[1] *Vorträge und Aufsätze hauptsächlich aus dem Handels- und Wechselrecht*, von Dr R. Koch, pp. 163-4.

[2] The imperial treasury is bound to pay the State notes in cash at any time when this is required, but an independent fund of cash set apart for this purpose does not exist. *Handwörterbuch der Staatswissenschaften*, vol. v., art. "Papiergeld," p. 97, ed. 1893. Jena: Conrad and Elster, Lexis and Loening.

and increases the share which the Government will obtain. The untaxed limit of issue (note reserve, as termed in Germany) is increased, as mentioned above, from M.293,400,000 (£14,670,000) to M.450,000,000 (£22,500,000). The arrangement with the six note-issuing banks is designed to cause them to work in harmony with the Reichsbank, when the Reichsbank has to raise its rate in order to protect its gold reserve. The official published rate of discount of the Reichsbank is to be binding on the private note-issuing banks after it has reached or when it exceeds 4 per cent. At other times they are not to discount at more than a quarter per cent. below the official rate of the Reichsbank, or in case the Reichsbank itself discounts at a lower rate than the official rate, at more than one-eighth per cent. below that rate. If the Reichsbank discounts below the official rate, it is to announce that fact in the *Gazette*.

The subject being important, we quote from the amending Act the sections governing the discount rate:—Gesetz, betreffend die Abänderung des bank-gesetzes vom 14 März 1875; vom 7 Juni 1899, Artikel 7, § 1. The private note-issuing banks are bound by artikel 7, § 2, after the 1st January 1901—"(1) Not to discount below the rate published in § 15 of the bank law, so long as this rate attains or exceeds 4 per cent.; and (2) moreover, not to discount at more than a quarter per cent. below the Reichsbank rate, published in § 15 of the bank law, or in case the Reichsbank itself discounts at a lower rate, not to discount at more than one-eighth per cent. below that rate."

It remains to be seen whether the note-issuing banks will find these conditions too onerous, and will give up their right of issuing notes rather than be bound by them. The object of the enactment is apparently to protect the specie reserve of the Reichsbank, but it may be doubted whether, considering the importance of the other banks of Germany—none of which are bound by similar conditions—relatively to the note-issuing banks, the restrictions put on the note-issuing banks will have any practical effect.

Since 1870 banking has made immense progress in Germany, but it will probably be some time before the system of making payments by cheque instead of specie or notes becomes general.

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United States.

History.

The "National Bank Act" of 1864, as amended, has been modified by the Act of March 1900. Originally designed to force a market for U.S. bonds during a time of civil strife and to provide for the issue of national currency, the Act of 1864 has created a great commercial institution, whose distinctive features are: implied responsibility of the U.S. Government for the safety of the notes of the banks; reports made five times each year to the Comptroller of the Currency as to condition on days previous to the date of his call therefor; verification of each bank's assets and liabilities by experienced Government examiners; and a compulsory cash reserve for each national bank, in large cities equal to 25 per cent. of the amount of its deposits. In the smaller cities this reserve is 15 per cent. of that liability, three-

fifths of which may be deposited with banks in the larger cities as approved by the Comptroller of the Currency. Banks or associations may own their banking houses but no other real estate, unless taken for debt, and then only for five years. Interest rates are charged according to state laws. Dividends may not be paid to stockholders unless one-tenth of the profits is set aside as surplus, though such surplus need not exceed 20 per cent. of the capital stock. Notes of a bank, secured by a deposit at Washington of U.S. bonds, are receivable in payment of taxes, excises, public lands, and all other debts except custom duties. The average circulation of each bank or association is subject to a tax, and a fund amounting to 5 per cent. of such circulation is deposited at the Treasury by each bank for the purpose of redeeming mutilated notes. In addition to a possible loss of the money invested in the shares of national banks, stockholders are personally liable for the debts of such banks to the amounts of their respective holdings at par.

By 1873 the National Banks' circulation had amounted to $341,320,256. Because of the swollen volume of the country's paper currency, gold had remained out of circulation, the premium working slowly down from the enormous war price of $258 of paper money for $100 of gold in July 1864, to a rate of only 15 per cent. premium in the same month of 1873. During the panic of 1873 the circulating notes of the banks held good and were redeemed. With the "hard times" clamour for more currency, and with the constant outflow of exported gold, the Government's legal tender obligations could not be met in that coin. In preparation for the resumption of specie payments, 1st January 1879, the Government sold bonds, depositing large sums in the New York banks. Under the Bland Bill of 1877 the Government coined monthly 2,000,000 to 4,000,000 silver dollars—worth, internationally, about 90 cents in gold each. The New York Sub-Treasury was admitted to membership in the Clearing House in 1878, and in the same year the Clearing House rule was adopted, prohibiting payments of balances between members in silver except in small sums. In New York and Boston it was agreed that deposit accounts kept in terms of gold should be abolished. Arrangements were made for the maintenance of 40 per cent. of the outstanding U.S. notes to be held by the Treasury in gold. By the aid of the banks, which agreed not to demand payment of their legal tender notes in gold from the New York Sub-Treasury, a gold standard of value was established in 1879.

The regular increase in the volume of money under the Bland Law, and the inability of the U.S. Treasury to get rid of its accumulating stock of silver through the banks, led Congress, in 1882, to stipulate that no national banking association should be a member of any Clearing House in which silver certificates should not be received in settlement of balances; but the banks were only striving to resist the conversion of their banking reserve from gold into silver. Meanwhile, under the stimulus of agricultural and business prosperity, speculation had gone beyond bounds, producing in 1884 a panic, mainly confined to New York financial circles. Several important failures occurred in Wall Street, including the Marine and Metropolitan Banks, though the banks in general well sustained the burden of credits. On 1st October 1881 the circulation of all the national banks amounted to $320,000,000. In July 1882 the Government funded its outstanding 5 per cent. war bonds by an issue of 3 per cents. As considerably more than half the bank holdings were of the class converted, and as the Government policy of reducing interest also led to the retirement of bonds by the aid of its now steadily-growing revenue surplus, during the next few years bank-note circulation steadily decreased, until by October 1890 the outstanding notes were reduced to $122,928,084, the lowest point ever reached. In 1885, because of a diminishing gold reserve, the New York banks on appeal turned over to the U.S. Treasury nearly $6,000,000 gold, in return for fractional silver coin. During these years other forms of currency than the bank notes increased in volume. In 1890 the Treasury legal tender notes, and the form of Government obligation known as silver certificates, together aggregated $620,000,000. Until this time the Government's gold reserve had been constantly maintained since 1879 at above $100,000,000, and the arrangement with the banks for them to redeem in gold the notes turned in by the public while exchanging gold at the Sub-Treasury for the same notes had been carried out. In 1890 a law was passed which obliged the U.S. Treasury to purchase 4,500,000 ounces of silver monthly, and to pay for the same in U.S. notes, which should be redeemed in gold or silver coin. In 1891 the gold reserve fell below $100,000,000.

The years between 1885 and 1893 were years of activity and business prosperity, supported by abundant harvests marketed at high prices. A reaction was the result, and by 1893 a memorable panic had set in. Frightened depositors withdrew their money from banks in the west, while increased demands for loans came upon the banks east and west alike. The western banks withdrew from the reserve cities the funds which they had left with the reserve banks, in order to secure the 2 per cent. interest allowed on such deposits, with the result of decreasing the cash reserve in New York city alone over $41,000,000 in the space of two months, bringing these reserves, as was usually the case in times of panic, below the 25 per cent. required by law. Large railroad and industrial suspensions resulted, yet, as heretofore, the banks were able to meet all emergencies because of their inherent soundness. In that year the New York banks turned over to the Treasury more than $6,000,000 in gold in exchange for U.S. notes. During this panic a plan was again successfully employed, which had been tried in the panic of 1873 and again in 1884 and 1890, namely, the issue by the New York Clearing House of loan certificates, having as the basis of their value securities and sound commercial paper of the banks deposited with the Clearing House to an amount 25 per cent. above the par of the certificates. These Clearing House certificates passed between the banks in lieu of cash settlement for Clearing House balances. The example of New York was followed by the Clearing Houses of Boston, Philadelphia, Baltimore, and Pittsburgh. No very important National Bank failures resulted, although upwards of 150 banks out of an aggregate of 3800 suspended during the year, all but five being in the west and south; nearly 400 state and savings banks and private bankers, however, came to grief. Finally, the New York banks, by means of increased Clearing House certificates, arranged to import several millions of gold.

Because of a scarcity of currency, depositors had been compelled to accept certified cheques instead of money for all purposes except the most urgent needs. Both gold and paper money commanded a premium of 4 per cent. over bank cheques, and gold was attracted from abroad and from being hoarded to realize the profit. In February 1894 the banks subscribed for 80 per cent. of a new issue of Government bonds. In August of the same year, on appeal from the U.S. Treasury, they again exchanged $15,000,000 of gold for U.S. notes called legal tenders. In November the banks again subscribed for a further issue of Government bonds. In January 1895 a syndicate

of international banks and bankers subscribed for another issue of Government bonds, with the condition that the syndicate would protect the Treasury against the withdrawal of gold for export purposes. These operations, extending through the years 1895 and 1896, together with the check given to the increasing amount of silver by the repeal in 1893 of the Silver Purchase Law of 1890, had the effect of restoring public confidence in the Government's ability to redeem its obligations in gold at any time. Since 1895 banking has not experienced startling changes, bearing up well under the Venezuelan difficulties of that year, the outbreak of the Spanish war in 1898, and the flurry in the money market in December 1899.

Some tendencies have shown themselves. Following other lines of business, consolidation of banks has increased as bankers have become impressed with the advisability of having larger financial institutions. In the same way many banks have increased their capital, so that larger amounts could be lent at one time, and that larger depositors might be attracted by the added security. In April 1899 the New York banks, acting through the Clearing House, agreed upon a schedule of charges for the collection of out-of-town cheques deposited with them in the course of business, such cheques having been collected gratis. The custom has been growing of requiring statements of financial condition from merchants and corporations when asking for loans or offering for sale single-name commercial paper. The formation of the large industrial companies has tended to take from the banks the smaller loans made heretofore to the individual concerns absorbed, and to substitute the lending of large sums to the industrial combinations themselves, the latter plan involving more of the principles of corporation financing.

National Banks.

In March 1900 certain of the provisions of the National Banking Act were amended as follows:—The ratio of population to capital of new banks in places of less than 3000, to be $25,000; in places of not more than 6000, not less than $100,000. Old and new banks to be allowed circulation up to the full par of bond deposited with the Treasury, while such bonds shall remain at or above par in the market. Not more than one-third of each bank's circulation to be in denomination of five dollars. Each bank to be permitted to obtain circulation on deposit of new 2 per cent. bonds authorized under the same Act. The average circulation to be taxed ¼ per cent. each half-year. The bonds thus authorized were designed to refund former issues at higher rates, and from the first, large exchanges of the new bonds were effected, the latter being much esteemed as a basis for national bank circulation, particularly as touching newly-organized banks in small towns and cities. On 13th February 1900, the national banks of the U.S. numbered 3604; their total assets were $4,674,910,713, inclusive of about 550 millions of dollars due to and from the banks themselves. Among their assets were the following, in millions of dollars:—loans and discounts, 2481; U.S. bonds for circulation, 236; stocks, securities, &c., 330; banking houses, 79; other real estate and mortgages owned, 28; specie, 339; legal tender notes, 122. Among the liabilities were, also in millions of dollars:—capital stock paid in, 613; surplus and undivided profits, 363; circulating notes, 204; due to state banks and bankers, 318; individual deposits, 2481; U.S. deposits, 103. Of the above assets New York city banks comprised $1,107,000,000, including loans and discounts of 499 millions; their capital stock was 56 millions; their surplus and undivided profits, 68 millions; their circulation outstanding, 17 millions; their individual deposits, 475 millions. The National City Bank of New York, the largest bank in the U.S., had a capital of 10 million dollars paid in, and assets of 168 millions; in 1902 the capital was enlarged to 25 million dollars, with a surplus in addition of 15 millions. The Chemical National Bank, also of New York, had 38 millions of assets, at the same time reporting a capital stock of $300,000, with a surplus of undivided profits of $6,697,000, or over 22 times the amount of the original capital.

State Banks.

From the inception of the National Bank plan, the State banks began to withdraw their circulating notes, a national law having been passed making their notes subject to a prohibitive tax of 10 per cent. on the average annual circulation. By 1873 the aggregate of notes outstanding on account of all the State banks was only about $200,000, some of them having a few scattered notes in circulation at the present time. The laws in all the forty-four States differ to some extent, but the following chief distinctions from the National Bank plan may be observed, the excellent laws of New York State being taken as fairly representative of the regulations in all the States. A State superintendent of banks is appointed by the Governor for a term of three years. This official exercises a control over the banks, including savings banks and loan and trust companies, similar to that of the National Comptroller of the currency. Reports are rendered to him every half-year; and in New York State, as in most of the other States (Rhode Island being an exception to the general rule), an examination of each bank is made by his department at irregular intervals, but at least once in each year. Loans may not be made to any one person, firm, or corporation in excess of 20 per cent. of a bank's combined capital and surplus. Notes or other evidences of debt shall not be purchased for less than the amount due according to the face of the same. Loans may be made upon mortgages, but except for owning a banking-house, real estate may not be acquired except for debt. A money reserve of 15 per cent. is required in New York city, and of 10 per cent. in other cities in New York State. Stockholders are responsible for the debts of the bank to the extent of the par value of their stock, in addition to the amount invested in such stock. Under the New York law 6 per cent. is the legal rate of interest, but demand loans secured by collaterals may be made at higher rates. Since 1895 it has been lawful in New York State for banks in the same municipality to consolidate, as agreed upon by their respective directors and subject to the approval of the superintendent of banks. This privilege has been utilized in several cases, one large New York city institution, the Corn Exchange bank, having in three years absorbed five smaller State banks. In 1863 the State banks numbered 1466 throughout the United States. Five years later they had decreased to 247; but in subsequent years they grew very rapidly in number, aggregating 620 in 1880, 2101 in 1890, and 4191 in 1899. The assets of these latter aggregated in 1899, $1,636,000,000, including the following in millions of dollars:—Loans on real estate, 51; other loans, 857; stocks and bonds, 172; due from banks, 255; real estate, 68; cash and cash items, 216. Among their liabilities also in millions of dollars were:—Capital stock, 233; surplus and undivided profits, 113; deposits, 1164; due to banks, 108. The greater proportion of failures on their part, as against failures of National Banks, should be noted. In the six and a half years beginning with the panic year of 1893 and ending 30th June 1899, 283 State banks failed, having assets, according to their books, amounting to $62,739,332. Of these sums there had been recovered from shareholders $1,517,178, and from the liquidation of assets $32,925,233, or about 56 per cent. of the total assets. The total failures of National Banks during thirty-six years, from 1864-99 inclusive, were

only 387. The nominal assets of these National Banks aggregated $235,636,778. Upon the assets of 375 of these there had been collected on 31st October 1899, either from stockholders or from the liquidation of assets, 73·92 per cent.

There is a large number of private bankers in the United States, particularly in the central-western States. In 1899, 756 of these had total assets of over $87,000,000, of which about $14,000,000 represented the investment or other holding of individual capital and about $65,000,000 depositors' funds.

Clearing Houses.

The New York Clearing House Association, instituted in 1853, is the foremost clearing organization in the United States. The largest banks in the city send representatives each morning to the clearing building, where all the cheques received on deposit during the previous day by each bank on other Clearing House banks are exchanged. At precisely ten o'clock, on the stroke of the manager's bell, the clerks of the banks begin to pass from desk to desk, delivering packages of cheques to the settling clerk of each bank. The average length of time required for effecting this exchange of cheques is nine minutes, and the cheques are immediately taken away to the banks on which they are drawn. The aggregates of cheques received, as per the footings made by all the settling clerks, is made to balance against the aggregates, previously prepared, of all the cheques which have been brought to the Clearing House. Forty-five minutes usually suffices to ascertain the amount in which each bank has become a debtor or creditor with the Clearing House. Each debtor bank then has until 12.30 o'clock to turn in to the manager of the Clearing House in cash the amount of its debit balance, settlement with creditor banks being made, also in cash, by 1.30 o'clock. Tardiness as well as inaccuracies in listings or footings subjects the banks to fines. During 1900 a single cheque for $17,000,000 was cleared. In the previous year one bank had a credit balance after making its day's exchanges of $13,462,379.78. The total clearings of the New York institution during 1899 were $57,368,230,771. The average daily clearings amounted to $189,961,029. The total balances for that year between members were $3,085,971,370, the average each day being $10,218,448, involving the handling of over 250,000 daily cheques. Similar Clearing House arrangements obtain in 71 other American cities. The total clearings of all these institutions were $38,526,000,000 in 1879; $56,175,000,000 in 1889; and $88,909,671,776 in 1899. The New York Association was, in 1900, composed of 63 banks and the U.S. sub-treasury at New York. Ninety-five banks have been members of the Association since it was organized. The loss in numbers is due to failures, retirements, and consolidations. Of the first 25 members, 19 still remained in 1900. The Association is composed only of National and State banks, but these provide clearing accommodations for 78 other banking institutions, trust companies, which do an individual deposit business, and smaller neighbouring banks. No bank can become a member of the New York Clearing House, or is allowed to clear its cheques through the bank of a member, until its Board of Directors by resolution gives permission to the Clearing House Committee to examine into its financial condition at any time without notice. The Clearing House issues every Saturday a statement showing the condition of all the banks by aggregates, averaged for the week, and giving surplus over required reserve. This statement is regarded as important by financial circles throughout the U.S. as indicating by comparison tendencies in the money market. (T. L. G.)

II. Laws affecting Banks and their Customers.

Apart from the question of the issue of bank notes the modern tendency of legislation and legal decision alike appears to favour the expansion and facilitate the operations of banking. With regard to note issue, the legislation which culminated in the Bank Charter Acts of 1844 and 1845 secured to the Bank of England the absolute monopoly of the note issue within the City of London and a three-miles radius. Outside that radius, and within sixty-five miles of the City, there is a concurrent right in banks, consisting of six or less than six persons, established before 1844, and issuing notes at that date; beyond the sixty-five-miles radius the privilege may be exercised by all banks established before 1844, and then issuing notes, who have not since lost their right to do so by bankruptcy, abandonment of business, or temporary suspension of issue. According to some authorities, the effect of 20 and 21 Vict. cap. 49, sec. 12 was to sanction the increase in the constitution of any bank issuing notes outside the three-miles and within the sixty-five-miles radius from six to ten persons without affecting the power to issue notes. This is the view accepted by Chalmers, Macleod, and Byles; while, on the other hand, Lord Lindley, Grant, Chitty, Douglas Walker, and Cavanagh regard the constitution of such banks as limited to six persons. Consideration of the various statutes appears to support the view of the latter authorities, and the rule as laid down above is believed to be the correct one. The increase in the number of Joint Stock Banks and the gradual absorption of the smaller and older concerns have had the effect of diminishing the output of notes other than those issued by the Bank of England, and, as exemplified by the case of *The Attorney-General* v. *Birkbeck*, 12 Q. B. D. 57, it would seem impossible to devise any scheme by which the note-issuing power of an absorbed bank could be continued to the new or amalgamated body.

The functions of a bank as what is somewhat incorrectly termed a bank of deposit, as opposed to a bank of issue, are of more everyday importance. The term "bank of deposit" gives a mistaken idea of the real relation between banker and customer. So long ago as 1848 it was decided by the House of Lords in *Foley* v. *Hill*, 2 H. of L. 28, that the real relation between banker and customer was that of debtor and creditor, not in any sense that of trustee and *cestui que trust*, or depositee and depositor, as had been formerly supposed and contended. The ordinary process by which a man pays money in to his account at his banker's is in law simply lending the money to the banker; it fixes the banker with no fiduciary relation, and he is in no way responsible to the customer for the use he may make of the money so paid in. And as being a mere debt, a customer's right to recover money paid in is barred on the expiration of six years by the Statute of Limitations, if there has been no payment meantime on account of principal or interest, and no acknowledgment sufficient to bar the statute (*Pott* v. *Clegg*, 16 M. & W. 321). Such a state of affairs, however, is hardly likely to arise, inasmuch as, in the absence of specific appropriation, earlier drawings out are attributed to the earlier payments in, as in the ordinary case of current accounts, and so the items on the credit and debit side cancel each other. An apparent exception to this system of appropriation exists in cases where a man wrongfully pays into his own account monies held by him in a fiduciary capacity. In such circumstances he is presumed to have drawn out his own monies rather than those affected by the trust, and so long as the account is in credit, any balance will be

Banker and customer.

attributed to the trust money. As between contending claims to the money, based on different breaches of trust, the ordinary rule of appropriation will apply.

It has often been suggested that the only method of withdrawing money from a banker is by cheque, that the presentation of a cheque is a condition precedent to the liability of the banker to repay. This is not so; such a view being inconsistent with the cases establishing the effect of the Statute of Limitations on money left in a banker's hands, and with the numerous cases in which a balance at a bank has been attached as a simple and unconditional debt by a garnishee order, as, for instance, in *Rogers* v. *Whiteley*, 1892, A. C. 118. The banker's position with regard to cheques is that, superadded to the relation of debtor and creditor, there is an obligation to honour the customer's cheques provided the banker has a sufficient and available balance in his hands for the purpose (*Foley* v. *Hill*). If, having such funds in his hands, the banker dishonours a cheque, he is liable to the customer in substantial damages without proof of actual injury having accrued (*Rolin* v. *Steward*, 14 C. B. 595). It would further seem a legitimate condition that the cheque should be drawn in the ordinary recognized form, not in one raising any question or doubt as to its validity or effect. Cheques drawn to "wages or order," "petty cash or order," or the like, are common, and are usually regarded as payable to bearer. Such payees are not, however, "fictitious or non-existent persons," so as to render the cheques payable to the bearer under sec. 7, subs. 3 of the Bills of Exchange Act, 1882, hereinafter referred to, nor can such payees indorse. Some banks, therefore, refuse to pay such cheques, and it is conceived they are justified in so doing. Money paid in so shortly before the presentation of the cheque that there would not have been time to pass it through the books of the bank would not be treated as available for this purpose. If a person have an account at one branch of a bank, he is not entitled to draw cheques on another branch where he has either no account or is overdrawn, but the bank has, as against the customer, the right to combine accounts at different branches and treat them as one account (*Garnet* v. *M'Ewen*, L. R. 8 Ex. 10).

The very questionable practice of post-dating cheques has been the source of considerable doubt and inconvenience to bankers. The use of such documents enables the drawer to obtain the results of a bill at a fixed future date without the expense of a regular bill-stamp. But the Bills of Exchange Act, 1882, sec. 13, subs. 1, provides that "a bill is not invalid by reason only that it is ante-dated or post-dated, or that it bears date on a Sunday." It seems very possible that the drawer may be liable to penalties under the Stamp Act, 1891, either for issuing a document improperly stamped, or for executing an instrument in which all the facts and circumstances affecting its liability to stamp duty are not truly set forth, inasmuch as a post-dated cheque is not really payable on demand, but only on demand after a future date. These, however, are matters with which the banker is not concerned. He cannot refuse to pay a cheque presented after the apparent date of its issue on the ground that he knows it to have been post-dated. On the other hand, he is entitled and indeed bound to refuse payment if such a cheque is presented before the apparent date of its issue.

The banker is bound to observe secrecy with respect to the customer's account, unless good cause exists for disclosure, and the obligation does not cease if the account becomes overdrawn (*Hardy* v. *Veasey*, L. R. 3 Ex. 107). In England a cheque is not an assignment of funds in the banker's hands (Bills of Exchange Act, 1882, sec. 53). The holder of the cheque has therefore no claim on the banker in the event of payment being refused, his remedy being against the drawer and indorser, if any. On this section is also based the custom of English bankers not to pay part of the amount of a cheque where there are funds, though not sufficient to meet the whole amount. The section does not apply to Scotland, where it would seem that the bank is bound to pay over what funds it has towards satisfaction of the cheque. A banker is entitled to hold paid cheques as vouchers until there has been a settlement of account between him and the customer. The entries in a pass-book constitute *primâ facie* evidence against the banker, and when returned by the customer without comment, against him; but in either case such evidence may be displaced by proof that the entries have been made by mistake and do not represent the true state of the account. It has been held, however, that where the customer has altered his position on the faith of entries in the pass-book showing money to have been received, the banker cannot afterwards deny the receipt of such monies or retain others in satisfaction of them (*Skyring* v. *Greenwood*, 4 B. & C. 281). Acquiescence by the customer in a course of business indicated in the pass-book will justify the banker in treating such course of business as established for the future so long as the relation of banker and customer continues. In this manner the banker may acquire the right to charge interest or even compound interest on overdrafts, neither of which he is entitled to do at common law.

The above-mentioned rule, by which the holder of a cheque has no direct recourse against the banker who dishonours it, holds good even where the banker has marked or certified the cheque as good for the amount, such marking not amounting to an acceptance by the banker. As between banker and banker, however, such marking or certifying probably amounts to a binding representation that the cheque will be paid. In the United States, on the contrary, a certified cheque gives the holder a direct claim against the banker, and if the cheque be so certified at the instance of the holder this operates as a complete discharge to the drawer.

Where legislation has intervened for the protection of the banker, it has usually been to counterbalance some particular risk which would otherwise have been imposed upon him by enactments primarily intended to safeguard the customer. Thus in 1853 the Stamp Act of that year made a penny stamp sufficient for an order cheque as well as a bearer cheque, the object being the protection of the drawer by making it impossible for a wrongful holder to obtain payment without committing forgery. But it was recognized that this would cast a new burden on the banker, who would obtain no discharge by paying on a forged indorsement. A section was therefore inserted in the Act, relieving the banker from responsibility in case of payment on a forged or unauthorized indorsement, and the provisions of this section are practically re-enacted by sec. 60 of the Bills of Exchange Act, 1882. It appears, however, very doubtful whether this section protects a banker who, according to the usual custom, demands and obtains the signature of an ostensible payee on the back of an order cheque presented by him for payment in that character. Such signature is not an indorsement within sec. 2 of the Act, and the payment is not made on the forged indorsement, nor to him as indorsee, but as payee.

So again with crossed cheques. The custom of crossing cheques originated between bankers at the Clearing House, and was adopted by the public for a considerable period before it received any legislative recognition or efficacy. At this stage such crossing only operated as a warning to the banker on

Crossed cheques.

whom the cheque was drawn to exercise caution in paying the cheque otherwise than to a banker if crossed generally, or to a particular banker if crossed specially. Various statutes, now repealed, were passed between 1856 and 1882 dealing with the subject, the effect of which is reproduced by the Bills of Exchange Act, 1882. That statute authorizes various forms of crossing, and renders the paying banker liable, not only to the drawer, but also to the true owner, for any loss he may have sustained by reason of the banker having paid the cheque contrary to the crossing. The system, designed in the interest and for the protection of the public, imposed new burdens on the paying banker and indirectly on the collecting banker. It necessitated the intervention of a banker for the obtaining payment of any crossed cheque, thus largely increasing the mass of such business and the risk of the collecting banker being held liable in any case where he had collected a cheque for a person who had no title to it, as where it was held under a forged indorsement. Some counterbalancing advantages were therefore conferred on bankers. By sec. 80 it was enacted that where a banker on whom a crossed cheque is drawn, in good faith and without negligence pays it, if crossed generally, to a banker, and, if crossed specially, to the banker to whom it is crossed or his agent for collection, being a banker, he shall be entitled to the same rights and be placed in the same position as if payment of the cheque had been made to the true owner thereof. Exemption from liability in respect of payment of a crossed cheque was thus ensured to the paying banker in certain cases in which he might not have been able to debit his customer with payment of an open cheque. The protection to the collecting banker is contained in sec. 82, which enacts that "when a banker in good faith and without negligence receives payment for a customer of a cheque crossed generally, or specially to himself, and the customer has no title or a defective title thereto, the banker shall not incur any liability to the true owner of the cheque by reason only of having received such payment." This section has been the subject of much judicial interpretation, both as to what constitutes a customer and when a bank receives payment for the customer and when for itself. A single isolated transaction cannot constitute a man a customer (*Matthews* v. *Williams, Brown & Co.*, 10 *Times* L. R. 386; *Lacave* v. *Crédit Lyonnais*, 1897, 1 Q. B. 148). But where the relation of banker and customer exists, the fact that the account is overdrawn does not preclude the banker who has received the proceeds of a cheque paid in by his customer from protection (*Clarke* v. *The London and County Bank*, 1897, 1 Q. B. 552), the transaction being regarded as in substance a collection for the customer, although the banker might be benefited by the reduction of the overdraft. The judgment of the House of Lords (given on 22nd July 1901) in the case of *The Great Western Railway Co.* v. *The London and County Bank* (1901, A. C. 414) contains an authoritative exposition of this section. In that case a rate-collector named Huggins had for many years been in the habit of obtaining at one of the branches of the defendant bank cash for cheques drawn in his favour on other banks. He was consequently well known there, but kept no account with the defendant bank, and his only transactions with them were of the above nature. He fraudulently obtained from the plaintiff company a cheque to his own order crossed "not negotiable." This cheque he took to the defendants' branch and endorsed to them, receiving the full face value at once, save for a small balance which by his direction was put to another account, and the defendant bank in due course received the proceeds of the cheque from the bank on which it was drawn. The judge of first instance and the Court of Appeal held that the defendants were protected by sec. 82, having received payment of the cheque for a customer in good faith and without negligence, and gave judgment in favour of the bank. This judgment was reversed by the House of Lords, and judgment given for the plaintiffs, the main grounds of the judgment being that the dealings between Huggins and the bank were not properly describable as banking transactions, and could not therefore, however long continued, constitute him a customer, and secondly that, whether the bank were to be regarded as having purchased the cheque or as having advanced the full amount on the security of it, they had received the proceeds for themselves and not for Huggins. It may now therefore be taken as settled law that to constitute a man a customer within this 82nd section he must either have an account with the bank or at the least must be in the habit of resorting to the bank in the course of ordinary banking transactions productive of advantage to both parties, and further, that a bank which has given cash over the counter for a cheque drawn on another bank cannot subsequently set up that it received the proceeds for any one but itself. Lord Brampton in this case enunciated a dictum or suggestion to the effect that, even supposing the case had been one of banker and customer and of genuine collection for the customer, still the fact of the cheque being marked "not negotiable" would or might have made a difference and deprived the bank of the protection of the section, on the ground that it was negligence to collect such a cheque without inquiry, even for the ostensible payee. Obviously such addition to the crossing can have no application whatever where there has been no transfer of the cheque. And it is equally obvious that the fact of the customer being the transferee of a cheque crossed "not negotiable" in nowise affects the liability of the collecting banker. Under sec. 76 of the Bills of Exchange Act the words "not negotiable" are simply made an optional integral part of the crossing, and so when sec. 82 speaks of negligence in relation to a crossed cheque, it can only mean negligence altogether independent of the form of the crossing. Again, the bearing and design of the "not negotiable" crossing is, under sec. 81, to affect the title of the transferee, and sec. 82 specially protects the banker in cases where, other conditions being fulfilled, the customer has either no title or a defective title to the cheque. Section 77, subs. 6, of the Bills of Exchange Act provides that "when an uncrossed cheque, or a cheque crossed generally, is sent to a banker for collection he may cross it specially to himself." It would appear somewhat doubtful whether this enables a banker to avail himself of the protection of sec. 82 by crossing an open cheque received by him for collection. In *Bissell* v. *Fox*, 51 *Law Times* Rep. 663, Denman, J., expressed the opinion that sec. 82 only applied where the banker received the cheque already crossed, but this subsection was not brought to his notice, not being applicable to the case, and there are grounds for believing that it was expressly introduced for the purpose of enabling bankers so to protect themselves. The addition to a crossing of the words "not negotiable" was sanctioned and its effect defined by the Crossed Cheques Act, 1876, and re-enacted by sec. 81 of the Bills of Exchange Act, 1882. Curious misapprehensions have existed with regard to this crossing, owing probably to the somewhat ambiguous words employed. The presence of such a crossing does not preclude the transfer of the cheque. The word "negotiable" is not used as equivalent to "transferable" as it is elsewhere in the Act (see sec. 8, subs. 1). It denotes that the cheque is not fully negotiable, and the statutory effect annexed by the section to such crossing is to put the cheque on the footing of an overdue bill, with the result

that a person taking a cheque so crossed takes it subject to all equities affecting it, and can neither acquire nor pass on a better right either to the cheque itself or the money realized by means of it than the person from whom he took the cheque. But so long as there is nothing wrong with the cheque or the circumstances attending its issue or transfer, it may pass through any number of hands, and be enforced by the holder for the time being. See the judgment of Vaughan Williams, L.J., in *Great Western Railway* v. *The London and County Bank*, 1900, 2 Q. B. 464, and of the House of Lords in the same case. The addition of these words to the crossing in no way prejudices the protection afforded under the crossed cheques sections of the Bills of Exchange Act, 1882, to the paying banker, on whom the crossing only imposes the duty of seeing that the cheque reaches him through the proper channel.

A practice has grown up of adding to the crossing of a cheque the words "account payee," or similar words indicating an intention that the cheque shall be placed to some particular account. There is no statutory sanction for such an addition, and its effect is somewhat doubtful. It was decided in *National Bank* v. *Silke*, 1891, 1 Q. B. 435, that the addition of such words did not prevent the cheque being transferable. Nor can such words have the statutory effect attributed to the words "not negotiable" by sec. 81 of the Bills of Exchange Act, 1882. Probably the only effect of such crossings as "account payee" is one analogous to that of an ordinary crossing before the legislature intervened, or now of an indorsement being *per pro.*, namely, to impose a greater degree of caution upon the banker who receives a cheque so crossed for an account other than the one indicated; but the point has still to be definitely decided.

Forgeries.

The protection of the banker against forged indorsements under sec. 60 of the Bills of Exchange Act, 1882, extending only to bills or cheques payable to order on demand, the banker is not discharged in other cases by payment on a forged indorsement, unless circumstances exist to take the case out of the general rule. Such circumstances existed in the well-known case of *Vagliano* v. *The Bank of England*, 1891, A. C. 107. In that case, by the fraud of the plaintiff's clerk, a genuine acceptance of the plaintiff's was obtained to documents in the form of bills to which the drawer's name was forged, and to which the name of the payees to whose order they were drawn was subsequently forged as indorsers. The names utilized as those of drawer and payee were the names of persons having business transactions with the plaintiff Vagliano, and their names were selected as giving colour to the fraud. All the bills were accepted payable at the Bank of England where Vagliano had a large account. Their coming forward for payment was notified to the bank by letters of advice, which referred also to genuine bills, Vagliano's signature to the letters being fraudulently obtained. The fabricated bills were presented to the bank for payment by or on behalf of the fraudulent clerk, and paid by the bank over the counter. There were forty-three of such bills, and the amount realized by the clerk was £71,500, with which, on discovery of the frauds and conviction of the clerk, Vagliano refused to be debited. The House of Lords, by a majority, ultimately decided in favour of the bank. The main grounds of the judgment were as follows: That whether the documents could properly be termed bills or not, they must be treated as such as against Vagliano who had accredited them as such, and whose case against the bank was based on their possessing that character; that, inasmuch as the persons whose names appeared as payees and indorsers, though really existing people known to Vagliano, were never intended to have and never could have had anything to do with the bills, the bills came within the provisions of sec. 7, subs. 3 of the Bills of Exchange Act, 1882, which enacts that "Where the payee of a bill is a fictitious or non-existent person, the bill may be treated as payable to bearer"; that whatever may have been the law prior to the Bills of Exchange Act, it was not necessary for the operation of this subsection that the fictitious or non-existent character of the payee should be within the knowledge of the acceptor or other person sought to be made liable; that it was open to any one whose interest it was to do so to treat the bills as payable to bearer, that the bank was entitled to do so, and was therefore discharged; that apart from these considerations, the bank were agents for Vagliano in the payment of bills accepted payable there, that Vagliano's own act in accepting the bills and signing the letters of advice, and his omission to take any steps to verify the supposed transactions when circumstances occurred which might have aroused suspicion, were the direct cause of the bank's making the payments on his behalf, and that he was therefore not entitled to repudiate them. It was incidentally decided in this important case that a banker is not entitled to a reasonable time in which to make inquiries and satisfy himself as to the genuineness of the indorsements on a bill, but must pay or refuse payment at once. Prior to this date the contrary opinion had prevailed, founded on a dictum of Maule, J., in *Robarts* v. *Tucker*, 16 Q. B. 560; and when once the payment has been made, the banker, on discovery of the forgery, would appear to have no power, as against an innocent party, to retract it or claim repayment of the money. Such a payment has no doubt been made under a mistake of fact, and so under ordinary rules of law would be recoverable, but it is essential for the free circulation of negotiable instruments that their payment or dishonour should be conclusive as well as immediate, and if in the interval between payment and the claim for the return of the money the payee's position might have been altered, as would almost invariably be the case, the money is not recoverable (*London and River Plate Bank* v. *The Bank of Liverpool*, 1896, 1 Q. B. 7). This somewhat rigorous rule has been modified in Canada. By an Act of the Canadian Legislature passed in 1897, if a bill bearing a forged or unauthorized indorsement is paid in good faith and in the ordinary course of business by or on behalf of the drawee or acceptor, the money may be recovered from the person to whom it was paid or from any indorser who has indorsed the bill subsequently to the forged or unauthorized indorsement, provided notice be given in the same manner as notice of dishonour. It was the more imperative on Canada to take this step because bankers there have no such protection in case of payment of bills payable on demand or cheques on a forged or unauthorized indorsement as is afforded in England by sec. 60 of the Bills of Exchange Act, 1882.

Another class of forgery to which bankers are more or less exposed is where the amount of a cheque is fraudulently altered, and the banker is thereby induced to pay the larger sum. In such cases the question arises whether he is entitled to debit the customer's account with the increased amount. In *Young* v. *Grote*, 4 Bing. 253, a man left signed blank cheques with his wife to be filled up as business required. The wife delivered one to a clerk with instructions to fill it up for a particular sum. He filled it up for that sum, but purposely left spaces to allow of the introduction of other words and figures. He showed it to the wife in this state, who told him to get it cashed; the clerk then added words and figures, raising the apparent amount by £300, which the

clerk obtained from the banker and appropriated. The court held that the bank were entitled to debit the account with the larger sum. The reasons assigned by the different judges were various and somewhat obscure, and probably no case has ever been so much discussed, doubted, and even dissented from as this one, which Lord Esher once described as "the fount of bad argument." The most recent criticisms upon it appear in the case of *Scholfield* v. *Lord Londesborough*, 1896, A. C. 514. There the House of Lords held that there was no duty on the part of the acceptor of a bill towards the possible holder binding him to take precautions against fraud of this nature, but there are passages in the judgments which distinctly recognize that such a duty may exist on the part of a customer towards his banker by virtue of the relation of mandant and mandatory, and the authority of *Young* v. *Grote* may be regarded as considerably rehabilitated by these expressions of opinion.

Valuables deposited.

The question of a banker's responsibility for the loss of valuables deposited with him by a customer for safe-keeping was raised, but not decided, in an action brought by Mrs. Langtry against the Union Bank of London in 1896. Certain jewels belonging to her had been delivered up by the bank to an unauthorized person on a forged order. The case was settled; but bankers being desirous to ascertain their real position, many legal opinions were taken on the point, and after consideration of these, the Central Association of Bankers issued a memorandum, in which they stated that the best legal opinion appeared to be that a distinction must be drawn between cases in which valuables were by mistake delivered to the wrong person and cases in which they were destroyed, lost, stolen, or fraudulently abstracted, whether by an officer of the bank or some other person. That in the former case the question of negligence did not arise, the case being one of wrongful conversion of the goods by a voluntary act for which the bank was liable apart from any question of negligence. That, in the second case, that of loss or theft, the banker being a gratuitous bailee, would only be liable if he had failed to use such care as an ordinary prudent man would take of valuables of his own. The latter rule is practically that laid down in *Giblin* v. *MacMullen*, L. R. 2 P. C. 318, but in estimating the amount of care to be taken by the banker, the nature of the goods, if known or suspected, and the exceptional means of protection at the disposition of bankers, such as strong-rooms, must be taken into consideration. Methods of obviating both classes of risk by means of special receipts have frequently been suggested, but such receipts do not appear to have come into general use.

This gratuitous assumption of the custody of valuables, like the collection of cheques and the usage by which bills are ordinarily accepted payable at a banker's, and presented and paid there, is an abnormal graft upon the original and simple system of banking. Banks are compelled to afford such facilities and undertake the resultant liabilities by the pressure of competition increasingly enhanced by the concurrence of Post Office and Trustee Savings Banks, state-aided institutions whose returns conclusively demonstrate that they are utilized by classes for whose benefit they were never intended. And naturally this multiplication of the banker's functions complicates his legal position, inasmuch as, according to the branch of business he is in a particular case pursuing, he may have to be regarded as a debtor, a creditor, an agent, or a bailee.

Apart, too, from such unusual transactions as the cashing of crossed cheques over the counter, many banks undertake the discounting of bills and the granting of advances on various classes of securities. This latter branch of business falls within the region of general rather than banking law, but the question has frequently arisen whether a bank has taken a cheque in its capacity as agent for collection, or whether it has taken it as a transferee in the same way as a discounted bill. For some purposes this has been treated as a question of fact. In *Gaden* v. *The Newfoundland Savings Bank*, 1899, A. C. 281, it was held that there was a *prima facie* presumption that a bank, not being a discount bank, had not taken the document as a transferee, so as to gratuitously guarantee its payment. But it would seem that where the account is overdrawn at the time the cheque is paid in, where the customer is allowed to draw against the cheque before it is cleared, or even where the cheque is at once entered as cash to the credit of the customer, the bank become holders for value to the extent of being able to sue upon the cheque in their own name. See *ex p. Richdale*, 19 Ch. D. 409; *M'Lean* v. *The Clydesdale Bank*, 9 A. C. 95; *Royal Bank of Scotland* v. *Tottenham*, 1894, 2 Q. B. 715; *Gordon* v. *The London City and Midland Bank* (*ubi sup.*). Logically, this would exclude, in such cases, the exercise of the right, universally claimed by bankers, to debit the customer with the amount of the cheque when dishonoured, such right being strictly only consistent with the character of an agent for collection. The cases of *Gaden* v. *The Newfoundland Savings Bank*, 1899, A. C. 281; *J. Bavins, Jun., and Sims* v. *The London and South-Western Bank*, 1900, 1 Q. B. 270; and *Gordon* v. *The London City and Midland Bank*, 1902, 1 K. B. 242, however, recognize the possible co-existence of the two rights, the right to debit the customer being referable to an implied agreement between banker and customer, as suggested in *Gordon* v. *The London City and Midland Bank*. The existence of the banker's lien enables him in many cases to enforce for his own benefit negotiable instruments strictly belonging to the customer. A banker has a lien over all securities of the customer coming to his hands in his capacity of banker for the amount of the general balance due from the customer. The lien extends to money, but not to goods or securities deposited for a specific purpose, as for safe custody, and it is excluded where another agreement relating to the subject-matter is shown.

Agency.

Pledging of securities.

The unauthorized pledging by stockbrokers or money-brokers of their clients' securities to secure advances from banks to themselves has given rise to important and apparently conflicting decisions of the House of Lords. In 1888 that tribunal gave judgment in the case of *Lord Sheffield* v. *The London Joint Stock Bank*, 13 A. C. 333. That judgment was widely understood as laying down the general proposition, that the nature of the business of the borrower which necessitates his being entrusted with securities belonging to other people was sufficient to put the banker on inquiry as to the extent of his authority to deal with them. In the later case of *Simmons* v. *The London Joint Stock Bank*, 1892, A. C. 201, the House of Lords expressly declared that Lord Sheffield's case had been decided simply on the facts, which, in their Lordships' opinion, established actual knowledge on the part of the bank of the limited authority of the agent, and that no such proposition as is above referred to was to be deduced from that case. It must, therefore, be taken that no new legal principle was embodied in the earlier case. Nor was any new doctrine enunciated in the judgments in Simmons's case. They merely applied the ordinary rule of law by which the transferee of a negotiable instrument, whether the transfer

be absolute or by way of pledge, if he take it in good faith and for value, and before it is overdue, acquires an independent title, unaffected by any equities existing against previous holders. Their Lordships expressly disclaimed the idea that there was anything in the nature of the business of a stockbroker or money-dealer to put a bank on inquiry as to his authority to deal with securities in his hands tendered as cover for a personal advance. The possession by an agent of negotiable instruments is, in the absence of extrinsic suspicious circumstances, sufficient evidence of his authority to deal with them in any way he pleases. This view, being based on the essential character of negotiable instruments, only applies to such as are in their nature fully negotiable, that is, which possess the quality of vesting in a *bonâ-fide* holder for value an independent title against all the world.

Negotiable instruments.

Outside bills, notes, and cheques, the category of fully negotiable instruments is a somewhat indeterminate one. It includes all such securities as either by statute or by the custom of merchants have acquired this particular quality. It has been claimed that custom of the Stock Exchange to treat a security as fully negotiable is, apart from statute, the only trustworthy test. It would probably be more correct to say, that in order to attain the status of full negotiability a security must be on its face negotiable and recognized as such by the mercantile community of the United Kingdom at large. Negotiability in the country of its origin is no evidence of negotiability in England (*Picker* v. *The London and County Bank*, 18 Q. B. D. 515). It has been contended on the authority of *Crouch* v. *Crédit Foncier*, L. R. 8 Q. B. 374, that, with regard to English securities, at any rate, evidence of modern mercantile usage was inadmissible to affix the character of negotiability to an instrument not recognized as negotiable by statute, or by that ancient custom of merchants which has been adopted by the common law. The judgment of Mr. Justice Kennedy in the *Bechuanaland Exploration Company* v. *The London Trading Bank, Limited*, 1898, 2 Q. B. 658, seems, however, to show conclusively that this view is not in accordance with the decision of the House of Lords in *Goodwin* v. *Robarts*, 1 Ap. Cases, 476, and that when once a security, whether English or foreign, is universally recognized and treated by the mercantile community of Great Britain as negotiable, the fact of its acceptance as such being recent is no bar to its admission into the category of negotiable securities. See *Edelstein* v. *Schuler*, 1902, 2 K. B. 144.

Bankers are affected or protected in certain cases by special legislation annexing to particular classes of documents incidents usually found in connexion with strictly negotiable instruments. Thus, section 95 of the Bills of Exchange Act, 1882, extends to dividend warrants the provisions of the Act regarding crossed cheques; and sec. 17 of the Revenue Act, 1883, makes the same provisions applicable to "any document issued by a customer of any banker, and intended to enable any person or body corporate to obtain payment from such banker of the sum of money mentioned in such document." In dealing with such documents the banker must always bear in mind that it is only the crossed cheques sections of the Act which are applied by the above-mentioned legislation. Unless the documents are in themselves negotiable, either as being cheques within the terms of the Bills of Exchange Act, or as having acquired negotiability by statute or custom, they remain non-negotiable and even non-transferable instruments, and must be treated as such. The class of document, now so common, in which payment is made conditional on an annexed receipt being signed, dated, and presented with the order for payment, or in which payment is made dependent on presentation within a specified period, are not cheques or negotiable instruments, though included in the above legislation. Bankers, therefore, would not be safe in collecting them for persons other than the actual payee, notwithstanding the crossing.

Garnishee orders.

The rule laid down by the House of Lords in *Rogers* v. *Whiteley*, 1892, A. C. 118, as to the course to be adopted by a banker on whom a garnishee order *nisi* is served in respect of a judgment recovered against his customer, appears to impose a hardship on the latter. The garnishee order binds all debts due or accruing due to the customer to answer the judgment debt. The House of Lords held that however much the balance to the customer's credit exceeded the stated amount of the judgment debt, the banker, after service of the order, was entitled and indeed bound to hold the whole balance, and to dishonour all cheques of the customer presented after that date, whether drawn before the order was served or not. It was suggested in some of the judgments that steps might be taken to modify this result of the process, but up to the present no alteration in the practice has been notified.

Although, as before stated, a banker is entitled to combine several accounts against the customer, he cannot do so in the face of an established course of business by which they are kept separate (*Buckingham* v. *The London and Midland Bank*, 12 *Times* L. R. 70). It is further deducible from this case that a bank is not entitled arbitrarily to close a customer's account when in credit by tendering him the balance, or offering to transfer it to another bank. Provision must at least be made for outstanding cheques, and the practice of referring them to another bank is not an adequate provision, as it involves technical dishonour of the cheques.

Legal evidence.

The Bankers' Books Evidence Act, 1879, was passed to obviate the inconvenience and dislocation of business caused to bankers by their being compellable to produce their books in court, in legal proceedings to which they were not parties. It provides that duly authenticated copies of entries in such books shall be receivable as evidence of such entries, and the matters, accounts, and transactions therein recorded, and that no banker or officer of a bank shall in any legal proceedings, to which the bank is not a party, be compellable to produce books or attend as a witness where such evidence could be supplied under the provisions of the Act unless a judge for special cause so orders. Provision is also made for inspection of bankers' books by parties to any legal proceedings who obtain a judge's order for the purpose. Although the exercise of this latter power is not in terms limited to inspection of the account of one of the parties to the litigation, an order will not be made for the inspection of the account of any other person save in exceptional circumstances, such, for instance, as there being ground for believing that the account, though in another name, is substantially the account of the litigant (*Pollock* v. *Garle*, 1898, 1 Ch. 1; *South Staffordshire Tramways Co.* v. *Ebbsmith*, 1898, 2 Q. B. 669).

Fiduciary accounts.

Banks frequently decline to open accounts under headings denoting that the customer holds the money in a fiduciary capacity, such as that of trustee or executor. But even if an account is so headed, or if the bank is otherwise affected with notice of its being a trust account, the bank is not entitled to raise any question whether cheques drawn on it are drawn for or applied to proper purposes. Presumably, however, a banker would be justified in refusing to honour a cheque drawn on the account, the object of which was to benefit himself, as, for instance, to pay off an ascertained overdraft on the customer's private

account; and a banker will not be allowed to retain any benefit from a payment made in circumstances amounting to privity on his part with the breach of trust (*Gray* v. *Johnston*, L. R. 3 H. of L. 1), as where, for instance, the banker has pressed for the payment of an ascertained overdraft on private account and received a cheque on the trust account for that purpose. The mere fact that money standing to the credit of a trust account was transferred to an overdrawn private account on which no balance had been struck, and for the liquidation of which no application had been made, and, being so transferred, wiped out the overdraft, was held in *Gray* v. *Johnston* not to show any privity on the part of the banker with the breach of trust, and he retained the money so transferred against the beneficiaries.

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(J. R. P.*)

Bankruptcy.—The history of English bankruptcy legislation prior to the year 1869, and the chief features of the Consolidating and Amending Act passed in that year, are briefly set forth in the article on "Bankruptcy" in the ninth edition of this work. The main object of the Act of 1869 was to remedy abuses which had grown up under previous bankruptcy Acts, the effect of which, to adopt the language of Sir Robert Collier, the then Attorney-General, had been to enable a bankrupt to "defraud those to whom he was indebted, and to set them at defiance." Lord Cairns, in introducing the measure in the House of Lords, also expressed the opinion that the large increase which had taken place in the annual insolvency of the country during the preceding years could not "be attributed to depression in trade, but must be traced to the enormous facilities which are given to debtors who wish to be released from their debts on easy terms." It is a curious illustration of the difficulties which have attended bankruptcy legislation in England, that the measure which was passed in 1869 to remedy these defects was described twelve years later by Mr Chamberlain, the President of the Board of Trade, in introducing an Amending Bill, as "the most unsatisfactory and the most unfortunate of the many attempts which had been made to deal with the subject," and as "the object of the almost unanimous condemnation of all classes." This result cannot be regarded as due to any new departure or change of principle in the Act of 1869, which, on the contrary, while it introduced some amendments in the methods of procedure which were apparently well calculated to effect a reform of many of the abuses complained of, followed in the main the lines of the immediately preceding legislation. The failure of the measure was rather the failure of a long-continued line of policy; and the fact that after half a century's experience of legislation, directed by the ablest minds in the legal profession, matters had grown worse instead of better, was calculated to cast serious doubts on the soundness of the principles on which the various bankruptcy Acts from 1825 to 1869 had been based. During this period no less than six measures of first-class importance had received the assent of the Legislature, viz. the Acts of 1825, 1831, 1842, 1849, 1861, and 1869, each of which was a practical acknowledgment of the failure of its predecessor; and the last of these, as already stated, was admitted to be the most unsatisfactory in its results.

Review of English Legislation.

In order to understand the causes of these successive failures, it is necessary to bear in mind the complex character of the considerations which enter into the question. Bankruptcy law was primarily a branch of the criminal law, its object being to punish fraudulent bankrupts, and to compel the surrender of their property for the benefit of creditors, but without releasing the debtor from his obligations. Subsequent legislation introduced the principle of granting relief to the bankrupt with or without the consent of the creditors, where he conformed to the provisions of the bankruptcy law. But the whole of the procedure was conducted by or under the supervision of the court exercising jurisdiction in bankruptcy. On the other hand, the right of creditors to exercise some control over the realization of the debtor's property through an assignee chosen by themselves was recognized at an early date, but this right was also exercised subject to the supervision of the court, which investigated the claims of creditors and determined who were entitled to take part in the proceedings. Provision was also made for the interim protection of the debtor's property by official assignees attached to the court, who took possession until the creditors could be consulted, and under the supervision of the court audited the accounts of the creditor's assignee. So long as this system continued substantial justice was generally secured; the claims of creditors were strictly investigated, and only those who clearly proved their right before a competent court were entitled to take part in the proceedings. The bankrupt was released from his obligations, but only after strict inquiries into his conduct, and under the exercise of judicial discretion. The accounts of assignees were also strictly investigated, and the costs of solicitors and other agents were taxed by officers of the court. But the system was found to be cumbrous, to lead to delay, and too often to the absorption of a large part of the estate in costs, over the incurring of which there was a very ineffective control. Hence arose a demand for larger powers on the part of creditors, and the introduction into the bankruptcy procedure of the system of "arrangements" between the debtor and his creditors, either for the payment of a composition, or for the liquidation of the estate *free from the control of the court*. At first these arrangements were carefully guarded. Under the Act of 1825, a proposal for payment of a composition might be adopted only after the debtor had passed his examination in court, and with the consent of nine-tenths in number and value of his creditors assembled at a meeting. Upon such adoption the bankruptcy proceedings were superseded. Dissenting creditors, however, were not bound by the resolution, but could still take action against the debtor's subsequently acquired property. These powers were not found to be sufficiently elastic, and the Act failed to give public satisfaction. Attempts were made by the Acts of 1831 and 1842 to remedy the defects complained of, by a reconstitution of the Bankruptcy Court and its official system. But these measures also failed, because they were based on the assumption that judicial bodies could exercise effective control over administrative action, a control for which they are naturally unsuited, and which they could only carry out by cumbrous and expensive methods of procedure. Under the Act of 1849 a totally new principle was introduced by the provision that a deed of arrangement executed by six-sevenths of the creditors for £10 and upwards should be binding upon *all* the creditors without any proceedings in or supervision by the court. But the determination of the question who were or were not creditors was practically left to the debtor himself, without any opportunity for testing by independent investigation the claims of those who signed the deed to control the administration of the estate. It is not difficult to see, in the light of subsequent experience, how well calculated this provision was to encourage fraudulent arrangements, and to introduce laxity in the administration of debtors' estates. A modification of the too stringent conditions of the Act of 1825, which would have enabled a bankrupt to pay a composition on his debts, with the consent of a large proportion of his *bonâ-fide* creditors, and subject to the approval of the court, after hearing the objections of dissenting creditors, would doubtless have proved a beneficial reform, but the Act of 1849 proceeded on a very different principle. Instead of reforming, it practically abolished judicial control. By avoiding Scylla it fell into Charybdis. To give *any* majority of creditors the power to release a debtor from all his obligations without full disclosure of his affairs, and without any exercise of judicial discretion or any investigation into the causes of the failure, or the conduct of the debtor, would in any circumstances have been to introduce a new and mischievous principle into legislation. But to give such a power to creditors whose claims were subject to no independent investigation was to invite inevitable confusion and failure. Yet this was the dominating principle of English bankruptcy legislation for nearly thirty-five years. Under the Act of 1861 the evil was aggravated, by reducing the majority required to make a deed of arrangement binding on all the creditors, to a majority in number and three-fourths in value of those whose claims amounted to £10 and upwards. It was these provisions which, according to the highest judicial authorities, enabled bankrupts

Act of 1825.

Acts of 1831 and 1842.

Act of 1849.

Act of 1861.

to defraud their creditors and set them at defiance. Yet, in the legislation which ensued, this fact appears to have been entirely ignored. Under the Act of 1869, which was passed for the avowed purpose of remedying the evils which had arisen, the procedure under a bankruptcy petition was certainly rendered more effective. Meetings of creditors were presided over, and creditors' claims were, for voting purposes, adjudicated upon by the registrar of the court; the bankrupt had to pass a public examination in court, which although chiefly left to the trustee appointed by the creditors, afforded some opportunity for investigation; and the bankrupt could not obtain his discharge without the approval of the court, and in certain circumstances the consent of the creditors. An independent official, the Comptroller in Bankruptcy, was appointed, whose duty it was to examine the accounts of trustees, call them to account for any misfeasance, neglect, or omission, and refer the matter to the court for the exercise of disciplinary powers where necessary. These provisions were well calculated to promote sound administration, but they were, unfortunately, rendered nugatory by provisions relating to what were practically private arrangements on similar lines to those which had rendered previous legislation ineffective. In some respects the evil was aggravated. Deeds of arrangements were nominally abolished, but under sections 125 and 126 of the Act, a debtor was empowered to present a petition to the court for liquidation of his affairs by "arrangement," or for payment of a composition, whereupon a meeting of creditors was summoned from a list furnished by the debtor, and without any judicial investigation of claims, a majority in number and three-fourths in value of those who lodged proofs of debt, and who were present in person or by proxy at the meeting, might by resolution agree to liquidation by arrangement, or to the acceptance of the composition. Such resolution thereupon became binding upon all the creditors, without any act of approval by the court, any judicial examination of the debtor, or any official supervision over the trustee's account. As a debtor was not permitted to present a bankruptcy petition against himself, his only method of procedure was that which thus removed the matter from the supervision and control of the court, and as about nine-tenths of all the proceedings under the Act of 1869 were initiated by debtors, it followed that only about one-tenth was submitted to proper investigation. It is true that the creditors might refuse to assent to the debtor's proposal, and that any creditor for £50 or upwards could present a petition in bankruptcy, but even where this course was adopted, the proceedings under the petition were, as a rule, stayed by the court if the debtor subsequently presented a proposal for liquidation or composition, and the creditor was left to pay the expenses of his petition if the requisite majority voted for the debtor's proposal. So far, therefore, as the Act was concerned, every inducement was held out to the adoption of a course which took the examination of the debtor, the conditions of his discharge, and the audit of the trustee's accounts, out of the control of the court.

Act of 1869

One of the chief reasons why the Acts of 1849, 1861, and 1869 thus proved failures, lies in the obvious fact that the creditors of a particular estate are not, as appears to have been assumed, a homogeneous or organized body capable of acting together in the administration of a bankrupt estate. In the case of a few special and highly organized trades it may be otherwise, but in the great majority of cases the creditors have but little knowledge of each other, or means of organized action, while they have neither the time nor the inclination to investigate the complicated questions which frequently arise, and which are therefore left in the hands of professional trustees or legal agents. But the appointment of trustees under these Acts, instead of being the spontaneous act of the creditors, was frequently due to touting on the part of such agents themselves, or to individual creditors whose interests were not always identical with those of the general body. According to Mr. Robson, the author of a standard work on the subject, the arbitrary powers conferred by the Act of 1861 "led to great abuses, and in many cases creditors were forced to accept a composition, the approval of which had been obtained by a secret understanding between the debtor and favoured creditors, and not unfrequently by the creation of fictitious debts." These evils were greatly aggravated by the decisions of the court relating to proofs on bills of exchange, under which it was held that the holder of a current bill could prove on the bankrupt estate of an endorser, although the bill was not yet due, and the acceptor was perfectly solvent and able to meet it at maturity. Thus in large mercantile failures, bankers and other holders of first-class bills could prove and vote on the estates of their customers, for whom the bills had been discounted, and thus control the entire proceedings, although they had no ultimate interest in the estate. But probably the greatest source of the abuses which arose under the Act of 1869 was the proxy system established by the Act, and by the rules which were subsequently made to carry it out. The introduction of proxies was no doubt intended to give absent creditors an opportunity of expressing their opinions upon any question which might arise. But the system was too often used for the purpose of stifling the views of those who took an independent part in the proceedings. The form of proxy prescribed by the rules contained no limitation of the powers of the proxy holder, and no expression of the opinion of the creditor. It simply appointed the person named in it as "my proxy," and these magic words gave the holder power to act in the creditor's name on all questions that might be raised at any time during the bankruptcy. Hence arose a practice of canvassing for proxies, which were readily given under the influence of plausible representations, such as the holding out of the prospect of a large composition, but which, when once obtained, could be used for any purpose whatsoever except the receipt of a dividend. Thus it frequently happened that the entire proceedings were controlled by professional proxy-holders, in whose hands these documents acquired a marketable value. They were not only used to vote for liquidation by arrangement instead of bankruptcy proceedings, but not infrequently the matter took the form of a bargain between an accountant and a solicitor, under which the former became trustee, and the latter the solicitor in the liquidation, without any provision for control over expenditure, or for any audit of the accounts. Even where a committee of inspection was appointed to exercise functions of control and audit, they too were often appointed by the proxy-holders, and not infrequently shared in the benefits. On the other hand, where the amount of debts represented by the proxy-holder was insufficient to carry the appointment of a trustee and committee, the votes could be sold to swell the chances of some other candidate. Where the debtor opposed these appointments, or refused to assist in carrying them by using such influence as he might possess, he sometimes became a target for the exercise of revenge. His discharge, which under liquidation by arrangement was entirely a matter for the creditors, might be refused indefinitely; and so largely and harshly was this power exercised under the proxy system, especially where it was supposed that the debtor had friends who could be induced to come to his aid, that a special Act of Parliament was passed in 1887, authorizing the court to deal with cases where, under the Act of 1869, a debtor had not been able to obtain a release from his creditors. On the other hand, the complaisant debtor, although he had incurred large obligations in the most reckless manner, often succeeded in stifling investigation and obtaining his release without difficulty as a return for his aid in carrying out the arrangement.

Causes of non-success.

The result of such a system could not be other than a failure. After the Act of 1869 had been in operation for ten years, the Comptroller in Bankruptcy reported that out of 13,000 annual failures in England and Wales, there were only 1000 cases (or about 8 per cent.) "to which the more important provisions of the Act for preventing abuses by insolvent debtors and professional agents applied; the other 12,000

Effect on bankruptcy statistics.

cases (or 92 per cent.) escaping the provisions which refer to the examination and discharge of bankrupts, and to the accounts, charges, and conduct of the agents employed." It is not to be supposed that all the cases in the latter class were marked by the abuses which have been here described. In a large number the proceedings were conducted by agents of high character and standing, and with a due regard to the interests of the creditors. But the facilities for fraudulent and collusive arrangements afforded by the Act, and the want of effective control over administration, inevitably tended to lower the morale of the latter, and to throw it into the hands of the less scrupulous members of the profession. The demand for reform, therefore, came from all classes of the business community. No fewer than thirteen bills dealing with the subject were introduced into the House of Commons during the ten years succeeding 1869. At length in 1879 a memorial, which was authoritatively described as "one of the most influential memorials ever presented to any Government," was forwarded to the Prime Minister by a large body of bankers and merchants in the City of London. The matter was then referred to the President of the Board of Trade (Mr Chamberlain), who made exhaustive inquiries, and in 1881 introduced a measure which, with some amendments, finally became law under the title of the "Bankruptcy Act, 1883." Hitherto the question had been dealt with as one of legal procedure; it was now treated as an act of commercial legislation, the main object of which, while providing by carefully framed regulations for the equitable distribution of a debtor's assets, was to promote and enforce the principles of commercial morality in the general interests of the trading community. One of the chief features of the Act of 1883 is the separation which it has effected between the judicial and the administrative functions which had previously been exercised by the court, and the transfer of the latter to the Board of Trade as a public department of the state directly responsible to Parliament. Under the powers conferred by the Act a new department was subsequently created, under the title of the Bankruptcy Department of the Board of Trade, with an officer at its head called the Inspector-General in Bankruptcy. This department exercises, under the direction of the Board of Trade, a general supervision over all the administrative work arising under the Act. It has extensive powers of control over the appointment of trustees, and conducts an audit of their accounts; and it may, subject to appeal to the court, remove them from office for misconduct, neglect, or unfitness. A report upon the proceedings under the Act is annually presented to Parliament by the Board of Trade, and although the department is practically self-supporting, a nominal vote is each year placed upon the public Estimates, thus bringing the administration under direct parliamentary criticism and control. The Act also provides for the appointment and removal by the Board of Trade of a body of officers entitled Official Receivers, with certain prescribed duties having relation both to the conduct of bankrupts and to the administration of their estates, including the interim management of the latter until the creditors can be consulted. These officers act in their respective districts under the general authority and directions of the Board of Trade, being also clothed with the status of officers of the courts to which they are attached. While effecting this supervision and control by a public department directly responsible to Parliament, the main objects of the measure were to secure—(1) An independent and public investigation of the debtor's conduct; (2) The punishment of commercial misconduct and fraud in the interests of public morality; (3) The summary and inexpensive administration of small estates where the assets do not exceed £300 by the Official Receiver, unless a majority in number and three-fourths in value of the creditors voting resolve to appoint a trustee; (4) Full control in other cases by a majority in value, over the appointment of a trustee and a committee of inspection; (5) Strict investigation of proofs of debt, with regulations as to proxies, and votes of creditors; (6) An independent audit and general supervision of the proceedings, and control of the funds in all cases. Besides amending and consolidating previous bankruptcy legislation, the measure also contains special provisions for the administration under bankruptcy law of the estates of persons dying insolvent (§ 125); and for enabling county courts to make administration orders for payment by instalments in lieu of committal to prison, in the case of judgment debtors whose total indebtedness does not exceed £50 (§ 122). It also provides for the getting in and administration by the Board of Trade of unclaimed dividends and undistributed balances on estates wound up under previous Bankruptcy Acts (§ 162). Lastly, it amends the procedure under the Debtors Act of 1869, dealing with criminal offences, by enacting that when the court orders a prosecution of any person for an offence under that Act, it shall be the duty of the director of public prosecutions to institute and carry on the prosecution.

Act of 1883.

An Amending Act, under the title of the "Bankruptcy Act, 1890" (53 and 54 Vict. c. 71), was passed in that year, mainly with the view of supplementing and strengthening some of the provisions of the Act of 1883, more particularly with regard to the conditions under which a bankrupt should be discharged, and requiring that schemes of arrangement or composition should be approved by the court. It also dealt with a variety of matters of detail which experience had shown to require amendment, with the view of more fully carrying out the intentions of the Legislature as embodied in the principal Act. These two Acts are to be construed as one, and may be cited collectively as the Bankruptcy Acts 1883 and 1890. They are further supplemented by a large body of general rules made by the Lord Chancellor with the concurrence of the President of the Board of Trade, which may be added to, revoked, or altered from time to time by the same authority. These rules are laid before Parliament and have the force of law.

Act of 1890.

Besides these general Acts, various measures dealing with special interests connected with bankruptcy procedure have from time to time been passed since 1883, the chief of which are as follow, viz., the Bankruptcy Appeals (County Courts) Act, 1884; the Preferential Payments in Bankruptcy Act, 1888, regulating the priority of the claims of workmen and clerks, &c., for wages and salaries; and the Bankruptcy (Discharge and Closure) Act, 1887, dealing with unclosed bankruptcies under previous Acts.

Special Acts.

It would be out of place in this article to attempt to answer the question how far this latest legislation has solved the difficult problems which prior to 1883 were found so intractable. The annual reports of the Board of Trade, which are accompanied by elaborate tables of statistics, and by copious illustrations both of the working of the system and of the characteristic features and causes of current insolvency, are published as parliamentary papers, and may be usefully consulted by those interested in the subject. It appears from these reports that the total number of insolvencies dealt with under the Bankruptcy Acts during the ten years ending 31st December 1900, was 43,895, involving estimated liabilities amounting

Results of legislation.

to £69,029,795, and estimated assets amounting to £25,667,785. It may also be pointed out that, according to the official figures, the cost of bankruptcy administration under the present system has very considerably decreased as compared with that under the Act of 1869. Estates are also closed at much shorter intervals, and, what is more important from a public point of view, it appears that while the estimated liabilities of bankrupt estates during the ten years ending 1883 amounted on an average to £22,380,000 per annum, the estimated liabilities during the ten years ending 1900 only averaged £6,902,979 per annum. But during the latter period there was a further estimated annual liability of £4,986,399 on private arrangements entered into outside of the Bankruptcy Act by insolvent debtors. There are no means of ascertaining the corresponding amount of liabilities on private arrangements outside of the Bankruptcy Acts prior to 1883, and therefore a complete comparison is impossible; but it is evident that on any method of computation there has been a very great diminution in the trading insolvency of England and Wales, while it is also clear as a matter of general knowledge in commercial circles, that a great decrease in the proportion of fraudulent trade and reckless speculation has been a marked feature of private trading during the period in question.

Revenue and expenditure.

The cost of bankruptcy administration under the Act is provided for: (1) by fees charged to bankrupt estates, which for the year ended 31st March 1900 amounted to £111,874; (2) by interest on balances at the credit of such estates with the bankruptcy estates account, a portion of which invested in public securities yielded for the same year an income of £20,400; and (3) by interest on unclaimed funds at the credit of estates under former Bankruptcy Acts, which yielded £37,746; the total revenue of the department for the year 1900 being thus £170,020. Out of this were paid the salaries of all the officers of the department, including the official receivers; the remuneration due in respect of bankruptcy services to the county court registrars; pensions, &c., payable to retired officers under the present and previous Bankruptcy Acts; cost of bankruptcy prosecutions; and rents, stationery, travelling, and other incidental expenses; the total expenditure amounting for the year ended March 1900 to £160,901. The system is thus self-supporting, and involves no charge upon the tax-payers of the country. It has been objected that inasmuch as the Act professes to be based on the principle of enforcing commercial morality in the interests of the general community, the cost of administering it should not be charged entirely to the bankruptcy estates concerned. But when it is considered that the revenue of the department, to the extent of £37,746, is derived from funds to which estates administered under the present Act have contributed nothing, this objection does not appear to be well founded.

Summary of procedure.

For the convenience of readers who may require more detailed information, the accompanying summary of the leading provisions of the law relating to bankruptcy procedure is submitted. It must be borne in mind, however, that the subject is in some of its branches extremely intricate, and that both the law and the procedure are being constantly affected by a considerable body of judicial interpretation. A reference to the latest text-books or competent professional advice will always be advisable for those who have the misfortune to be practically interested either as debtors or as creditors in bankruptcy proceedings.

The "Deeds of Arrangement Act, 1887," although not falling strictly within the scope of the bankruptcy law, may also, in consequence of its important bearing upon the question of insolvency in England and Wales, be here noticed. It has been pointed out that, under the Bankruptcy Acts of 1849 and 1861, non-official arrangements by deed between a debtor and the general body of his creditors were not only officially recognized, but were in certain circumstances made binding on all the creditors, including those who refused to assent to them. Under the Act of 1869, although such deeds were no longer recognized or made binding on non-assenting creditors, the proceedings under the "liquidation by arrangement" and "composition" clauses were practically private arrangements by resolution instead of deed, and were proved by experience to be open to the same abuses. It has also been shown that under the Act of 1883 no arrangements either by deed or by resolution have any force against dissenting creditors, unless confirmed after full investigation and approval by the bankruptcy courts. Private arrangements, therefore, cease to form any part of the bankruptcy system. But they are, nevertheless, binding as contracts between the debtor and such creditors as assent to them. Being, however, in the nature of assignments of the debtor's property, they are either deemed fraudulent if the benefit of the assignment is limited to a portion of the creditors, or, if it is extended to all they become acts of bankruptcy, and, like any other voluntary assignment, are liable to be invalidated if made within three months prior to the petition on which a receiving order is made against the debtor. Treated as voluntary assignments, which are not binding on those who do not assent to them, such arrangements, where honestly entered into and carried out by capable administration, in many cases form a useful and expeditious method of liquidating a debtor's affairs, and where the debtor's insolvency has been brought about without any gross misconduct they will probably always be largely resorted to. The danger attending them is that even in cases where the debtor has been guilty of misconduct, a private arrangement may be used to screen his conduct from investigation, while in many cases it may be made the medium for the concealment of fraudulent preferences. The absence of any independent audit of the trustees' accounts may also encourage or conceal irregularities in administration. Previous to 1887, however, much inconvenience arose from the fact that the execution of these private arrangements was frequently kept secret, and fresh credit was obtained by the debtor without any opportunity being afforded for the new creditors becoming acquainted with the fact that they were dealing with an insolvent person, and that in many cases they were simply supplying the means for meeting past obligations in respect of which the debtor had already committed default. The "Deeds of Arrangement Act, 1887," was therefore passed to compel the disclosure of such arrangements, by declaring them void unless registered within seven days after the first execution by the debtor or by any creditor. Registration is effected by lodging with the Registrar of Bills of Sale at the central office of the supreme court a true copy of the deed, and of every inventory and schedule attached thereto, together with an affidavit by the debtor, stating the total estimated amount of property and liabilities, the total amount of composition if any, and the names and addresses of the creditors. Where the debtor's residence or place of business is outside the London bankruptcy district, the registrar is required to forward a copy of the deed to the registrar of the county court of the district where the debtor's residence or place of business is situated. Both the central and the local registers are open to public inspection on payment of a small fee, and general publicity is secured by the action of various

Deeds of arrangement.

trade agencies, which make a practice of extracting and publishing the information for the benefit of those interested. By section 25 of the Bankruptcy Act, 1890, every trustee under a deed of arrangement is required to transmit to the Board of Trade within thirty days of the 1st of January in each year an account of his receipts and payments, and such accounts are open to the inspection of any creditor on payment of a small fee. The registrar is also required to make periodical returns of the deeds thus registered to the Board of Trade, in order that a report of proceedings under the Deeds of Arrangement Act may be included in the annual report which the department is required to make on proceedings under the Bankruptcy Acts. Full statistics of such proceedings are accordingly included in these reports, from which it appears that during the ten years ended 31st December 1900 the total number of registered deeds of arrangement was 33,688, with estimated liabilities amounting to £49,863,989, and estimated assets to £25,673,159.

Summary of Bankruptcy Procedure.

Subject to certain special provisions in the case of what are termed "small bankruptcies" (see below), the following summary sets forth the leading provisions of the various acts and rules relating to bankruptcy administration grouped under convenient heads to facilitate reference. In some cases the effect of legal decisions has been embodied in the summary.

Preliminary Proceedings.

Petition and Receiving Order.—Any court exercising bankruptcy jurisdiction in the district in which he resides or carries on business in England or Wales may make a receiving order against a debtor, whether a trader or not, either on his own petition or on that of a creditor or creditors whose claims aggregate not less than £50. In the case of a creditor's petition proof must be given of the debt, and of the commission of an act of bankruptcy within three months preceding the date of the petition. An act of bankruptcy is committed if the debtor fails to satisfy the creditor's claim upon a bankruptcy notice; if he makes an assignment for the benefit of his creditors generally; if he absconds or keeps house; if he gives notice of suspension of payments; if his goods are sold or seized under execution; if he files in court a declaration of inability to pay his debts; or if he grants a fraudulent preference or conveyance. These acts are here enumerated in the order in which they most frequently occur in practice.

Object and Effect of Receiving Order.—The object of the order is to protect the debtor's property until the first meeting of creditors, and to bring the debtor and his affairs within the jurisdiction of the court. Its effect is to stay all separate action against the debtor, and to constitute the Official Receiver attached to the court receiver of the debtor's property, although the legal title still remains in the debtor. Where there is an estate or business to be managed the Official Receiver may appoint a special manager, who receives such remuneration as the creditors, or failing them the Board of Trade, may determine. As a consequence of the order the following obligations are imposed upon the debtor:—He must make out and submit to the Official Receiver within a prescribed period a statement of his affairs, containing the names and addresses of his creditors, the amount of their claims and the securities held by them, and the nature and value of his assets; and accounting for his deficiency. Any material omission or false statement of his losses or expenses is a misdemeanour under the Debtors Act, unless he can prove that he had no intention to defraud. The statement is open to the inspection of creditors. He must also in every case submit to a public examination in court, in which the Official Receiver, the trustee, and any creditor who has proved his debt may take part. His evidence may be used against him. He may further be specially examined by the court at any time with reference to his dealings or property. He must attend the first meeting of creditors, wait upon the Official Receiver, trustee, and special manager, and give all necessary information, and generally do all acts which may reasonably be required of him with the view of securing a full investigation of his affairs. He may be arrested if there is reasonable ground for believing that he is about to abscond, destroy papers, or remove goods, or if he fails without good cause to attend any examination ordered by the court. The court may also for a period of three months order his letters to be readdressed by the Post Office to the Official Receiver or trustee. With regard to persons other than the debtor, any person capable of giving information respecting the debtor, his dealings or property, may be examined by the court, and a summary order may be made against such person for delivery of any property belonging to the debtor.

First Meeting of Creditors.

This meeting is summoned by the Official Receiver, notice being given in the *London Gazette* and in a local paper, and sent by post to each creditor. A summary of the statement of affairs should accompany the notice, with any observations by the Official Receiver which he may think fit to make. The object of the meeting is to decide whether any proposal for payment of a composition or for a scheme of arrangement submitted by the debtor is to be entertained, or whether an application should be made to the court to adjudicate the debtor bankrupt. In the latter case the meeting may by an ordinary resolution appoint a trustee with or without a committee of inspection. It may also give any directions as to the administration of the estate. The meeting should be held at the place most convenient for the majority of the creditors. It is presided over by the Official Receiver or his deputy, who, subject to appeal to the court, admits or rejects proofs for the purpose of voting. For the transaction of business three creditors qualified to vote, or all the creditors if fewer than three, must be present or represented. Only persons who have proved their debts are entitled to vote, and detailed regulations respecting proofs and the valuation of securities are laid down in the first and second schedules to the Act of 1883. One of the chief alterations in the law on this point is the condition imposed on creditors on bills of exchange to deduct from their claims the value of the liability of prior obligants before voting, thus cancelling the power of controlling the proceedings previously possessed by persons who had no real interest in the estate. Votes may be given in person or by proxy, and stringent regulations are laid down with the view of preventing the abuse of proxies. General proxies entitling the holder to exercise all the powers which the creditor could exercise if present, may be given to the Official Receiver, or to any person in the regular employment of the creditor. Special proxies may be given to any person to vote for specified resolutions, or for the appointment of specified persons as trustee and committee. Only official forms can be used, and the blanks must be filled up in the handwriting of the creditor or some person in his regular employment, including the authorized agent of a creditor resident abroad. A proxy must be lodged with the Official Receiver not later than four o'clock on the day before the meeting or adjourned meeting at which it is to be used. Resolutions are ordinary, special, or extraordinary. An ordinary resolution is carried by a majority in value of the creditors voting; a special resolution by a majority in number and three-fourths in value of such creditors. The only instance of a resolution other than these is that required for the approval of a composition or scheme which requires a majority in number and three-fourths in value of all the creditors who have proved. The majority of questions arising at a meeting are decided by an ordinary resolution.

Adjudication.

If the creditors so resolve, or if a composition or scheme of arrangement is not proposed by the debtor, or entertained by the creditors, or if entertained, is not approved by the court, or if without reasonable excuse the debtor fails to furnish a proper statement of his affairs, or if his public examination is adjourned *sine die*, the court adjudicates the debtor bankrupt, and thereupon his property vests in a trustee, and, subject to the payment of the costs and fees of administration, is divisible among his creditors, until all his debts are paid in full with interest at the rate of four per cent. per annum.

Effect on Bankrupt.—The bankrupt is bound to aid the trustee in his administration, and if he wilfully fails to deliver up any part of his property he is guilty of contempt of court. He is also liable to criminal prosecution under the Debtors Act, if with intent to defraud he conceals or removes property to the value of £10 or upwards; or if he fails to deliver to the trustee all his property, books, documents, etc.; or if he knowingly permits false debts to be proved on his estate without disclosure; or mutilates, falsifies, destroys, or parts with books or accounts; or attempts to account for his property by fictitious losses; or if within four months next before presentation of a bankruptcy petition, he obtains property on credit by false representation; or pledges or disposes of, otherwise than in the ordinary way of his trade, any property which has not been paid for; or by misrepresentation obtains the assent of his creditors to any agreement with reference to his affairs. He is also, under the Act of 1883, guilty of misdemeanour if before his discharge he obtains credit for more than £20 from any person without informing such person that he is an undischarged bankrupt. It is the duty of the Official Receiver to report any such facts to the court, and if the court is satisfied that there is a reasonable probability of conviction, it is required to order a prosecution which is then conducted by the Director of Public Prosecutions.

Disqualifications.—A bankrupt cannot during his bankruptcy, or until five years after his discharge, unless the bankruptcy is annulled, or he obtains his discharge with a certificate by the court that the bankruptcy was caused by misfortune without misconduct, act as a member of the Legislature, or as a justice of the peace, mayor, alderman, councillor, guardian or overseer of the poor, member of a sanitary authority, school, highway, or burial board, or select vestry in any part of the United Kinghom.

Annulment.—An order of adjudication may be annulled if the court is of opinion that it should not have been made, or that the bankrupt's debts are paid in full, or if a composition or scheme of arrangement is approved by the court after adjudication.

Discharge.—The court may also at any time after the conclusion of the bankrupt's public examination, and after hearing the Official Receiver, the trustee, and any creditor, to all of whom previous notice of the application must be given, grant the bankrupt a discharge either absolutely or under conditions, but subject to the following qualifications, viz.: (1) If the bankrupt has committed a criminal offence connected with the bankruptcy, the application must be refused unless for special reasons the court determines otherwise. (2) If the assets are not equal in value to ten shillings in the pound of the unsecured liabilities (unless the bankrupt can show that he is not responsible); or if proper books have not been kept; or if the bankrupt has traded after knowledge of insolvency; or has contracted debts without reasonable probability of payment; or failed to account for his deficiency; or contributed to the bankruptcy by rash speculation, gambling, culpable neglect, or by unjustifiable expenses; or has taken or defended legal proceedings on frivolous grounds; or has within three months preceding the receiving order given an undue preference; or has increased his liabilities with the view of making his assets equal to ten shillings in the pound; or has previously been bankrupt, or made an arrangement with creditors; or has been guilty of any fraud or fraudulent breach of trust; then the court shall, on proof of any of these facts, either (*a*) refuse the discharge, or (*b*) suspend it for a period of not less than two years, or until a dividend of not less than ten shillings in the pound has been paid; or (*c*) qualify the order by the condition that judgment is entered up against the bankrupt for payment of any unpaid balance of his debts, or any part of such balance out of his future earnings or property. The bankrupt may, however, after two years apply to the court to modify the conditions if he is unable to comply with them. An order of discharge releases the debtor from all his obligations, except debts due to the Crown, and other obligations of a public character which can only be discharged with the consent of the Treasury, debts incurred by fraud, and judgment debts in an action for seduction or as a co-respondent in a matrimonial suit or under an affiliation order, which are only released to such extent and subject to such conditions as the court may expressly order. The release of the bankrupt does not operate as a release of any partner of or co-obligant with him. Neither does it release the bankrupt from liability to criminal prosecution.

Composition or Scheme of Arrangement.

After a receiving order has been made the debtor may submit a proposal for the payment of a composition, or for the liquidation of his affairs, by a trustee or otherwise, without adjudication. The proposal must be lodged with the Official Receiver in sufficient time to allow notice, together with a report by that officer, to be sent to the creditors before the meeting is held at which it is to be considered. If the proposal is entertained at the meeting by a majority in number and three-fourths in value of all the creditors who have proved their debts, and if it is thereafter approved by the court, it becomes binding upon all creditors who would be bound by an order of discharge had the debtor been adjudicated bankrupt. A similar proposal may be made after adjudication, and if entertained by the creditors and approved by the court, the adjudication may be annulled. The debtor's release will be subject to the terms of the scheme, but his future acquired property will not pass to the creditors unless there is an express stipulation to that effect. If default is made in carrying out the scheme, or if it is found that it cannot proceed without injustice or undue delay, the court may at any time adjudicate the debtor bankrupt, in which case the scheme will fall to the ground, except in respect of past transactions under it. The approval of a composition or scheme does not release the debtor from his liabilities under the criminal law, nor from the necessity of undergoing a public examination which must, in fact, be held and concluded before the approval of the court is applied for. Also before such approval is given a report must be filed by the Official Receiver upon its terms and on the conduct of the debtor, and the court must be satisfied after hearing that officer and any creditor, that the proposal is reasonable and calculated to benefit the creditors, and that no criminal offences connected with the bankruptcy have been committed by the debtor. Further, if any fact is proved which would have prevented the debtor from obtaining an absolute or unconditional order of discharge had he been adjudged bankrupt, the composition or scheme cannot be approved unless it provides reasonable security for the payment of not less than seven shillings and sixpence in the pound on all the unsecured debts. Where a trustee is appointed to carry out the composition or scheme, all the provisions of the Act with reference to the remuneration of the trustee, the custody of funds, the audit of his accounts, and the control exercised by the Board of Trade, apply in the same manner as they would under an adjudication. Further, the provisions relating to the administration of property, proof of debts, dividends, &c., will also apply, so far as the nature of the case and the terms of the arrangement admit.

Property divisible among the Creditors.

No part of the law of bankruptcy is more intricate, or has been the subject of more litigation than this, and any detailed view of the effect of legal decisions can only be gathered by a perusal of the cases; but the following general principles may be stated:—The term "property" includes not only property of which the bankrupt is the true owner, but property in his possession, order, or disposition in his trade or business with the consent of the true owner, in such circumstances that he is the reputed owner thereof. The application of the doctrine of reputed ownership has been considerably restricted in recent years by the growth of alleged trade customs, in accordance with which property is frequently lent under a contract of "hire and purchase," or otherwise; and by the decisions of the courts that where such custom is sufficiently proved the doctrine does not apply. Further, the trustee's title not only includes property in the actual possession of the bankrupt, but relates back to the date of the first act of bankruptcy committed by him within the three months preceding the presentation of the bankruptcy petition, and thus invalidates all payments and assignments to creditors made during that period with knowledge on the part of the creditor or assignee of the commission of the act of bankruptcy. In such cases the trustee may, therefore, require the money or property to be restored to the estate. And even where no prior act of bankruptcy is proved, any payment made to a creditor with the view of giving such creditor a preference over the other creditors, within the three months preceding the presentation of the petition on which the payer is made bankrupt, is rendered void as against his trustee. Settlements of property within the two years preceding the bankruptcy, unless made before and in consideration of marriage, or made in good faith for valuable consideration, are also void, as are similar settlements within ten years, unless it is proved that the settlor was (independently of the settled property) solvent at the date of the settlement, and that the interest in the property passed to the trustees on the execution of the deed. The same rule applies to covenants to settle in consideration of marriage future acquired property in which the debtor had no interest at the date of the marriage (other than property acquired by the bankrupt through his wife), if such property is not actually transferred before the bankruptcy. Executions by a creditor not completed at the date of the receiving order are also void, and the proceeds of an execution in the hands of the sheriff must, with certain exceptions, and subject to deduction of costs, be handed over to the trustee. But all property held by the bankrupt on trust, and tools of trade, wearing apparel and bedding to a total value not exceeding £20, are excluded from the property divisible among the creditors. With respect to property acquired by the bankrupt, whether by gift or legacy, or consisting of accumulations of business or other profits after the commencement of the bankruptcy, and before he obtains his discharge, the trustee's title also prevails; but *bond-fide* transactions by the debtor for value, other than transactions relating to freehold property, appear to be valid. Where the bankrupt is a beneficed clergyman the trustee may, subject to certain provisions for the due discharge of the duties of the office, apply for the sequestration of the profits of the benefice; and where he is in receipt of a salary, income, or pension, etc., the court may order any part thereof to be paid to the trustee, but where he is an officer of the army, navy, or civil service, such order is only to be made with the consent of the chief of the department concerned

Claims of Creditors and Dividends.

In the distribution of the debtor's property certain claims are entitled to priority over others. Thus the landlord, although not entitled to a preference out of the funds in the hands of the trustee, can distrain for unpaid rent on the goods and effects of the debtor remaining on the landlord's premises, but where the distraint is levied after the commencement of the bankruptcy this right is limited by the Act of 1890 to six months' rent due before adjudication, the remainder of his claim ranking for dividend with the claims of other creditors. Various gas and water companies have also statutory powers of distraint under special Acts, but the policy of recent legislation has been to discourage any extension of such privileges. Where the bankrupt holds an office of trust in any

savings bank or friendly society, any balance in his hands due to such bank or society has been held under the Acts relating to these bodies to be payable in preference to any other claim against the estate. Other preferential claims are regulated by the Bankruptcy Acts and by the Preferential Payments in Bankruptcy Act of 1888, and include taxes, parochial and other local rates for not more than one year, wages and salaries for four months, but not exceeding £50 [limited in the case of ordinary labourers and workmen to two months' wages not exceeding £25], and agricultural labourers' claims not exceeding one year's wages, if hired by special contract for payment of a lump sum at the end of a year. These claims are entitled to preference not only over funds in the hands of the trustee, but also over the proceeds of any distraint levied by the landlord within the three months prior to the receiving order, the latter in that case becoming a preferred creditor for the amount so paid. Articled clerks and apprentices may also be allowed repayment of a proportion of the premium on their unexpired agreements. On the other hand, usual trade discounts (exceeding 5 per cent.) must be deducted from traders' proofs, and the following claims are postponed until the general creditors are paid in full, viz., claims by a married woman for loans to the husband for the purposes of his business, claims for loans advanced to any person in business at a rate of interest varying with the profits, and claims for interest in excess of 5 per cent. per annum. Subject to these exceptions all debts proved in the bankruptcy must be paid *pari passu*. Any surplus after payment of 20s. in the pound and interest at the rate of 4 per cent. per annum, from the date of the receiving order, is payable to the bankrupt.

Proofs of Debt.—All claims and liabilities present or future, certain or contingent, arising out of obligations incurred before the date of the receiving order are provable in the bankruptcy, an estimate of the liability in the case of contingent debts being made by the trustee subject to appeal to the court. But demands in the nature of unliquidated damages arising otherwise than by reason of a contract, promise, or breach of trust, are not provable. A secured creditor if he proves must either surrender his security, or value the security and prove for the balance; and the trustee can thereupon, subject to the creditor's power in certain circumstances to amend the valuation, take over the security by paying the amount of the valuation, or may require it to be realised. He may be required by the creditor to elect which of these courses he will adopt, failing which the equity of redemption will vest in the creditor. For further regulations as to proofs, the time within which they must be lodged for voting and for dividend, and the manner of dealing with them, reference should be made to the first and second schedules of the Act of 1883 and the rules connected therewith.

Dividends.—After payment of costs of administration and preferential debts, it is the duty of the trustee to distribute the estate with all convenient speed,—the first dividend within four months after the first meeting of creditors, and subsequent dividends at intervals of not more then six months, but the declaration may be postponed for sufficient reason by the committee of inspection. Notice of the intention to declare a dividend is gazetted and sent to each creditor mentioned in the bankrupt's statement of affairs who has not proved. The notice should state the last day for proving in order to participate in the distribution, and should be given not more than two months before the declaration. When the dividend is declared, notice of the amount due, and where the same is payable, is sent to each creditor who has proved, with a statement showing particulars of the estate. And provision must be made for creditors at a distance, who have not had time to prove, for disputed claims, and for debts the subject of claims not yet determined. Creditors who fail to prove before the declaration of a dividend are entitled to receive their dividends on proving before any subsequent dividend is declared, but cannot disturb the distribution of any dividend already declared. Before distributing a final dividend notice is sent to every creditor whose claim has been notified to the trustee, but not finally established, with an intimation that unless so established within a specified period he will be excluded from participation in the estate. In the case of a bankrupt firm the joint creditors are not entitled to receive a dividend out of the separate property of the bankrupts until all the separate creditors are paid in full.

Trustee's Administration.

While the interim preservation and management of the estate is conducted by or under the direct supervision of officers appointed by and responsible to the Board of Trade, the ultimate realization and distribution of the assets devolve upon the trustee appointed by the creditors. But besides acting as receiver prior to the first meeting of creditors, the Official Receiver also becomes trustee by operation of law on the making of an order of adjudication. He vacates the office when a trustee is appointed by the creditors, and certified by the Board of Trade, but again becomes trustee on the creditors' trustee being released, dying, resigning, or being removed from office. As the bankrupt's property vests in the trustee for the time being, and passes from trustee to trustee by operation of law, and without any formal act of conveyance, the continuity of the office is thus secured.

Appointment of Trustee.—A trustee may be appointed by a majority in value of the creditors voting, at the first or any subsequent meeting, or the appointment may be left to the committee of inspection. In either case the appointment is subject to confirmation by the Board of Trade, who may object on the ground that the creditors have not acted in good faith in the interests of the general body, or that the person appointed is not fit to act, or occupies such a position in relation to the debtor, to any creditor, or to the estate, as makes it difficult for him to act with impartiality, or that in any previous case he has been removed from office for misconduct or for failure without good cause to render his accounts for audit. An appeal from such objection to the High Court lies at the instance of a majority in value of the creditors, but in the absence of an appeal it is fatal to the appointment. Before being confirmed, the trustee-elect must also furnish security to the satisfaction of the Board of Trade, and such security must be kept up to the amount originally fixed, or to such lesser amount as that department may require, throughout the tenure of the trusteeship, failing which the trustee is liable to be removed from office. Where the creditors fail to appoint a trustee, the Board of Trade may do so, but such appointment may at any time be superseded by the creditors.

Removal.—The trustee may be removed by the creditors at a meeting summoned for the purpose without reason assigned, or by the Board of Trade for misconduct, or for incapacity or failure to perform his duties, or on either of the other personal grounds of objection to which the appointment is open. But the removal is in like manner subject to appeal at the instance of creditors. If a receiving order is made against a trustee he thereby vacates office. He may also, with the consent of a general meeting of creditors, resign, but his resignation does not operate as a release from his liability to account for his administration.

Powers and Duties.—The trustee is required to take immediate possession of the bankrupt's property, including deeds, books, and accounts, and has the powers of a receiver in the High Court for the purpose of enforcing delivery. After payment of the costs of administration it is his duty to distribute the estate in dividends as speedily as possible. He may also, and with the sanction of the committee, or where there is none, with that of the Board of Trade, carry on the business so far as is necessary to a beneficial winding up, institute or defend legal proceedings, employ a solicitor to do any business previously sanctioned by the same authority, compromise debts and claims, raise money on mortgage, sell property on credit, or divide the estate where practicable among the creditors in its existing form. He may, without special sanction, but subject to any directions which may be given by the creditors in general meeting, or failing them, by the committee, sell the property or any part of it for cash, including business goodwill and book debts, and either by public auction or private treaty, and generally exercise all the powers which the bankrupt might before adjudication have exercised in relation to the property, or which are by the Bankruptcy Act conferred on the trustee.

Where any part of the property is held subject to onerous obligations, such as the payment of rent, etc., the trustee may disclaim the same, subject in certain cases to the leave of the court, and the disclaimer operates to determine all interest in or liability in respect of the property on the part of the estate. The trustee is required to keep a Record book (which is commenced by the Official Receiver), containing minutes of the proceedings in the bankruptcy, and a Cash book in the prescribed form, in which all receipts and payments by him must be entered. All monies received must forthwith be paid into an account at the Bank of England, entitled the "Bankruptcy Estates Account," which is under the control of the Board of Trade, unless where in special circumstances the sanction of that department is obtained to the opening of a local banking account, but in no circumstances must estate monies be paid to the trustee's private account. When monies are required for the purpose of the estate, special cheques or money orders are issued by the Board of Trade on the application of the trustee.

Control over Trustee.—In his administration of the estate the trustee is subject to control by the committee of inspection, the creditors, the court, and the Board of Trade. The committee is appointed by the creditors, and must consist of not more than five nor less than three creditors, or authorized representatives of creditors. It acts by a majority present at a meeting, and should be convened once a month unless it otherwise directs. If no committee is appointed, the Board of Trade may give any direction or permission which might have been given by a committee. Directions given by the committee, if not inconsistent with the provisions of the Act, are binding on the trustee, unless contrary to or overruled by those of the creditors or of the court. The Official Receiver or trustee may summon a meeting of the creditors at any

time to ascertain their wishes, and must do so when so required by one-sixth in value of the creditors, or when directed by the court. The Board of Trade may also direct the Official Receiver to summon a meeting for the purpose of reviewing any act done by the trustee or any resolution of the committee of inspection. Further, the trustee may apply to the court for directions in any particular matter, and the court may also, on the application of any person aggrieved, reverse or modify any act of the trustee, or make such order as it deems just. The directions of the court override those of the creditors. The Board of Trade is required to take general cognizance of the conduct of trustees, to inquire into any complaints by creditors, and in the event of any trustee not faithfully performing his duties, to take such action, including the power of removal, as may be expedient. It may also direct a local investigation of the trustee's books and accounts, and may require him to answer any inquiries, or may apply to the court to examine him on oath. If any loss has arisen to the estate from any misfeasance, neglect, or omission of the trustee, it may require him to make it good. The orders of the Board of Trade under the powers conferred by the Act may be enforced by the court by committal of the trustee or otherwise.

Audit of Accounts.—The trustee's accounts must be audited by the committee of inspection not less than once in every three months; and once in every six months, as well as at the close of the administration, the record and cash books must also be submitted with the vouchers, and the committee's certificate of audit to the Board of Trade for final audit. If it appears that the trustee has retained more than £50 in hand for more than ten days without a satisfactory explanation, he may be removed from office, surcharged with interest at the rate of 20 per cent. per annum, and lose all claim to remuneration.

Remuneration.—The trustee's remuneration is fixed by the creditors, or by the committee if so authorized by them. It must be in the nature of a percentage on the amount of the realizations and on the dividends. If one-fourth of the creditors in number or value dissent from the resolution, or if the bankrupt satisfies the Board of Trade that the remuneration is excessive, the Board may review the same and fix the remuneration. A trustee may not receive any remuneration for services rendered in any other capacity, *e.g.*, as solicitor, auctioneer, etc. beyond that voted to him as trustee; nor may he share his remuneration with the bankrupt, the solicitor, or other person employed about the bankruptcy; or receive from any person any gift, or other pecuniary or personal benefit in connection therewith.

Costs.—A trustee receiving remuneration is not allowed the costs of any other person in respect of duties which ought to be performed by himself. All bills of solicitors and other agents employed must be taxed before payment, as being in accordance with the prescribed scales of costs; and the taxing master must satisfy himself that the employment has been properly authorized before the work was done. All bills of costs must be delivered to the trustee within seven days of the request for the same, otherwise the estate may be distributed without regard to such costs.

Release.—When the property, so far as it is capable of realization, has been realized and distributed, the trustee must apply to the Board of Trade for his release, forwarding to each creditor a notice of his having done so, together with a copy of his final accounts, and the Board of Trade, after preparing and considering a report on the same, and the objections of any person interested, may, subject to appeal to the High Court, grant or withhold the release. If a release is withheld, the court may, on the application of any person interested, make such order against the trustee as it thinks just. The release when granted operates as a removal from office, and thereupon the Official Receiver again becomes trustee, and is thus in a position, even after the nominal close of the bankruptcy, to deal with any circumstances which may arise, or which have not been foreseen and provided for.

Small Bankruptcies.

When the Official Receiver reports, or the court is otherwise satisfied that the debtor's property is not likely to realize more than £300, the court may make an order for the summary administration of the estate, in which case, if the debtor is adjudged bankrupt, the Official Receiver in the ordinary course becomes and remains trustee, and certain other modifications are effected with the view of simplifying and accelerating the procedure. The chief of these modifications are as follow, viz., the Board of Trade acts as committee of inspection; there is no advertisement of the proceedings in a local paper; in legal proceedings all questions of law and fact are determined by the court without a jury; adjudication may be made on a report by the Official Receiver before the first meeting of creditors, where no composition or scheme is proposed; meetings of creditors may be held in the town where the court sits or the Official Receiver's office is situated; notice to creditors of meetings other than the first meeting, or of application by a debtor for his discharge, are dispensed with in the case of creditors for amounts not exceeding £2. Costs, other than a solicitor's charges, may be paid without taxation; and the time for declaring the first dividend is extended to six months, but the whole estate must be realized and distributed within this period if practicable. No modification, however, is permitted in the procedure relating to the public examination and discharge of the bankrupt. Notwithstanding that an order has been made for summary administration, the creditors may at any time by a resolution passed by a majority in number and three-fourths in value of those voting at the meeting, appoint a trustee in place of the Official Receiver, in which case the summary order ceases to be operative.

Scottish Bankruptcy Legislation.

Since the publication of the ninth edition of this work some important changes have taken place in the law of bankruptcy in Scotland, although the main features of that law, as embodied in the Act of 1856, remain substantially untouched. Among the less important alterations may be mentioned those effected by the Bankruptcy and Real Securities Act of 1857, which deals with the costs of competition for trusteeships; the Bankruptcy Amendment (Scotland) Act, 1860, which enables the Court to recall a sequestration where it is more convenient that the estate should be wound up in England or Ireland; and the Bankruptcy Amendment Act (Scotland), 1875, which makes the wages of clerks, shopmen, and servants preferential claims for a period not exceeding four months and an amount not exceeding £50, while the claims of workmen are placed on a similar footing for a period not exceeding two months. One of the principal modifications is that effected by the Debtors (Scotland), Act of 1880, which abolished imprisonment for debt, but which, like its English prototype (the Debtors Act of 1869), contains a series of important provisions for the punishment of fraudulent bankrupts. Under these provisions the laws of the two countries on that subject are practically assimilated, although some minor differences still survive. One of the most important of these differences is, that while the Scottish Act makes the failure, within the three years prior to the sequestration, to keep "such books and accounts as, according to the usual course of any trade or business in which he (the debtor) may have been engaged, are necessary to exhibit or explain his transactions" a criminal offence, the English Act contains no provision of an analogous character; the non-keeping of such books being treated as a fact to be taken into account in dealing with the debtor's application for his discharge, but not coming within the scope of the criminal law. On the other hand, there are a few minor trading irregularities dealt with in the English Act which are not specifically included in that of Scotland. Another important distinction is that under the Scottish Act the same offences may be treated differently, according as they are brought for trial before the Court of Justiciary or a sheriff and jury, in which case the maximum penalty is two years' imprisonment; or before a sheriff without a jury, in which case the penalty is limited to imprisonment for a period not exceeding sixty days. This distinction admits of a useful elasticity in the administration of the law, having regard to the comparative importance of the case, which is hardly possible under the English Act.

Another most important modification of the law is effected by the Debtors Act of 1880, combined with the Bankruptcy and Cessio Act of 1881, and the Act of Sederunt anent Cessios of 22nd December 1882. Under the law existing prior to these enactments, the process of *cessio bonorum* operated chiefly as a means for obtaining release from imprisonment for debt on a formal surrender by a debtor of all his goods and estate. But under this process the debtor was not entitled to a discharge, and his future acquired property was still subject to diligence at the instance of unsatisfied creditors. By abolishing imprisonment for debt (except in regard to Crown debts

and public rates and assessments), the Legislature also practically abolished this use of the process of cessio, and the process itself would probably have become obsolete, but for certain changes effected by the Act of 1881, which have given it a different and more extended scope. Among these changes may be noted (1) the extension to "any creditor of a debtor who is notour bankrupt," without reference to the amount of his debt, of the right, hitherto limited to the debtor himself, to petition the court for a decree of cessio, the prayer of the petition, whether presented by the debtor or by a creditor, being "to appoint a trustee to take the management and disposal of the debtor's estate for behoof of his creditors"; (2) the discretionary power given to the court upon such petition to award sequestration under the Bankruptcy Act, in any case where the liabilities of the debtor exceed £200; and (3) the right of the debtor to apply for his discharge under similar conditions to those obtaining in the case of sequestration. An important modification of the law relating to discharge which equally affects a debtor under the Bankruptcy and Cessio Acts, is also effected by the provision of the Act of 1881, which requires, in addition to the concurrence of creditors, the fulfilment of one of the following conditions—viz., "(*a*) That a dividend of five shillings in the pound has been paid out of the estate of the debtor, or that security for payment thereof has been found to the satisfaction of the creditors; or (*b*) That the failure to pay five shillings in the pound has, in the opinion of the sheriff, arisen from circumstances for which the debtor cannot justly be held responsible." Orders of cessio are only made in the Sheriff Courts, and when made, the court also appoints a trustee, who conducts the proceedings without the control exercised by the creditors in a sequestration. Under these conditions it will be seen that the original purpose and constitution of the process of cessio has entirely disappeared, and it has now become a modified form of official bankruptcy procedure, with a less elaborate routine than in the case of sequestration, and one perhaps more suitable to the smaller class of cases, to which in practice it is limited.

The Bankruptcy Frauds and Disabilities (Scotland) Act of 1884 applies to sequestrations and decrees of cessio the criminal provisions of § 31 of the English Bankruptcy Act of 1883, relating to the obtaining of credit for £20 and upwards by an undischarged bankrupt, without disclosure of his position. It also places the law relating to the disqualifications attaching to such bankrupts on a similar footing to that of the English Act.

The Judicial Factors Act of 1889 contains a provision calculated to check excessive costs of administration, by requiring that where the remuneration of a trustee under a sequestration is to be fixed by the commissioners, intimation of the rate of remuneration is to be given to the creditors and to the Accountant of Court before being acted on, and the latter officer is empowered, subject to appeal, to modify the same if he deems it expedient.

It may be pointed out that the Deeds of Arrangement Act of 1887, which applies to England and Ireland, does not apply to Scotland, and there is no analogous provision requiring registration of private deeds of assignment for the benefit of creditors as a condition of their validity in that country.

Finally, it is to be noted that the office of Accountant in Bankruptcy, which was established by the Bankruptcy Act of 1856, has under the Judicial Factors Act of 1889 been abolished, the duties being merged in those of the office of Accountant of the Court of Session.

Irish Bankruptcy Legislation.

With the exception of an Act passed in 1888 for establishing local Bankruptcy Courts in certain districts in Ireland, and an Act passed in 1889, applying the main provisions of the English Act of 1888, relating to preferential payments in bankruptcy, to Ireland, no material change has occurred in the Irish law of bankruptcy, which therefore continues to be regulated by the two leading Irish statutes of 1857 and 1872, together with the Irish Debtors Act, 1872, and corresponds in its main features to some of the older English enactments, with modifications adopted from the English Act of 1869. It may be pointed out, however, that the system of liquidation by arrangement and composition without the approval or control of the court, which proved fatal to the success of the latter, has not at any time been imported into the Irish law.

The Deeds of Arrangement Act of 1887, which has been already discussed above under the head of English bankruptcy legislation, also applies in its main provisions to Ireland, and as supplemented by the Irish Deeds of Arrangement Amendment Act of 1890, places the law relating to this branch of insolvency procedure upon a similar footing in both countries, so far as regards the publicity of such deeds. The last-mentioned Act also requires a similar registration of all petitions for arrangement under the Bankruptcy Act of 1857.

Bankruptcy Legislation in the British Colonies and India.

Since the passing of the English Bankruptcy Act of 1883, there have been numerous acts of legislation affecting the law of bankruptcy in the British Colonies. In some of these the principles of the English Act have been more or less closely followed, the main distinction being that the control and supervision which in England is vested in the Board of Trade and its officers, are in the Colonies vested in the local courts and specially constituted officials acting under their control. For general information on the subject of Colonial and Indian bankruptcy legislation down to a recent date, reference may be made to the Sixteenth Annual Report to Parliament by the Board of Trade, dated 1st August 1899, and to the subsequent annual reports of that department, which contain interesting *résumés* of the principal features of the various acts at present in force in the British Colonies and in India. (J. SM.*)

BANKRUPTCY IN THE UNITED STATES.

The United States Bankruptcy Law of 1867 was repealed in 1878. For the twenty years following, until 1898, the only insolvency laws in the United States were those of the separate States, in which there has been little change; they varied much, especially as to dissolving attachments and preferences and granting discharges. In 1898 these laws were again superseded by another general United States Bankruptcy Act.

The especial objects of this Act were the securing of discharges from debts to all insolvents not guilty of fraud, and promptness and economy in the settlement of estates. The provisions as to discharges from debts are much more liberal than in any former Act. Any bankrupt may have a discharge from his debts unless he has committed some crime punishable by imprisonment under the Act (viz., concealment of property or perjury), or with fraudulent intent and in contemplation of bankruptcy destroyed, concealed, or failed to keep books from which his true condition might be ascertained. No dividend to or consent of the creditors is required. A preference, or conveyance to defraud creditors, or spending or wasting of property, or loss by gambling before the adjudication, is no ground for refusing a discharge. Discharges do not affect the following:—taxes, judgments for frauds, false pretences, or wilful injuries; debts not scheduled; debts created by embezzlement or misappropriation, either as an officer or by one acting in a fiduciary capacity. Compositions approved by a majority in number and amount of the creditors, and confirmed by the judge, may be enforced; and the bankrupt, upon depositing the consideration for the composition, and money to pay the preferred

claims, and the costs of the proceedings, will be discharged. Jurisdiction of proceedings in bankruptcy is committed to the United States district court with the right of appeal in some cases to the circuit court of appeals and the supreme court. A jury may be demanded by the respondent in involuntary cases. The judges appoint referees for the different sections of their districts, and must appoint one for each county in which the services of a referee are needed. The referees have extensive judicial powers, and most of the proceedings are in practice conducted before the referees; but their orders are subject to revision by the judges. Judges only can grant discharges and confirm compositions; but the petitions are usually sent to the referees to report the facts with their recommendation. Any person, except a corporation, owing debts, may become a voluntary bankrupt. Involuntary petitions may be brought against any natural person, except a wage-earner or farmer, and any business corporation owing 1000 dollars. A wage-earner is defined to be one whose compensation does not exceed 1500 dollars per annum. Acts of bankruptcy are less in number than in former laws. They are, transferring property to delay or defraud creditors; making or permitting preferences; making a general assignment; admitting in writing inability to pay debts and willingness to be adjudged bankrupt. An adjudication in bankruptcy dissolves attachments and levies of execution, and avoids preferences, made within four months of the adjudication. A trustee to administer the estate is elected by a majority in number and amount of the unsecured creditors; the judge or referee may disapprove an appointment, but may appoint only when creditors fail to do so. The trustee takes, as of the time of adjudication, all property which a creditor, under the laws of the State, might appropriate. In partnership cases the creditors of the partnership elect the trustee, who administers the estates of the partnership and of the individual partners. The assets are marshalled, partnership assets being applied first to partnership claims and individual assets to individual claims. The bankrupt is allowed to retain all property exempt by the laws of the State in which he resides. These exemptions vary greatly—*e.g.*, from homesteads worth $500 to those worth $5000, and in about the same proportions as to personal property. Taxes, wages of labourers to the amount of $300, earned within three months of the adjudication, and claims preferred by the laws of the State, are preferred in United States bankruptcy. Fees are very small.

As may be seen from the above summary, there are many differences between the law of 1867 and that of 1898. One distinction of importance concerns jurisdiction of suits by trustees. A trustee can only sue where the bankrupt could have sued—that is, usually, only in the State courts. A suit to recover property fraudulently conveyed by the bankrupt to one in the same State cannot be brought in the district court unless the defendant consents. The law has worked well upon the whole, and an association of referees in bankruptcy has recommended to Congress several amendments calculated to remove its objectionable features. The principal points of the amendments thus recommended are: (1) the adding of the following to the grounds for objecting to the granting of discharges—viz., obtaining credit by false representations, making fraudulent preferences or transfers not restored, causing bankruptcy by gambling, destruction of books, refusing to obey orders made or to answer questions approved by the Court; (2) providing that discharges shall not affect liability for fraud or wilful injury, or for alimony, or support of family, or seduction; (3) increasing the compensation to trustees; (4) allowing corporations to become voluntary bankrupts; (5) shortening the time for involuntary proceedings; (6) giving the United States courts jurisdiction to set aside preferences and fraudulent transfers; (7) making definite the effect upon dividends of *bond-fide* payments on account within four months of the bankruptcy. These amendments and several others of less importance, when adopted, would make the Act of 1898 the most liberal, as well as the most economical, Bankruptcy Act which has ever existed in the United States (H. G. N.)

Banks, Nathaniel Prentiss (1816-1894), American politician and soldier, was born in Waltham, Massachusetts, on the 30th of January 1816, and died there on the 1st of September 1894. He was admitted to the bar, and, in 1849, was elected to the State Assembly, of which he was speaker in 1851 and 1852. In 1853 he was chairman of the state constitutional convention. In that year he was elected to the national House of Representatives, as a coalition-Democrat. He was re-elected by the "American" party, and after a long contest became Speaker of the House. In 1856 he was re-elected by the Republicans, but resigned, in 1857, to become governor of Massachusetts, to which office he was re-elected in 1858 and 1859. After serving for a short time as president of the Illinois Central Railroad, he became, in 1861, a major-general of volunteers in the Civil War. He performed conspicuous services in the army of the Potomac, and in the department of the Gulf of Mexico. He resigned his commission in 1864, and was again elected a representative in Congress, where he served almost continuously until 1877. For several years he held the important position of chairman of the Committee on Foreign Affairs. He was once more a member of the House from 1889 to 1891.

Bankura, a town of British India, in the Burdwan division of Bengal, situated on the left bank of the river Dhalkisor. Population, about 19,000. The town stands high, and is reckoned healthy. It has a high school, with 246 pupils in 1896-97, two printing-presses, one of which issues a weekly newspaper in the vernacular, and a Hindu public library.

The district of BANKURA lies partly in the plain and partly on the hills, its northern boundary being the river Damodar. It contains an area of 2621 square miles. Population (1881), 1,041,752; (1891), 1,069,668, showing an increase of 3 per cent.; average density, 408 persons per square mile. Hindus numbered 920,373; Mahommedans, 45,312; aborigines (chiefly Sonthals), 103,747; Christians, 132, of whom 21 were Europeans; "others," 104. In 1901 the population was 1,114,185, showing a further increase of 4 per cent. Land revenue and rates in 1897-98 were Rs.5,21,559; the number of police was 367; the boys at school in 1896-97 numbered 37,587, being 47·6 of the male population of school-going age; the registered death-rate (1897) was 26·7 per thousand. There are 14 indigo factories, with an out-turn valued at Rs.17,700. Large quantities of lac and tusser silk are gathered in the hilly tract, which is overgrown with jungle. The stone quarries and minerals are little worked. There are two coal mines, employing about 200 people, and producing about 9000 tons a year. Both cotton and silk are woven, and plates, &c., are carved from soap-stone. The district is exposed to drought, and also to destructive floods. It suffered in the famines of 1866, 1874-75, and again in 1896-97. The old capital of the country was at Bishnupur, which is still the chief centre of local industries. The north of the district is near the East Indian railway, beyond the river Damodar.

Bannu, a town and district of British India, in the Derajat division of the Punjab. The town (also called Edwardesabad and Dhulipnagar) lies in the north-west corner of the district, in the valley of the Kuram river. Population, about 6000. The municipal income in 1897-98 was Rs.52,781. The cantonments of Fort Dhulipnagar accommodate artillery, cavalry, and infantry. There are a missionary church, school, and printing-press, a Victoria Jubilee high school (opened in 1897), and a Mahommedan school.

The district of BANNU, stretching across both banks of the Indus, contains an area of 3847 square miles. The population in 1891 was 372,276, being 97 persons per

square mile. Classified according to religion, Mahommedans numbered 337,269; Hindus, 33,832; Sikhs, 1062; Christians, 58, including 39 Europeans; "others," 55. In 1901 the population was 403,072, showing an increase of 8 per cent. The total amount of land revenue and rates was returned as Rs.4,93,138, the incidence of assessment being 3¼ annas per acre; the number of police was 514. In 1896-97, out of a total cultivated area of 628,734 acres, 166,575 were irrigated, almost entirely from private canals. Salt is quarried on Government account at Kalabagh, and alum is largely obtained in the same neighbourhood. The chief export is wheat. The main line of the North-Western railway, with a branch now in process of extension northwards, runs for 93 miles through the cis-Indus tract; and a military road, 80 miles in length, leads from Bannu town towards Dera Ismail Khan. The Indus, which is nowhere bridged within the district, is navigable for native boats throughout its course of 76 miles. Education is making fair progress. In 1896-97 there were altogether 297 schools attended by 6029 boys, the proportion of boys at recognized schools to those of school-going age being 12 per cent. The death-rate in 1897 was 43 per 1000; the rainfall in 1897 was 20·23 inches.

Banswara, a native state of India, in the Rajputana agency, with an area of 1505 square miles. The population in 1891 was 180,916, showing an average density of 120 persons per square mile. The estimated gross revenue in 1896-97 was Rs.2,53,788; the tribute, Rs.38,000. The administration is in the hands of a Hamdar or minister. The petty state of KUSHALGARH is feudatory to Banswara; area, 432 square miles; population (1891), 31,353; gross revenue, Rs.61,977. In 1901 the population of the two states was 165,276, showing a decrease of 22 per cent., due to the effects of famine.

The town of BANSWARA has a population of about 7500.

Bantam, the most western residency of Java, on Bantam Bay, with its chief town of the same name, 45 miles west by north of Batavia. The soil is fertile only in the central portion of the residency, which, from several causes (cattle plague of 1879, fever epidemics, the eruption of Krakatao in 1883, causing the death of 24,000 of the inhabitants, and the insurrection of 1888), is less populous and less cultivated than the rest of Java. The industries are rice, coffee, *katjang*, and fishing. The capital is in a decayed state. The residency (area, 2989 square miles) had, in 1897, a population of 709,339, including 302 Europeans, 1959 Chinese, 54 Arabs, and 35 other Asiatic foreigners.

Bantry, a seaport in county Cork, Ireland, on Bantry Bay, which is one of the headquarters stations of the Channel Squadron and an important fishing centre. It is the terminal station of the Cork, Bandon, and South Coast Railway. The coaches on the famous Prince of Wales route to Glengariff start from here. The manufacture of Irish friezes and tweeds is now successfully carried on; also salmon fishing. Population, about 2900.

Bantu Languages. — The greater part of Africa south of the equator possesses but one linguistic family so far as its native inhabitants are concerned. This clearly-marked division of human speech has been entitled the Bantu, a name invented by the late Dr Bleek, and it is, on the whole, the fittest general term to use to designate the most remarkable group of African languages.[1]

It must not be supposed for a moment that all the people who speak Bantu languages belong necessarily to a special and definite type of Negro. On the contrary, though there is a certain physical resemblance among those tribes who speak the purest Bantu dialects (the Ba-yanzi of the Upper Congo, the people of the great lakes, the Ova-herero [Damara], Zulu-Kafirs, Awemba, and some of the east coast peoples), there is nevertheless a great diversity in outward appearance, shape of head, and other physical characteristics, among the negroes who inhabit Bantu Africa. Some tribes speaking Bantu dialects are dwarfs or dwarfish, and obviously akin to the non-Bantu Bushmen or Forest Pygmies. Others betray relationship to the Hottentots; others again cannot be distinguished from the most exaggerated forms of the black West African Negro. Yet others again, especially on the north, show traces of Galla or Nilotic intermixture. But the general deduction to be drawn from a study of the Bantu languages as they exist at the present day is that at some period not much more than two thousand years ago a powerful tribe of negroes speaking the Bantu mother language, and allied physically to the negroes of the Western Nile and Southern Lake Chad basins, pushed themselves forcibly into the southern half of Africa, which at that time was probably very sparsely populated except in the north-west, east, and south. The Congo basin at the time of the Bantu invasion would have been occupied on the Atlantic seaboard by west coast negroes, and in the centre by Forest Pygmies; the vicinity of Victoria Nyanza and the East African coast region down to opposite Zanzibar probably had a population partly Nilotic-negro and partly (in the south) Hottentot. From Lakes Tanganyika and Nyasa south-westwards to the Cape of Good Hope the population was Hottentot and Bushman. Over nearly all this area the Bantu swept with such a vehemence that they destroyed or absorbed the vast majority of the preceding populations, of which, linguistically speaking, the only survivors are the scattered tribes of pygmies in the forests of the Congo and Gabun, a few patches of quasi-Hottentot and Nilotic peoples between Victoria Nyanza and the Zanzibar coast, and the Bushmen and Hottentots of South-West Africa. The first area of decided concentration on the part of the Bantu was very probably Uganda and the shores of Tanganyika. The main line of advance south-west trended rather to the east coast of Africa than to the west. Finally, when the Bantu had reached the south-west corner of Africa, their further advance was checked by two causes: first, the concentration in a healthy, cattle-bearing part of Africa of the Hottentots (themselves only a superior type of Bushman, but able to offer a much sturdier resistance to the big black Bantu negroes than the crafty but feeble Bushmen), and secondly, the arrival on the scene of the Dutch and British, but for whose final intervention the whole of Southern Africa would have been rapidly Bantuized, as far as the imposition of language was concerned. The theory thus briefly set forth of the origin and progress of the Bantu, and the approximate date at which their great southern exodus commenced, is to some extent attributable to the present writer only, and has been traversed at different times by other writers on the same subject. In

[1] *Bantu* (literally *Ba-ntu*) is the most archaic and most widely spread term for "men," "mankind," "people," in these languages. It also indicates aptly the leading feature of this group of tongues, which is the governing of the unchangeable root by prefixes. The syllable *-ntu* is nowhere found now standing alone, but it originally meant "object," or possibly "person." Combined with different prefixes it has different meanings. Thus (in the purer forms of Bantu languages) *muntu* means "a man," *bantu* means "men," *kintu* means "a thing," *bintu* "things," *kantu* means "a little thing," *tuntu* "little things," and so on. This term *Bantu* has been often criticized by writers, such as Sir H. M. Stanley, but no one has supplied a better, simpler designation for this section of the negro race and of negro languages, and the term has now been definitely consecrated by a use of over forty years.

the nearly total absence of any historical records, the only means of building up Bantu history lies in linguistic research, in the study of existing dialects, of their relative degree of purity, of their connexion one with the other, and of the most widely spread roots common to the majority of the Bantu languages. The present writer, relying on linguistic evidence, fixed the approximate date at which the Bantu negroes left their primal home, somewhere in the very heart of Africa (between the northern basin of the Congo, the western basin of the Nile, and the southern basin of Lake Chad), at not much more than two thousand years ago; and the reason adduced seems unanswerable. It lies in the root common to nearly all the Bantu languages expressing the domestic fowl—*kuku* (*nkuku, ngoko, nchuchu, nsusu, nguku, nkū*). Now the domestic fowl reached Africa first through Egypt, at the time of the Persian occupation—not before 500 to 400 B.C. It would take at that time at least a couple of hundred years before—from people to people and tribe to tribe up the Nile valley—the fowl, as a domestic bird, reached the very heart of Africa. The Muscovy duck, introduced by the Portuguese from Brazil at the beginning of the 17th century, is spreading itself over Negro Africa at just about the same rate. Yet the Bantu people must have had the domestic fowl well established amongst themselves before they left their primeval home, because throughout Bantu Africa (with rare exceptions, and those not among the purest Bantu tribes) the root expressing the domestic fowl remounts to the one vocable of *kuku*.[1] Curiously enough this root *kuku* resembles to a marked degree several of the Persian words for "fowl," and is no doubt remotely derived from the cry of the bird. Among those Negro races which do not speak Bantu languages, though they may be living in the closest proximity to the Bantu, the name for fowl is quite different.[2] The fowl was only introduced into Madagascar, as far as researches go, by the Arabs during the historical period, and is not known by any name similar to the root *kuku*. Moreover, even if the fowl had been (and there is no record of this fact) introduced from Madagascar on to the east coast of Africa, it would be indeed strange if it carried with it to Cameroon, to the White Nile, and to Lake Ngami one and the same name. It may, however, be argued that such a thing is possible, that the introduction of the fowl south of the equator need not be in any way coincident with the Bantu invasion, as its name in North Central Africa may have followed it everywhere among the Bantu peoples. But all other cases of introduced plants or animals do not support this idea in the least. The Muscovy duck, for instance, is pretty well distributed throughout Bantu Africa, but it has no common widely-spread name. Even tobacco (though the root "taba" turns up unexpectedly in remote parts of Africa) assumes totally different designations in different Bantu tribes. The Bantu, moreover, remained faithful to a great number of roots like "fowl," which referred to animals, plants, implements, and abstract concepts known to them in their original home. Thus there are the root-words for ox (*-buzi*), pig (*-gulu*), pigeon (*-jiba*), dog (*mbwa*), hippopotamus (*-bugu*), elephant (*-jobo, -joko*), leopard (*ngwi*), house (*-yumba* and *-dago*), moon (*-ezi*), sun (*-juba*), water (*-ndiba, mandiba*), lake or river (*anza*),[3] drum (*ngoma*), name (*-ina* or *jina*), wizard (*-nganga*); adjectives like *-bi* (bad), *-eru* (white); verbs like *jwa* (to die), *ta* (to strike, kill), *la* or *lia* (to eat). The root-words cited are not a hundredth part of the total number of root-words which are practically common to all the spoken dialects of Bantu Africa. Therefore the possession amongst its root-words of a common name for "fowl" seems to the present writer to show conclusively that (1) the original Bantu tribe must have possessed the domestic fowl before their dispersal to the southern half of Africa began, and that (2) as it is historically certain that the fowl as a domestic bird did not reach Egypt before the Persian conquest in 525 B.C., and probably would not have been transmitted to the heart of Africa for another couple of hundred years, the Bantu exodus may safely be placed at a date not much anterior to 2100 years ago. It is also interesting to note that the designs on the Zimbabwe and other neighbouring monuments supposed to be made by the Semitic gold workers of Southern Zambezia exhibit natives with distinct Hottentot physical peculiarities, as though at the period when these buildings were erected (about 2000 years ago) black Bantu negroes were not familiar to the pre-Islamite Arabians who mined for gold in what is now Rhodesia. Early Arab geographers, also, while alluding to the Zenj or modern Zanzibar negroes on the east coast of Africa opposite Zanzibar, described the regions farther south as being inhabited by Wakwak, who from the accounts given seem to have been a savage people of Hottentot or Bushman race. Indeed, the very name Wakwak may be only a corruption and duplication of the Hottentot root *kwa*, which means "men" and is a constant tribal suffix.[4] Further, the legends and traditions of the Bantu peoples themselves invariably point to a northern origin, and a period, not wholly removed from their racial remembrance, when they were strangers in the land. It is not to be supposed that this argument about the relatively recent occurrence of the Negro exodus which has spread the Bantu languages over a third of the Dark Continent implies that Africa south of the Equator was uninhabited, or even very sparsely inhabited, prior to the Bantu invasion. On the contrary, it would seem as if the southern half of Africa had been inhabited from a very early period in the history of mankind. It is merely that the invasion of the Bantu and the expansion of their family of languages are events of very recent occurrence. No doubt before their coming the eastern coast regions, down to about the Ruvuma river, were inhabited by a Nilotic type of Negro akin to the Shiluk, Dinka, and Masai; and the west coast of Africa, down to about the Congo mouth, was inhabited by negroes of the Guinea type, while the Congo forests and Angola were sparsely peopled by dwarf races, which in the south and south-east developed or degenerated into Bushmen and Hottentots. Seemingly the Bantu somewhat early in their migration down the east coast took to the sea, and not merely occupied the islands of Pemba and Zanzibar, but travelled as far afield as the Comoro archipelago, and even the west coast of Madagascar. Their invasion of Madagascar must have been fairly considerable in numbers, and they seemingly gave rise to the race of black people known traditionally to the Hovas as the Va-zimba.

The accompanying map will show pretty accurately the distribution of the Bantu-speaking Negroes at the present day. It will be seen by a glance at this map that the areas in which Bantu languages of archaic form and general purity from other elements are

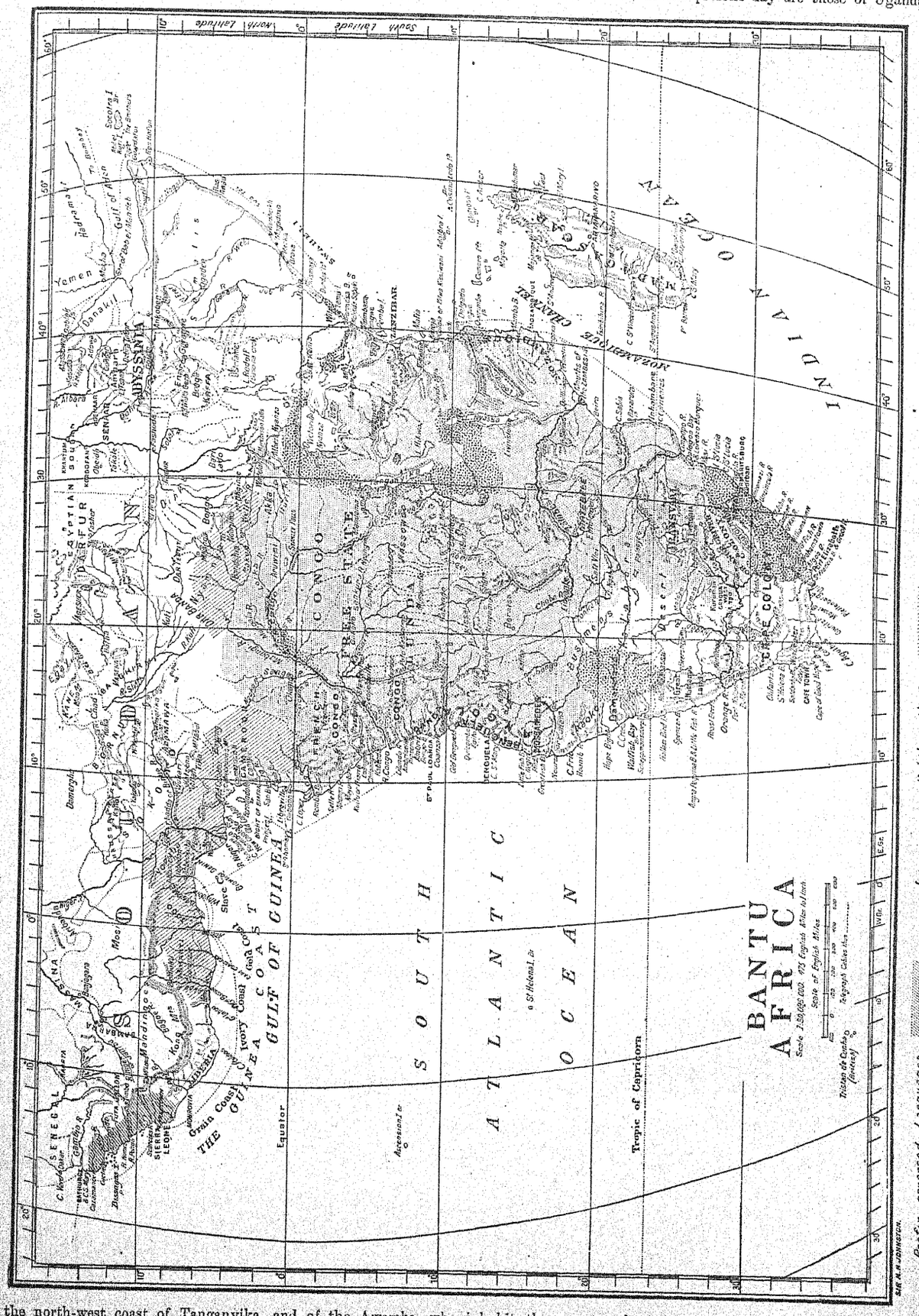
[1] In Luganda, the language of Buganda, Victoria Nyanza, and also in Lunyoro on the White Nile, the word for "fowl" is *nkoko*. In Ki-Swahili of Zanzibar it is *kuku*. In Zulu it is *inkuku*. In some of the Cameroon languages it is *lokoko*, and on the Congo it is *nkogo, nsusu*. On the Zambezi it is *nkuku*; so also throughout the tribes of Lakes Nyasa and Tanganyika.

[2] From this statement are excepted those tongues classified as "semi-Bantu." In some languages of the Lower Niger and of the Gold Coast the word for "fowl" is generally traceable to a root *kuba*. This form *kuba* also enters the Cameroon region, where it exists alongside of *-koko*. *Kuba* may have arisen independently, or have been derived from the Bantu *kuku*.

[3] Whence the many *nyanza, nyanja, nyasa, mwanza*, of African geography.

[4] As in *Nama-kwa, Gri-kwa*, &c.

spoken are somewhat widely spread. Perhaps on the whole the most archaic dialects at the present day are those of Uganda, of



MAP ILLUSTRATING THE PRESENT DISTRIBUTION OF THE BANTU-SPEAKING NEGROES.

the north-west coast of Tanganyika, and of the Awemba, who inhabit the country between the south-westernmost corner of

Tanganyika, the river Chambezi, and the districts round the north end of Lake Nyasa. Another language of typical Bantu construction is the Ki-yanzi or Ki-bangi tongue, spoken on a section of the Central Congo and on the Lower Ubangi river; another is the well-known Oci-herero of Damaraland. Ki-makonde, on the east coast of Africa, is archaic; so in some features is the celebrated Ki-swahili of Zanzibar, and the Ci-bodzo of the Zambezi delta; while the celebrated Zulu-Kafir dialects, though they exhibit several marked changes in vocabulary and phonetics (both probably of recent date), preserve nevertheless so many of the characteristics of the hypothetical mother tongue that, until the languages of the great lakes came to be known, Zulu-Kafir was regarded as the Sanskrit of the Bantu. Perhaps it is so, as Sanskrit is now viewed in relation to the original Aryan tongue. In that case the lake dialects would correspond to Lithuanian (only "more so," that is to say, even nearer to the original Bantu than are the Lithuanian dialects to the hypothetical Aryan parent speech), the Oci-herero to Greek, and Ki-yanzi to Gothic.

With our present inadequate knowledge of the affinities of the existing Bantu tongues it is difficult and premature to divide them accurately into groups and subdivisions, the enumeration of which also in an article like the present becomes too much of a wearisome string of names; but there may be mentioned severally (1) the *Uganda* group of languages, occupying the area between Albert Nyanza and the White Nile, the north and west coasts of Victoria Nyanza, the north and north-west coasts of Tanganyika and the Congo forests (a clearly-marked congeries of kindred dialects); (2) the *Ki-emba* or *Ci-wemba*, between Tanganyika, Bangweulu, and Nyasa; (3) the *Nyamwezi* group, south of Victoria Nyanza; (4) the *Swahili*; (5) the *Nyika*, and (6) the *Kikamba* groups, on the east and north-east; (7) the *Ci-hehe* group, south of the *Nyamwezi* and north of the Ruvuma river; (8) the well-marked *Makonde-Yao*, to the south of the Ruvuma, and south and east of the Yao; (9) the remarkable *Makua* tongue (which though very archaic in the roots of its vocabulary is, like the Secuana, singularly corrupt in phonetics). Southern and Eastern Nyasaland and Central Zambezia are filled (10) with various *Ci-nyanja* or *Mañanja* dialects. Immediately south of the Central and Lower Zambezi (putting aside the intrusive Zulu) is (11) the *Makaraka* group. South and west of that again is (12) the *Secuana*,[1] spoken over a wide area in closely-allied dialects. (The *Secuana*, like the *Makua*, though truly Bantu in its roots, is extremely corrupt in its phonetics.) It has not, however, except in one or two dialects, borrowed any "clicks" from the Hottentots.

To the south and east of the *Secuana* group lies (13) the important *Zulu-Kafir* section, which with cognate dialects stretches along the coast regions from Port Elizabeth in the south to Inhambane[2] in the north. The dialects in the coast region between Inhambane and the Zambezi share their alliance between the Zulu, Makaraka, and Nyanja groups. The word "Kafir" has been so long misapplied to the most southerly of the Bantu peoples that it is difficult to ignore it. It is simply the cant term of "infidel" applied by the Arabs of Sofala to the heathen Bantu round them, and communicated by the Arabs to the earliest Portuguese navigators who visited these shores. The Portuguese applied the term Cafres to all the east coast negroes from Natal to Quillimane. North-west of the Secuana is (14) the *Oci-herero* group of Damaraland, Ovamboland, and Portuguese West Africa as far north as Benguela and the highlands of Bihe. Herero is by far the most archaic of this section of the Bantu languages, the dialects related to it in the north and north-east being much more corrupt. The Central Zambezi region, west of the great Nyanja congeries of dialects, is mainly occupied by (15) the *Tonga* or *Toka* family, and west of this again is (16) the *Kiloi* language-group of Barotseland, which is related to (17) the *Kiboko* section of the Upper Zambezi and Lower Kasai. Then to the west comes (18) the great *Bunda* group, including most of the dialects of Angola and of the Lower Kwango. These shade by insensible gradations into (19) the *Kongo* family, on the Lower Congo from Stanley Pool to the sea, and extending north along the coast to Loango. The southern basin of the Congo is mainly occupied by one great family (20), the *Rua* or *Lunda* dialects, which stretch eastwards to the vicinity of Tanganyika, and even seem to include the *Ki-lungu* and *Ki-mambwe* of the Nyasa-Tanganyika Plateau. It is not known yet whether the language of the *Tu-shilange* and *Batetela* is related to the *Rua*. On the Upper Congo, from the vicinity of West Tanganyika and Nyangwe, down past Stanley Pool to the confluence of the Aruwimi, there seems to be one dominating form of the Bantu language which may be classified as (21) the *Manyema* group, and which exhibits very great corruption. The *Balolo* group (22) to the west, which occupies the regions immediately south of the Upper Congo, is seemingly related to the Manyema, but is less corrupted. The Lower Kasai would appear to be occupied by (23) a group which may be called, from one of its dialects, the *Kibuma*. These languages march with the Kongo dialects to the west. The greater part of the Central Congo, on both banks, and the Lower Ubangi are occupied by peoples speaking (24) the *Ki-bangi* (or *Ki-yanzi*) language. West of that, and about Stanley Pool and the interior of French Congo, is (25) the *Kiteke* group, which, with its allied languages, marches on the west with the Kongo dialects, and on the north-west with (26) the *Gabun* or *Mpongwe* family. North of the *Mpongwe* group (which ends about the Gabun river) is (27) the *Cameroon* group, which includes all the coast dialects up to the Rio del Rey (where the Bantu territory ends), and also the dialects of the island of Fernando Po. In the interior of Cameroon and of the Gabun there is a wide tract of country inhabited by tribes such as the Fan, which are evidently recent intruders, and can only be regarded as semi-Bantu. The general structure of these languages (*Mbudikum*, *Mfut*, *Bayoñ*, *Bamom*, *Paŭhwe* (Fan), *Papiax*, *Param*, *Penin*, *Balu*, *Nki*, *Meloñ*, *Momenya*, *Bagba*, *Juka*, *Kamuku*, *Basa*, *Juku*, even the *Mici* south of the Benue) is essentially Bantu, but of a very corrupt kind. But although the shattered prefixes are of obviously Bantu origin, only a very small part of the vocabulary can be called Bantu, and in many important root-words the Bantu connexion is not at all obvious. These languages seem to be of a degraded type, and possibly are very remotely descended from cognate dialects of the original mother language. Eastward of this intrusive wedge of semi-Bantu we again come to Bantu languages to the north of the Congo, within the limits of the Congo basin, the *Sanga* group (28) of dialects spoken by the Bonjo, the Baya, the Ndere, and the Yangere, in the basin of the river Sanga and its affluents. Immediately east of this *Sanga* group, although the people would appear to be Bantu, we know too little about their dialects to be able to classify them in groups. Farther east still, in the region between the Welle and Albert Nyanza, we come to (29) the *Baviru*, the Wazamboni, and other tribes encountered by Stanley in his march to the relief of Emin Pasha. These inhabitants of the north-easternmost corner of the Congo forests and the adjoining grass country up to the southern half of the western shore of Albert Nyanza bring us back to the Uganda group of languages from which we started, and to this group the dialects last referred to would seem to be related.

This summary of the geographical grouping of the Bantu languages may be concluded by again directing attention to the striking contrast which exists, from a linguistic point of view, north and south of the Bantu border line—a border line which, commencing on the west coast of Africa close to the Niger delta, and following more or less closely the limits of the Northern Congo watershed to Albert Nyanza, the White Nile, and Victoria Nyanza, thence continues in an irregular line to the vicinity of Zanzibar. North of this line there is great linguistic confusion, and an almost uncounted number of separate linguistic families exists, each differing from the other as they differ in turn from Bantu. This is the condition of affairs throughout all Negro Africa between Abyssinia and the Atlantic. Once the Bantu border line is crossed, however, there is but one family of languages—the Bantu—prevailing, with the possible exception of relics of a Pygmy language in the Congo forests, of Hottentot or Nilotic fragments in the Zanzibar *Hinterland*, and, of course, the Hottentot and Bushman dialects in South-West Africa. The general homogeneity of the Bantu languages is greater than that of the existing condition of Aryan tongues, though it is a great exaggeration to say that the various Bantu dialects differ from one another no more than do the existing Romance languages.

The following propositions may be laid down to define the peculiar features of the Bantu languages:—

1. *They are agglutinative in their construction, their syntax being formed by adding prefixes and suffixes to the root, but no infixes* (that is to say, no syllable incorporated into the root-word).

2. *The root* (*excepting its terminal vowel*) *is unchanging to all intents and purposes, though its first or penultimate vowel or consonant may be modified in pronunciation by the preceding prefix or succeeding suffix. With one exception there is no inflexion; that exception* (scarcely in origin a true one) *is in the preterite tense of the verb in certain languages where the root changes in its termination, probably by the absorption of a suffix.*

3. *No two consonants come together without an intervening vowel* (*except where one of them is a nasal, a labial, or a semi-vowel*); *no consonant is doubled* (*except by the accidental juxtaposition of two m's or n's, one of which represents an abbreviated particle*); *no word ever ends in a consonant, except in rare instances where the termination through contraction and the dropping of a vowel becomes a nasal sound.*

4. *Substantives are divided into many classes or genders indicated by the pronominal particle prefixed to the root. Some of these prefixes are used in a plural sense, others in the singular. No singular prefix can be used as a plural, nor can a plural prefix be employed in the singular number. There is a certain degree of correspondence*

[1] In accordance with the phonetic system adapted from Lepsius, in which Bantu languages are transcribed, *c* stands for the English *ch*. *Secuana* is the language spoken by the Bechuana.

[2] This is the Portuguese town and district, which should really be pronounced Inyambane—Portuguese *nh* = *ny*.

between the singular and plural prefixes (thus, No. 2 prefix (see below) invariably serves as plural to No. 1; No. 8 (plural) corresponds to No. 7 (singular), but this cannot be depended on as a rule). *The full number of the prefixes is sixteen.*[1] *The pronominal particle or prefix of the noun is attached to the adjectives, pronouns, and verbs in the sentence which are connected with that noun, and though in course of time these particles may differ in form from the noun-prefix, they were formerly identical in origin.* (This system is the "Concord" of Dr Bleek.) *The pronominal particles, whether in nominative or accusative case, must always precede the verbal root, though they often follow the auxiliary prefixed particles used in conjugating the verbs.* (An apparent but not a real exception to this rule is in the second person plural of the imperative mood, where an abbreviated form of the pronoun is affixed to the verb,[2] and other phases of the verb are occasionally emphasized by the repetition of the governing pronoun at the end.)

5. *The verbal root may modify its termination by a change of the last vowel or by suffixing certain particles, or it may even change its radical vowel either to form a tense or to alter the original meaning of the simple stem.*

6. *The root of the verb is the second person singular of the imperative.*

7. *No sexual gender is recognized.*

The sixteen original prefixes of the Bantu languages are given below. They are stated in the most archaic forms to be found in living languages; but their oldest types, and these latter obtained by deduction from the other forms of the particle used in the syntax, are given in brackets.

BANTU PREFIXES.

Singular.	*Plural.*
Class 1. Mu- (Ngu-)	Class 2. Ba-
,, 3. Mu- (Ngu-)	,, 4. Mi- (Ngi-)
,, 5. Di- (Ndi-)	,, 6. Ma- (Nga-)
,, 7. Ki- (Nki- ?)	,, 8. Bi-
,, 9. N *or* Ni	,, 10. Ti-, Ti-n-, *or* θi-,[3] bi-n-, *or* Zi-, Zi-n-
,, 11. Lu- (Ndu-)	,, 12. Tu (often diminutive in
,, 13. Ka (usually a diminutive)	sense)
,, 14. Bu- (sometimes used in a plural sense; generally employed to indicate abstract nouns)[4]	
,, 15. Ku- (identical with the preposition "to," used as an infinitive with verbs, but also with certain nouns indicating functions of the body primarily)	
,, 16. Pa- (locative: applied to nouns and other forms of speech to indicate place or position; identical with adverb "here," as *ku-* is with "there").	

To these sixteen prefixes should perhaps be added the preposition *mu-* "in," "into," which in some languages is used as a prefix or pronominal particle, as in the Swahili phrase { *M'nyumba-ni mw-ace* / In house in it (in) his } = In his house—where the preposition *M'* (abbreviation for *Mu-*) has the particle *mw* (*mu*) agreeing with it and placed before the pronoun *-ace*.

Also the prefix in the singular number having a diminutive sense, which is found in some of the north-western[5] Bantu tongues —*fi-* or *vi-*. This is possibly an additional prefix which has come into independent being in that rather divergent group. It cannot be traced to derivation from any of the other prefixes among the sixteen. It is always used in the singular, and its corresponding plural prefix is the twelfth (*tu-*).

The concord may be explained thus:—

Let us for a moment reconstruct the original Bantu mother tongue (as attempts are sometimes made to deduce the ancient Aryan from the most archaic of its daughters), and propound sentences to illustrate the repetition of pronominal particles known as the "concord."

OLD BANTU.

Abao	*ba-ntu*	*ba-bi*	*ba-ba-ota*	*tu-ba-oga.*
They	they person	they bad	they they- who kill	we them fear.

Rendered into modern dialect of Luganda, of Buganda:

Bo	*ba-ntu*	*babi*	*babota*	*tu-ba-tia.*
They	they person	they bad	they they- who kill	we them fear.

Or, again,

OLD BANTU.

Ngu-ti	*ngu-nguo*	*ngu-gwa;*	*ku-ngu-mbona?*
This tree	this-one	this falls;	thou this seest?

("The tree falls; dost thou see it?")

Rendered into Kiguha of Tanganyika, this would be:

Muti	*guno*	*guguwa;*	*ugumona?*
It tree	this (one)	it falls;	thou it seest?

The prefixes and their once identical particles have varied greatly in form from the aboriginal syllables as the various Bantu dialects became more and more corrupt. The eighth prefix, *bi-*, becomes *vi-*, *pi-*, *fi-*, *fy-*, *si*[6]; *i-*, *by-*, *bz-*, *py-*, *ps-*, *zi-*. Further confusion is caused by the retention and fusion in the prefix of the preceding vowel which marked the full definite form when the prefix was used as a definite article or demonstrative pronoun. The definite forms of the prefixes were these: 1. *Umu* (*uñgu*, *uñu*); 2. *Aba*; 3. *Umu* (*uñgu*, *uñu*); 4. *Imi* (*iñgi*, *iñi*); 5. *Idi* (*indi*); 6. *Ama* (*anga*, *ana*); 7. *Iki*; 8. *Ibi*; 9. *In-*; 10. *Iθin* or *izin*; 11. *Ulu*; 12. *Utu*; 13. *Aka*; 14. *Ubu*; 15. *Uku*; 16. *Apa*.

Not many of the existing Bantu languages possess all the prefixes of the mother tongue; that is to say, all the sixteen. Amongst those that do may be cited the Kirega, some of the Kavirondo dialects, and the Kiguha of the Uganda group; the Kiwemba of South Tanganyika; the Makonde of the Zanzibar coast, possibly the Nkonde dialects of the north end of Lake Nyasa; Oci-herero of Damaraland, and the Kongo language of the Lower Congo. The second prefix, *Ba*, retains its original form in the Uganda group, in the languages of North Tanganyika, on the Central Congo, in South-West Congoland, in Cameroon, Fernando Po, and the Gabun (with the exception of the Mpongwe); also in the upper part of the Central Zambezi, and perhaps in one or more dialects of West Nyasa and Kiwemba; in the Secuana dialects and in the Zulu-Kafir tongues. In the Herero group of languages it becomes *Va*, as also in parts of the Lower Zambezi and in South-East Africa. In the greater part of Eastern Africa and Nyasaland it becomes *Wa*, and dwindles finally into *A* in the Makua countries, in Southern Nyasaland, on the Nyasa-Tanganyika Plateau, among the Rua dialects of the South Congo basin, among the Manyema in Angola, on the Lower Congo, among the Mpongwe, and in some of the dialects of the Nyika and the Kamba groups in the north-eastern part of the Bantu language-field. North of the 10th parallel of south latitude the tenth prefix (*θi* or *Zi*) is rarely met with, though traces of its former existence may be deduced from its presence in the concordant particles. Thus, though it is absent as a plural prefix for nouns in the Swahili of Zanzibar, it reappears in the Concord. For instance: *ñombe hizi zangu*—cows these mine (These cows are mine). Although *ñombe* has ceased to be *ziñombe*, in the plural the *zi* particle reappears in *hizi* and *zangu*. Nevertheless, the tenth prefix is still met with in its full form in Kongo, perhaps in Mpongwe, and in the Kavirondo dialects of the Uganda group.

The pronouns in the Bantu are in most cases traceable to some such general forms as these:—

I, me . . .	*ñgi, mi.*[7]
Thou, thee . .	*ku.*
He or she, him, her .	*a;* also *ñgu*, *mu* (which becomes *yu*, *ye*); there is also another form perhaps, *ndi*, but the pronouns for the third person, as in so many other languages, partake largely of the nature of demonstrative pronouns, and are often identical with the latter.
Ye, you . . .	*nu*, *mu.*
They, them . .	*bao*, *ba.*

In addition to this it must be remembered that the Bantu languages do not distinguish sex, but divide all objects in the third person into two main divisions—(1) human beings and such other living creatures as may be distinguished by the first and second prefixes; (2) all other substances not actively "alive," which are distributed amongst the other "classes" of nouns. The pronominal particles of these are determined by the class to which they belong, the particles in question being more or less identical with the prefixes.

The Bantu verb consists of a practically unchangeable root which is employed as the second person singular of the imperative. To this root are prefixed and suffixed various particles. These are worn-down verbs which have become auxiliaries, or reduced adverbs or prepositions.[8] It is probable (with one exception) that the building up of the verbal root into moods and tenses has taken place independently in the principal groups of Bantu languages, the arrangement followed being probably founded on a fundamental system common to the original Bantu tongue. The exception alluded to may be a method of forming the preterite tense, which seems to be shared by a great number of widely-spread Bantu languages. This may be illustrated by the Zulu *tanda*, love, which changes to *tandile*, have loved, did love. This *-ile* or *-ili*

[1] Possibly seventeen.

[2] *Ita*=call! *Ita*-ni=call ye! *ni*=ye.

[3] English th- in "think."

[4] As *mu-ntu*, a man; *bu-ntu*, humanity.

[5] Perhaps in the Eastern Congo basin. In the form of *I-* it is seemingly present in Manyema.

[6] *Shi-*, the *F* palatized.

[7] *Mi* is probably a softening of *ñgi*, *ñi*; *ñgi* becomes in some dialects *nji*, *ndi*, *ni*; there is in some of the coast Cameroon languages a word *mba* for "I," "me," the origin of which is not very clear.

[8] Once, in their turn, nouns.

may become in other forms *-idi*, *-ire*, *-ini*, but is always referable back to some form like *-ili* or *ile*, which is probably connected with the root *li* or *di* (*ndi* or *ni*), which means "to be" or "exist." The initial *i* in the particle *-ile* often affects the last or penultimate syllable of the verbal root, thereby causing one of the very rare changes which take place in this vocable. In many Bantu dialects the root *pa* (which means to give) becomes *pele* in the preterite (no doubt from an original *pa-ile*). Likewise the Zulu *tandile* is a contraction of *tanda-ile*.

Two other frequent changes of the terminal vowel of the common root are those from the vowel *a* (which is almost invariably the terminal vowel of Bantu verbs), (1) into *e* to form the subjunctive tense, (2) into *i* to give a negative sense in certain tenses. It has been stated that the vowel *a* almost invariably terminates verbal roots. The exceptions to this rule are so rare that it might almost be included among the elementary propositions determining the Bantu languages. And these exceptions when they occur are generally due (as in Swahili) to borrowed foreign words (Arabic, Portuguese, or English).[1] This point of the terminal *a* is the more interesting, because by changing the terminal vowel of the verbal root and possibly adding a personal prefix one can make nouns from verbs. Thus in Luganda *senyua* is the verbal root for "to pardon." "A pardon" or "forgiveness" is *ki-senyuo*. "A pardoner" might be *mu-senyui*. In Swahili *patanisa* would be the verbal root for "conciliate"; *mpatanasi* is a "conciliator," and *upatanisho* is "conciliation." Another marked feature of Bantu verbs is their power of modifying the sense of the original verbal root by suffixes, the affixion of which modifies the terminal vowel, and sometimes the preceding consonant of the root. The fullest number of these variations and their usual meanings are as follows:—

Supposing an original Bantu root, *tanda*, to love; this may become

tandwa	to be loved.
tandeka or *tandika*	to be lovable.
tandila or *tandela*[2]	to love for, with, or by some other person.
tandiza (or *-eza*) } *tandisa* (or *-esa*)[3] }	to cause to love.
tandana	to love reciprocally.

The suffix *-aka* or *-aga* sometimes appears and gives a sense of continuance to the verbal root. Thus *tanda* may become *tandaka* in the sense of "to continue loving."[4]

The negative verbal particle in the Bantu languages may be traced back to an original *ka* or *sa* in the Bantu mother tongue. Apparently in the parent language this particle had already two forms—*ka* and *sa*. In the vast majority of the languages at the present day the negative particle in the verb (which nearly always coalesces with the pronominal particle) is descended from this *ka* or *sa*, assuming the forms of *ka*, *ga*, *nga*, *sa*, *ta*, *ha*, *a*. It has coalesced to such an extent in some cases with the pronominal particle that the two are no longer soluble, and it is only by the existence of some intermediate forms (as in the Kongo language) that we are able to guess at the original separation between the two. Originally the negative particle *ka* or *sa* was joined to the pronominal particles, thus:—

Ka-ngi	not I.
(therefore *Ka-ngi tanda* = I not love.)	
Ka-ku or *ka-wu*	not thou.
Ka-a	not he, she.
Ka-tu	not we.
Ka-nu	not ye.
Ka-ba	not they.

In like manner *sa* would become *sa-ngi*, *sa-wu*, &c. But very early in the history of Bantu languages *ka-ngi*, or *sa-ngi*, became contracted into *kai*, *sai*, and *ki*, *si*; *ka-ku* or *ka-wu* into *ku*; and *kaa* or *saa* have always been *ka* or *sa*. Sometimes in the modern languages the negative particle is used without any vestige of a pronoun being attached to it, and is applied indifferently to all the persons. Sometimes this particle has fallen out of use, and the negative is expressed (1) by stress or accent; (2) by a suffix answering to the French "pas," and having the same sense; and (3) by the separate employment of an adverb, like the "not" in English.

[1] Exceptions to this rule are of course foreign interjections which in course of time have been verbalized, and the verbal particle *li* or *di*, which means "to be."

[2] Or *-ira*, *-era*.

[3] This form may also appear as *sa*, as for instance *aka* = to be on fire, becomes *asa*, to set on fire.

[4] In choosing this common root *tanda*, and applying it to the above various terminations, the writer is not prepared to say that it is associated with all of them in any one Bantu language. One has to be so very careful what one writes on the subject of the Bantu languages in general, because at the present time very few people are living who have studied *several* of these languages. There are students of Zulu and Chinyanja, of Kongo, of Swahili, of Luganda, who are apt to attack a theory which does not exactly accord with the state of things of which they have made an exclusive study. Thus, although *tanda* is a common verb in Zulu, it has not in Zulu *all* these variations, and in some other language where it may by chance exhibit all the variations its own form is changed to *londa* or *randa*.

AUTHORITIES.—*A Comparative Grammar of South African Languages* (in two parts, left unfinished) by Dr W. H. I. BLEEK, 1869.—*Cenni di Glottologia Bantu Sud-Africana*, by Dr. GIACOMO DI GREGORIO. (Turin, 1882.) This last not much more than a paraphrase of the work of Bleek and others.—*A Sketch of the Modern Languages of Africa*, by R. N. CUST, 1882.—*Comparative Grammar of the South African Bantu Languages*, by Father J. TORREND. (Mainly based on a study of the languages of the Central Zambezi, and therefore erroneous in some deductions, and incomplete.)—*The Kilimanjaro Expedition*, by H. H. JOHNSTON, 1884. (Slight sketch of the history and structure of the Bantu languages given at the end of the book.)—*British Central Africa*, by Sir H. H. JOHNSTON (1898, second edition); a further description of the Bantu languages in general is given in this book, together with vocabularies and illustrations of the Bantu languages of South Central Africa.—*Man: Past and Present*, by Professor A. H. KEANE, 1899.—*An Encyclopædic Dictionary of the Mañanja (Mang'anja) Language of British Central Africa*, by the Rev. D. C. SCOTT, 1891.—*The Folklore of Angola*, by Dr ELI CHATELAIN.—*A Dictionary of the Kongo Language*, by the Rev. HOLMAN BENTLEY.—*Polyglotta Africana Orientalis*, by J. T. LAST.—The late BISHOP STEERE'S *Manuals of the Swahili, Shambala, and Makonde Languages*—*Introductory Handbook of the Yao Language*, by the Rev. ALEXANDER HETHERWICK.—*Vocabularies of Various Kongo Languages*, compiled by Dr A. SIMS; (published by Gilbert and Remington).

The present writer has, however, relied considerably for his information on vocabularies and other studies of Bantu languages independently compiled by himself, which are not yet accessible in print, but which he hopes to publish shortly. Some of these vocabularies (especially those to the north-west of the Bantu border line) have been printed in Foreign Office reports dealing with the Niger. Vocabularies of more or less value may also be found in Sir H. M. STANLEY'S *Through the Dark Continent*, and *In Darkest Africa*; also, in SERPA PINTO'S *How I Crossed Africa*, and in Commander V. L. CAMERON'S *Across Africa*. An interesting study of a little-known language is the *Methodo Pratico para Fallar a Lingua da Lunda*, by HENRIQUE DE CARVALHO. This work, the outcome of a Portuguese expedition to the Lunda country, was published in 1889 at Lisbon by the Imprensa Nacional. Another work which should certainly be consulted, especially in regard to the Western Bantu borderland, is KOELLE'S *Polyglotta Africana*.

(H. H. J.)

Banville, Théodore Faullain de (1823-1891), French poet and miscellaneous writer, born at Moulins in the Bourbonnais on 14th March 1823, was the son of a captain in the French navy. His boyhood, by his own account, was cheerlessly passed at a lycée in Paris; he was not harshly treated, but took no part in the amusements of his companions. On leaving school with but slender means of support, he devoted himself to letters, and in 1842 published his first volume of verse (*Les Cariatides*), which was followed by *Les Stalactites* in 1846. The poems encountered some adverse criticism, but secured for their author the approbation and friendship of Alfred de Vigny and Jules Janin. Henceforward Banville's life was steadily devoted to literary production and criticism. He printed other volumes of verse, among which the *Odes Funambulesques* received unstinted praise from Victor Hugo, to whom they were dedicated. Later, several of his comedies in verse were produced at the Théâtre Français and on other stages; and from 1853 onwards a stream of prose flowed from his industrious pen, including studies of Parisian manners, sketches of well-known persons (*Camées Parisiennes*, &c.), and a series of tales (*Contes bourgeois*, *Contes héroïques*, &c.), most of which were republished in his collected works (1875-78). He also wrote freely for reviews, and acted as dramatic critic for more than one newspaper. Throughout a life spent mainly in Paris, Banville's genial character and cultivated mind won him the friendship of the chief men of letters of his time. He was also intimate with Frédéric

Lemaître and other famous actors. In 1858 he was decorated with the Legion of Honour, and was promoted to be an officer of the order in 1886. He died in Paris on 15th March 1891, having just completed his sixty-eighth year. Banville's claims to remembrance rest mainly on his poetry. His plays are written with distinction and refinement, but are deficient in dramatic power; his stories, though marked by fertility of invention, are as a rule conventional and unreal. Most of his prose, indeed, in substance if not in manner, is that of a journalist. His lyrics, however, rank high. A careful and loving student of the finest models, he did even more than his greater and somewhat older comrades, Hugo, de Musset, and Gautier, to free French poetry from the fetters of metre and mannerism in which it had limped from the days of Malherbe. In the *Odes Funambulesques* and elsewhere he revived with perfect grace and understanding many old poetic forms, such as the *rondeau*, the *vilanelle*, and the *pantoum*. He was a master of delicate satire, and used with much effect the difficult humour of sheer bathos, happily adapted by him from some of the early folk-songs. He has somewhat rashly been compared to Heine, whom he profoundly admired; but if he lacked the supreme touch of genius, he remains a delightful writer, who exercised a wise and sound influence upon the art of his generation. (C.)

Baptists.—(1) *United Kingdom.*—The condition of the Baptists in the United Kingdom during recent years appears to have been one of steady prosperity, their members and adherents having increased at a rate probably more than proportionate to the increase of the population at large. In the *Baptist Year-Book* for 1901, the following statistics were given for their churches in 1900, excluding chapels which are "non-associated" and have no relations with the Baptist Union: churches 2739 (2812), places of worship 3918 (3798), members 365,678 (304,163), Sunday scholars 528,131 (448,921), local preachers 5562 (4155), pastors 1992 (1841). The figures in brackets are those for 1891; and in comparing them it should be borne in mind that whereas in 1891 estimated statistics were included for those churches which failed to send in returns, these are omitted in 1900, and "the figures given represent the statistics actually received in the returns from the churches"; and "the editor, as in former years, does not vouch for more than approximate correctness in the statistics." The Baptist Missionary Society, the earliest to be founded in the United Kingdom (*i.e.*, outside the Church of England), had a home income of £77,642, 2s. 9d. for the year ending 31st March 1900; and the expenditure during the same period was £81,912, 4s. 11d.: the list of missionaries on active service contains 146 names. Perhaps the most important event of recent years was the inauguration of a "Twentieth Century Fund" on the same general lines as those of the Wesleyans and Congregationalists. The proposal was to raise at least £250,000 before 21st April 1902, one half to be allotted to a "forward movement," and the rest to assisting weaker churches in the maintenance of their pastors, providing an annuity fund, building a Baptist church house, &c. Of this sum about £180,000 had been promised by August 1901; and the president of the Baptist Union declared, in the Autumn assembly of the previous year, that the movement had "risen far above money" and been productive of much spiritual good.

The *Baptist Year-Book*, published annually, gives full particulars of Baptist societies, colleges, publications, &c. (W. E. Co.)

(2) *United States.*—During the period 1875-1900 the Baptists of the United States increased more rapidly than the population as a whole, until in 1900 they reported 29,473 churches with 4,181,686 members. If to these we add numerous smaller bodies, such as the Free-Will Baptists and the Primitive Baptists, the total Baptist Church membership in the United States is about 4,500,000. But the chief growth in recent years has been in the direction of internal organization and education. Without any central ecclesiastical authority, or any one form of worship, or any one binding creed, the Baptists have developed a number of large and powerful voluntary organizations, which in turn have reacted strongly on the denominational life. Some of these were formed early in the 19th century, but many of them are of recent growth. The most important are the American Baptist Foreign Missionary Union (formed in 1814), the American Baptist Publication Society (1824), the American Baptist Home Mission Society (1832), the Southern Baptist Convention (1845), the American Baptist Historical Society (1853), the Baptist Congress (1882), the American Baptist Education Society (1888), and the Baptist Young People's Union of America (1891). Since 1870 five different Women's Societies have been formed for prosecuting missionary work at home and abroad. The Educational Society has had a notable career. Through its agency the University of Chicago was founded, and from the treasury of the Education Society sixty-six other institutions have been aided, the total assistance thus offered amounting to $1,273,100. Almost all of this was given on condition that far larger sums should be raised by others, and the resulting increase in the endowment of educational institutions has been very great. A scarcely less important work has been done by refusing aid to institutions whose further existence was needless. The Baptist Congress is an organization meeting annually in various cities for the discussion of questions of current interest, furnishing a platform on which all varieties of denominational opinion may find a hearing. It has done much to promote mutual understanding and tolerance of divergent views. The Baptist Young People's Union now includes several thousand young people's societies, and by its "Christian Culture Courses" (in which 15,000 persons were enrolled and examined in 1899) has performed a valuable work. The result of these various movements has been increased concentration of effort and centralization of administrative power, a decline of interest in sectarian controversy, and increased hospitality to new truth on the part of the entire denomination. No longer content with the attitude of protest and separation, the churches have devoted themselves to the development of their resources, and the training of leaders for the future.

The most striking change has been seen in the new attitude of the denomination towards education. In their earlier history in the United States, the Baptists were inclined to depreciate formal intellectual discipline, as tending to interfere with the spontaneity and power of true religion. But within twenty years the interest in education has advanced with unprecedented rapidity, and the gifts to education have been very generous. Brown University, founded in 1764, is the mother of all the Baptist institutions of the country. Vassar College, founded in 1861 under Baptist auspices, was the pioneer in the collegiate instruction of women in America, and marked a new epoch in American education. The University of Chicago, founded in 1890, seemed to grow up out of the prairie as if by magic, and within ten years reported 3500 students, and a property in buildings and endowment amounting to $13,000,000. This one institution has visibly changed the intellectual and religious development of the western states. Large sums have also been expended in academies and secondary schools, while the "freedmen's schools," planted by northern generosity

among the coloured people of the south, have done much to lift the level of the negro race in America. The *Baptist Year-Book* for 1900 reported as under Baptist control, seven theological seminaries with 1100 students; 104 colleges and universities with 26,000 students; and 84 academies with 11,000 students. The theological seminaries have buildings and endowment amounting to $4,850,000; the colleges and universities have about $30,000,000 in endowment and buildings; while the academies represent a valuation of $5,000,000. The result of these great endowments for Christian education is already seen in wider sympathies, a wiser evangelism, more important contributions to research and to literature, and a much higher standard of admission into the ranks of the ministry. A change of emphasis on doctrine has been a feature of great importance in recent denominational history. While retaining the essential tenets of their fathers, the new generation have acquired a new view of the Bible, a fresh interest in humanitarian effort, a new zeal in missionary enterprise, and a deeper interest in the application of truth to the present life of the world. (W. H. P. F.)

Baraba, or **Barabinskaya Steppe,** vast prairies of South-Western Siberia, between the Ob and the Irtysh, 52° to 56° N. lat., 75° to 85° E. long., comprising the Kainsk district of Tomsk and those of Omsk and Tara of Tobolsk. They are divided naturally into three parts: the Baraba proper, the Kulunda Steppe, and the Berezovaya Steppe, to which the marshy lowlands of the Vas'yugan are sometimes improperly added. The resemblance of these prairies to those of Canada about Winnipeg is striking. But nowhere in the world are vast areas of so low an altitude, *i.e.*, from 200 to 300 feet above the sea, found at such a great distance (over 1000 miles) from the ocean. They offer quite flat lowlands covered with a fertile soil, similar to the black earth of South Russia, in which even shingle had to be brought from enormous distances for the building of the railway. The slope of the surface is so gentle that immense marshes are formed farther north on the Vas'yugan, and the rivers flow lazily over the prairies, forming lakes which are rapidly drying up, while others, which formerly were freshwater lakes, have now become salt. The drying up of the lakes of the Chany basin has been so rapid that villages occupy ground that eighty years ago was covered with lakes. The Baraba Steppe has now a considerable and wealthy Russian population, distributed in large villages.

See MIDDENDORFF'S *Die Baraba.*—YADRINTSEFF in *Zapiski* of West Siber. Branch of Russ. Geogr. Soc., ii. (P. A. K.)

Bara Banki, a town and district of British India, in the Fyzabad division of Oudh. The town, which forms one municipality with Nawabganj, the administrative headquarters of the district, is 17 miles east of Lucknow by railway. The population is about 14,500; the municipal income in 1897-98 was Rs.18,940. There is some trade in sugar and cotton.

The district of BARA BANKI has an area of 1740 square miles. The population in 1891 was 1,130,906, being 649 persons per square mile. Classified according to religion, Hindus numbered 943,778; Mahommedans, 185,938; Christians, 147, of whom 21 were Europeans; "others," 1043. In 1901 the population was 1,179,532, showing an increase of 4 per cent. Land revenue and rates were returned as Rs.18,67,851, the incidence of assessment being R.1:10:2 per acre; the number of police was 4129. In 1896-97, out of a total cultivated area of 670,813 acres, 219,096 were irrigated from wells, tanks, &c. The principal crops are rice, wheat, pulse, and other food-grains, sugar-cane, and opium. Both the bordering rivers are navigable; and the district is traversed by two lines of the Oudh and Rohilkhand railway, with eleven stations. Trade in agricultural produce is active.

Baraboo, capital of Sauk county, Wisconsin, U.S.A., situated in the southern part of the state, on Baraboo river, and on the Chicago and North-Western Railway, at an altitude of 861 feet. Population (1880), 3266; (1890), 4605; (1900), 5751.

Baracaldo, a town of Spain, province of Biscay, on the Nervion or Bilbao river. It has important iron-works and a dynamite factory, and is connected by rail with all the mining districts of Somorrostro and the coast to Santander. The low flat country is covered with maize, pod fruit, and chacoli vine. Few towns in Spain have sprung up so rapidly. By 1887 its population was 8870, and by 1897, 12,709.

Baracoa, a seaport city of the north coast of eastern Cuba, the chief centre of the banana export trade. It is the oldest town in Cuba, having been settled as the first capital by Lieut.-Governor Diego Velasquez in 1511. It is also the oldest city in the territory now under the American flag. Population, 4937.

Barbados, an island of the British West Indies, lying 100 miles to the east of St. Vincent; area 166 square miles, with a dense population, which rose from 182,000 in 1891 to about 192,000 in 1900, mostly coloured. From the results of recent marine surveys Barbados would appear to belong geologically, not to the West Indian system proper, but to the Venezuelan coast range (Sierra Cumana), of which it at one time formed a seaward extension, the north-easterly direction of which is still indicated by the intervening islands of Trinidad and Tobago. It is one of the most thickly peopled lands in the world, and of the whole surface (106,500 acres) about 100,000 acres are under cultivation. The temperature is equable, ranging from 60° F. to 80° F. in the cool season, which is also the dry season (extending from Christmas to the end of May); and from 73° to 86° in the hot season. The rainfall of 1898 was 65 inches; September being the wettest month, and May the driest. The death-rate in 1898 was 39 per 1000. The density of the population compels to constant labour. The Barbadian negroes are, as a rule, more intelligent than those of the other West Indian islands. The whole island is almost entirely given up to sugar growing and manufacture: in 1898 there were 441 sugar-works in operation, with antiquated methods of machinery. Barbados is the headquarters of the Imperial Agricultural Department for the West Indies, instituted in 1898, on the recommendation of the West India Royal Commission of 1897. The value of the imports of 1896 was £1,049,000; that of 1899 was £998,006. In 1896 the exports were valued at £758,000, and in 1899 at £845,590. Of the exports, £610,405 represented produce of the colony. Of the island produce, the value of £473,750 was due to sugar, and £109,252 to molasses. The exports are distributed as follows:—to the United Kingdom, £13,834; British Colonies, £131,580; foreign countries (chiefly United States), £464,991. The imports were derived as follows:—from the United Kingdom, £429,148; British Colonies, £135,417; foreign countries (mainly United States), £433,441. The revenue for 1899 was £216,022, the expenditure for the same year being £207,883. In 1899 the revenue was swelled by a grant from the Imperial Government of £40,000 to repair damage done by the hurricane of 1898; and the expenditure by £31,443 spent on this account. In 1899 the public debt was £414,000. The revenue is derived mainly from customs and excise. The only mineral product is

"manjak," or glance pitch, a form of asphalt, which occurs in the older rocks of the Scotland district, which yielded in 1899 £2297 at £4, 10s. per ton. The manufactures of Barbados are few and comparatively insignificant—rum distilleries, a sulphuric acid factory, chemical mixing factories, one cigar and tobacco factory, and one ice factory. There is a fortnightly mail service between Bridgetown, the capital of the island, and Southampton; and also a fortnightly service between Canada and the Windward Islands and British Guiana, calling at Barbados, and frequent communication with the other West Indian Islands. A total tonnage of 632,553 entered and 632,864 cleared during 1899; but this is exclusive of a large number of vessels merely touching at the port. There is no inland telegraph, but a telephone service supplies its place, and a railway (24 miles in extent) runs partly round the island. In 1899 the island had three colleges, six secondary schools, and 171 elementary schools. In the last-named there were 25,334 children on the rolls, with an average attendance of 14,978. Codrington College was in 1899 in danger of being closed for lack of funds due to the decline of the value of the estates forming its endowment, but a special subscription was raised in England and the island, and this misfortune was averted. The police force consists of 355 officers and men. There are (1900) stationed in the island the headquarters and four companies of a British regiment and two companies of the West Indian regiment—the functions of the commanding officer extending throughout the British West Indies (except Jamaica) and British Guiana. The colony possesses representative institutions, but not responsible government. The Crown has a veto on legislation, and the Home Government controls the appointment of public officers. The Government consists of the governor, an executive council, a legislative council of nine members appointed by the Crown, and a House of Assembly having twenty-four members elected annually on the basis of a moderate franchise. The governor was for many years governor-in-chief of the Windward Islands, but in 1885 Barbados was made a separate government. (A. H. K.)

Barberino, two towns of Italy (Tuscany, province of Florence): (1) B. di Mugello, 16 miles N. of Florence. Population, about 10,500. (2) B. di Val d'Elsa, 16 miles S. by W. of Florence. It produces many chip and straw hats. Population, about 10,500.

Barberton. See TRANSVAAL.

Barbizon School, The.—This designation is applied to an illustrious group of French artists more or less associated with the village of Barbizon, near the forest of Fontainebleau, whose lives cover, roughly speaking, the first three-quarters of the 19th century. Its leaders were Corot, Rousseau, Millet, and Daubigny; and with them were associated Diaz, Dupré, Jacque, Français, Harpignies, and others less known. They founded a school of painters of the country—of its landscape and its peasant life—whose influence is so widespread that it may be traced in the art of every western nation at the present day. Each of the leaders of this group possessed a strong and individual genius, yet with all the wide differences of temperament, there exists in their work, taken as a whole, a common impulse sufficiently evident to justify the rough classification as a "school." It is, however, impossible to draw a hard and fast line; other artists, such as Decamps, Troyon, and Courbet, worked on similar lines; but, broadly speaking, the distinction of the Barbizon group is that they were the greatest of those who put aside the conventional idea of subject in their works, and in going direct to the fields and the woods for their inspiration, struck out a new path. In considering individual members of this group, it is enough to say here that the art of Corot was not allied to that of any contemporary painter, and, strictly speaking, owed nothing to Barbizon or its influences; nor perhaps did the art of Daubigny. The distinctive note of the school is seen in the work of Rousseau and of Millet, each of whom, after spending his early years in Paris, made his home in Barbizon. Unappreciated, poor, and neglected, it was not until after years of struggle that they attained recognition and success. They both died there: Rousseau in 1867, and Millet in 1875. It is difficult now to realize that their work, so unaffected and beautiful, should have been so hardly received. To understand this, it is necessary to remember the conflicts that existed between the classic and romantic schools in the first half of the 19th century, when the classicists, followers of the tradition of David, were the predominant accepted school. The romantic movement, with Géricault, Bonington, and Delacroix, was gaining favour. In 1824 Constable's pictures were shown in the Salon, and fixed the resolve of the younger men to abandon the lifeless pedantry of the schools and to seek inspiration, as he did, from nature. As may be imagined, every new departure was contested by the men in authority, who, quite honestly unable to see merit in works which ignored their cherished ideals, rejected them from the salons again and again. Rousseau was so often and persistently rejected that he was known as *le Grand Refusé*. In those troubled times Rousseau and Millet unburdened their souls to their friends, and their published lives contain many letters, some extracts from which will express the ideals which these artists held in common, and show clearly the true and firmly-based foundation on which their art stands. Rousseau wrote, "It is good composition when the objects represented are not there solely as they are, but when they contain under a natural appearance the sentiments which they have stirred in our souls. . . . For God's sake, and in recompense for the life He has given us, let us try in our works that the manifestation of life be our first thought: let us make a man breathe, a tree really vegetate." And Millet—"I try not to have things look as if chance had brought them together, but as if they had a necessary bond between themselves. I want the people I represent to look as if they really belonged to their station, and that imagination cannot conceive of their ever being anything else. People and things should always be there with an object. I want to put strongly and completely all that is necessary, for I think things weakly said might as well not be said at all, for they are, as it were, deflowered and spoiled—but I profess the greatest horror for uselessness (however brilliant) and filling up. These things can only weaken a picture by distracting the attention toward secondary things." In another letter he says—"Art began to decline from the moment that the artist did not lean directly and naïvely upon impressions made by nature. Cleverness naturally and rapidly took the place of nature, and decadence then began. . . . At bottom it always comes to this: a man must be moved himself in order to move others, and all that is done from theory, however clever, can never attain this end, for it is impossible that it should have the breath of life." It does not seem to-day that there is anything to contest in these words; nor is it easy now, on seeing how naturally the works of the Barbizon painters take their place in true line of succession with the masterpieces of the older schools, to imagine the storms that raged round them in their early days. Time has justified them; and those who led this little band now rank with the greatest of the many artists whom France proudly counts among her sons.

See D. CROAL THOMSON. *The Barbizon School.* Chapman and

Hall, 1891. (Mr Thomson gives a full list of the French authorities to be consulted.)—JULES BRETON. *Nos Peintres du Siècle.* Paris, 1900. Also the articles on COROT, MILLET, ROUSSEAU, DAUBIGNY, DIAZ, TROYON, and SCHOOLS OF PAINTING. (G. CL.)

Barbuda. See ANTIGUA.

Barcellona, a town of the province of Messina, Sicily, Italy, 27 miles W. by S. from Messina by rail. It prepares lemon juice and olive oil, manufactures macaroni and pottery, burns lime, and makes bricks. It is formed by the union of two communes—Barcellona and Pozzo di Gotto. Population about 18,000.

Barcelona, a maritime province in the N.E. of Spain, with an area of 2985 square miles. It is flat near the sea, but rises inland. The highest peak is Coll de Fou, 8317 feet. For many years Barcelona has been the most populous province in the kingdom, having in 1877 835,306 inhabitants; in 1887, 899,264; and in 1897, 1,034,538, in fact a little over the eighteenth part of the whole population of Spain. Emigration, chiefly to South America, has in no year taken more than 2000 inhabitants. The province is divided into 13 administrative districts, 3 of which constitute the city of Barcelona, and 320 parishes. None of the rivers are navigable, and the roads are in general indifferent and insufficient. The province is better off in regard to railways, of which there are 349 miles. Besides the main and more important lines, like those which communicate with Saragona (65 miles within the province), France, and Valencia, there are several useful and local lines connecting with important centres of industry. Indeed, to the Spaniards this province is, in a measure, a Manchester, Leeds, Sheffield, and Birmingham all in one. In every direction the country looks like a veritable hive of human activity and enterprise, every town and village full of "fabricas," with their tall chimneys, and alive with the din of machinery. Next to Barcelona rank as prosperous manufacturing centres, Badalona, with 18,075 inhabitants; Igualada, 10,419; Manresa, 25,121; Mataro, 19,918; Sabadell, 23,044; Tarrasa, 15,440; Vich, 11,724; Villanueva-y-Geltru, 12,046; and nine other towns, ranging from 5000 to 8000 inhabitants. There were, in 1898, 12,812 acres of irrigated soil and 91,857 acres of dry soil devoted to the culture of wheat, 51,562 acres to barley, oats, rye and maize, 22,812 to pod fruit, 13,500 to olive plantations, and 89,187 to the vine. The live stock included 11,389 horses, 9909 mules, 8293 asses, 10,499 cattle, 93,649 sheep, 20,173 goats, 18,886 pigs. The mineral productions are lead, zinc, lignite, salt, subterraneous waters; 8 salt and 13 lignite mines are in full production, but 197 mines, though duly registered, are unproductive. The province is very rich in mineral waters, containing 12 sulphurous springs, 22 chloruretted, 5 of bicarbonate, and 18 ferruginous. In point of climate the province can be divided into three distinct zones: a temperate one near the sea, where even palm and orange trees grow, a colder one in the valleys and plains, more inland, and a colder still among the mountains, where not a few peaks are snowclad for a great part of the year. In point of education this province is quite among the first in Spain, and as far back as 1880 there were 97,077 children enrolled on the school registers; the figures have since steadily increased.

Barcelona, the capital of the above province, on the shore of the Mediterranean, 310 miles N.E. of Madrid by rail. No town in Spain has increased so rapidly in importance, extent, and population. The population was, in 1887, 272,480; with the suburbs of Gracia, San Andres de Palamor, and San Martin de Provençals, 421,255; in 1897, including the same suburbs, 504,396. This increase is not due to any unusual excess of birth-rate, but chiefly to immigration from the rest of Spain. The influx has been occasioned by the extraordinary development of the industries and commerce of Barcelona since 1870. At the close of 1899 Barcelona paid about £550,000 in the shape of industrial and commercial taxes, being more than 11 per cent. of the whole amount of the said tax collected in the kingdom. Trades and industries give occupation to more than 150,000 hands of both sexes. There are powerful and numerous guilds and labour societies, and the principal trades union has enrolled more than 25,000 members. The spinning and weaving of wool, cotton, and silk are still its principal industries, but the enterprising spirit of the Catalans has impelled them to try almost every industry in which native capital could attempt to compete with foreign imports, especially since the institution of the protectionist tariffs of 1892. The prosperity has been in part due to the great development of means of communication around the city and in the four Catalan provinces. The city is the seat of the head offices of the Hispano-Colonial Bank, of the state-subsidized trans-Atlantic mail company, which has a splendid fleet of 50 steamers, and of several other great shipping companies. Its industrial companies are quite able to compete in peninsular markets with foreign rivals. The new part of the town has been adorned with splendid public promenades, parks, and public buildings. The older parts have been improved, and Barcelona has more numerous and better means of communication with its distant suburbs and environs than Madrid, in the shape of electric and steam tramways. Improvements have also been made in its port and quays, so much so, that during the Barcelona Exhibition of 1888 the fleets of ten European nations anchored inside the harbour or in the outer roadstead. During 25 years harbour duties have been levied to carry on the yet incomplete extension of the quays and harbour works.

The port of Barcelona is the most important in Spain. In 1898 3546 vessels of 2,796,367 tons (metric) entered, and 3385 of 2,743,725 tons (only 249 of 236,891 tons British) cleared: 2007 of the entrances and 1986 of the clearances were Spanish vessels, these high figures being largely due to the extent of the coasting trade. The imports from Great Britain were £1,670,568 in value in 1898, against £1,791,923 in 1897, the falling off being due to the coal strike in England and the high rates of exchanges during the war with the United States. The exports to England from Barcelona amounted in value to £126,320 in 1898, compared with £96,848 in 1897. The imports from British colonies in Asia and Africa were valued at £497,260 in 1898; exports to, at only £2947. Imports from France were valued at £476,171 in 1898; exports to, at £844,407, being an increase of £380,000 on the figures of 1897. Germany ranks next, exporting to Barcelona in 1898 goods valued at £502,413, and taking back to the value of £81,203. The war with the United States caused the imports from that country to drop from £2,512,915 in 1897 to £624,239 in 1898; but Barcelona obtained through other European markets the cotton that used to come direct from the States, as the value of cotton imported only dropped from £2,785,892 in 1897 to £2,349,384 in 1898. Comestibles, raw materials, and combustibles form the greater part of the imports, but this great manufactory singularly enough imports a considerable quantity of foreign manufactured goods, the most important items in this respect in 1898 being linen and jute goods, £268,784; woollen goods, £213,150; machinery, £230,219; and electric cables and dockyard materials, about £200,000. The principal exports are wines, cereals, olive oil, cotton goods, soap, cigarette-paper, furniture and barrels, boots, shoes and leather goods, machinery; but in almost every class there was a marked decline in 1898 compared with 1897, mainly attributable to the loss of the colonies, which falls especially heavy on Barcelona. The export of cotton goods declined £921,000 in value; soap and woollen goods each £20,000; shoes and leather goods £350,000. (A. E. H.)

Barcelona, a town of Venezuela, capital of the old state of Bermúdez (now capital of the state of Barcelona), close to the mouth of the river Neveri, and 12 miles from Guanta port by rail. At the beginning of the 19th century its population numbered 16,000

inhabitants, but is now only 9000. Among public buildings are Government house, the theatre, market, two hospitals, the Masonic temple, and several churches and educational institutions. It is an important commercial market.

Bareilly, or BARELI, a city and district of British India, in the Rohilkhand division of the North-West Provinces. The city is situated on the Ramganga river, 788 miles north-west from Calcutta. The population in 1891 was 107,785, of whom more than half were Hindus; in 1901, 117,433. The municipality consists of thirty-seven members, of whom twenty-seven are elected, but no interest is taken in the elections. The municipal income in 1897-98 was Rs.1,19,226. The principal buildings are two mosques built in the 17th century; a modern fort overlooking the cantonments; the railway station, which is an important junction on the Oudh and Rohilkhand line; the palace of the Nawab of Rampur, and the Government college. Bareilly is the headquarters of a military division under a brigadier. The chief manufactures are furniture and upholstery. In 1896-97 the college had 123 students. There is also an efficient high school. There are ten printing-presses, and an Anjuman, or literary institute, with a library and reading-room. The death-rate in 1897 was 34·13 per 1000.

The district of BAREILLY has an area of 1595 square miles; it had a population in 1891 of 1,040,950, being 652 persons per square mile, and in 1901 of 1,089,550, showing an increase of 5 per cent. Classified according to religion, Hindus in 1891 numbered 790,479; Mahommedans, 245,073; Christians, 5271, of whom 2437 were Europeans (mostly soldiers); "others," 127. The land revenue and rates were Rs.15,56,303, the incidence of assessment being R.1:5:9 per acre; the number of police was 3055. In 1896-97, out of a total cultivated area of 718,604 acres, 74,292 were irrigated from the Rohilkhand system of Government canals, and 94,045 from wells, tanks, &c. There are no manufactures except for domestic use, and little external trade. Several lines of the Oudh and Rohilkhand railway pass through the district.

Barentin, a town in the arrondissement of Rouen, department of Seine Inférieure, France, 11 miles N.W. of Rouen, with station on the railway from Paris to Havre. The town is situated in the valley of the Austreberte, a small affluent of the Seine, here crossed at a height of 100 feet by a fine railway viaduct, 540 yards long. The manufacture of cotton fabrics is the principal industry. Population (1896), 4413, comm., 5082.

Barguzin, a district town of East Siberia, province of Transbaikalia, on the Barguzin river, 27 miles from its entrance into Lake Baikal. It is situated in a large longitudinal valley which runs at the foot of the border range of the Vitim plateau, and ends in a wide prairie. Important gold mines are worked in its district; hot mineral waters are near to the town, at Turká. Population (1897), 1380.

Bar Harbor, a well-known summer resort in Hancock county, Maine, U.S.A., situated on the west shore of Frenchman Bay, on the east side of Mount Desert Island.

Bari, a seaport town, archiepiscopal see, and capital of the province of Bari, Apulia, Italy, on the Adriatic, 69 miles N.W. from Brindisi by rail. The citadel is now used as a prison. The Athenæum contains a technical school and the provincial museum. University classes are held here; and there is a nautical school. Bari is the seat of active industries—engineering works and foundries, olive-oil mills, and cooperages being the most important. The men make excellent sailors. The harbour on the west of the town has been improved since 1893; its depth varies from 11½ to 28 ft. The old harbour, on the E., is only used by fishing-boats. The exports average £2,279,700 annually (£2,521,700 in 1899); the imports £1,185,800 (£1,418,200 in 1899). The former consist principally of olive oil, wine, almonds, and cream of tartar. The shipping entering the port increased from 945 vessels of 430,242 tons in 1888 to 1789 vessels of 945,400 tons in 1899 (77 vessels of 98,780 tons being British). Population, of town (1881), 60,575; (1901), 79,693; of province (1881), 679,497; (1901), 823,998.

Barili, a town of 21,000 inhabitants, on the west coast of Cebu, Philippine Islands, in latitude 10° 16′ N. It has a relatively cool and healthful climate. Its people are agriculturists and raise Indian corn, sibucao, hemp, cacao and coffee. The language is Cebu-Visayan.

Baring Land. See NORTH-WEST TERRITORIES.

Barisal, a town of British India, headquarters of Backergunje district in Bengal, is situated on a river of the same name. Population, about 15,500. It is an important centre of river trade, on the steamer route through the Sundarbans from Calcutta to the Brahmaputra. It contains two colleges, opened without aid from government, and an English high school. There are four printing-presses, which issue two vernacular newspapers; a public library, established by subscription in 1858; and a students' union, for helping the sick and poor and promoting the intellectual and physical improvement of boys. Barisal has given its name to a curious physical phenomenon, known as the "Barisal guns," the cause of which has not yet been satisfactorily explained. These are noises, like the report of cannon, frequently heard in the channels of the delta of the Brahmaputra.

Barka. See TRIPOLI.

Barking, a market town and railway station in the Romford parliamentary division of Essex, England, on the Roding, near the Thames, 7 miles E. of Whitechapel church. Ilford, which was once a ward of Barking parish, was separated from the town in 1888, and now forms a civil parish under the metropolitan police. Victoria Gardens and a recreation ground have been opened, public baths erected, and the electric light installed. The Gaslight and Coke Company's works at Becton are in the parish, and also Warne and Company's rubber works, formerly of Tottenham, and both works employ a large number of hands, who reside in the town. Area, 3814 acres; population (1881), 9203; (1891), 14,301; (1901), 21,511.

Barkly, two towns in Cape Colony:—1. *Barkly East* lies in an upland valley near the river Kraal, which joins the left bank of the Orange a short distance above Aliwal North, and has an estimated population of over 2000; 2. *Barkly West,* formerly *Klip-drift,* stands on the right bank of the Vaal opposite Pniel in Griqualand West, about 24 miles to the north-west of Kimberley, and was the site of the first diamonds from river-diggings, which between 1870 and 1886 yielded stones to the total value of over £2,000,000, but are now nearly exhausted. The diamonds of this district are noted for their purity and lustre, and are generally associated with other crystals,—garnets, agates, quartz, and chalcedonies. After the discovery of the Kimberley diamond fields most of the Vaal diggings were abandoned, and the population of Barkly has fallen from about 4000 to less than 2000.

Barletta, a fortified seaport town and archiepiscopal see of the province of Bari, Apulia, Italy, on the S. shore of the Gulf of Manfredonia, 42 miles E.S.E. from Foggia. In 1887 it had an export trade in wine (90 per cent.), brandy, and tartaric acid of the aggregate value of £1,655,000.

By 1895 this had declined to a total of only £137,000, but since then it has increased again (£276,600 in 1899). The port is cleared by an average of 440 vessels of 294,500 tons annually. The chief industry is the manufacture of tartaric acid. Population (1881), 31,994; (1900), 44,891.

Barmen, a town in the Rhine province, Prussia, immediately E. of Elberfeld, 35 miles E. from Düsseldorf by rail. Its industries are identical with those of Elberfeld, with which it virtually makes one town. A pantheon or hall of glory (1900) is destined to contain statues of the Emperors William I. and Frederick III., the municipal library, the collections of the Berg Historical Society, and those of the Barmen Art Association. There are also a new concert hall and a monument of the 1870-71 war. Population (1890), 116,144; (1900), 141,947.

Barnard Castle, a market town and railway station, in the Barnard Castle parliamentary division of Durham, England, on the Tees, 15 miles W. of Darlington. Recent erections are a large county school, two Methodist chapels, and a fever hospital. The Bowes Museum has been extended and endowed. Area of township, 7790 acres; population (1881), 4269; (1891), 4725. Area of urban district, 533 acres; population (1881), 4096; (1901), 4421.

Barnby, Sir Joseph (1838-1896), English musical composer and conductor, was born at York on 12th August 1838. He was a chorister at York Minster from the age of seven, was educated at the Royal Academy of Music under Cipriani Potter and Charles Lucas, and was appointed in 1862 organist of St Andrew's, Wells Street, London, where he raised the services to a high degree of excellence. He was conductor of "Barnby's Choir" from 1864, and in 1871 was appointed, in succession to Gounod, conductor of the Albert Hall Choral Society, a post he held till his death. In 1875 he was precentor and director of music at Eton, and in 1892 became principal of the Guildhall School of Music, receiving the honour of knighthood in July of that year. His works include an oratorio, *Rebekah*, Ps. xcvii., many services and anthems and hymn-tunes, as well as some part-songs (among them the popular "Sweet and Low"), and some pieces for the organ. As a conductor he possessed the qualities as well as the defects of the typical north-countryman; if he was wanting in the higher kind of imagination or ideality, he infused into those who sang under him something of his own straightforward rectitude and uncompromising precision. He was largely instrumental in stimulating the love for Gounod's sacred music among the less educated part of the London public, although he displayed little practical sympathy with opera, the branch of art in which Gounod's best powers were manifested. On the other hand, he organized a remarkable concert performance of *Parsifal* at the Albert Hall in London in 1884. He conducted the Cardiff Festivals of 1892 and 1895. He died in London on the 28th of January 1896. (J. A. F. M.)

Barnes, William (1800-1886), the Dorsetshire poet, was born 22nd February 1800, at Rushay, near Pentridge in Dorset, the son of John Barnes and Grace Scott, of the farmer class. He was a delicate child, in direct contrast to a strong race of forebears, and inherited from his mother a refined, retiring disposition and a love for books. He went to school at Sturminster Newton, where he was considered the clever boy of the school; and, when a solicitor named Dashwood applied to the master for a quick-witted boy to join him as pupil, Barnes was selected for the post. He was therefore apprenticed to the law, and worked with the village parson in his spare hours at classics, and studied music under the organist. In 1818 he left Sturminster for the office of one Coombs at Dorchester, where he continued his evening education with another kindly clergyman. He also made great progress in the art of wood-engraving, and with the money he received for a series of blocks for a work called *Walks about Dorchester*, he printed and published his first book, *Orra, a Lapland Tale*, in 1822. In the same year he became engaged to Julia Miles, the daughter of an excise officer. In 1823 he took a school at Mere in Wiltshire, and four years later married and settled in Chantry House, a fine old Tudor mansion in that town. The school grew in numbers, and Barnes occupied all his spare time in assiduous study, reading during these years authors so diverse in character as Herodotus, Sallust, Ovid, Petrarch, Buffon, and Burns. He also began to write poetry, and printed many of his verses in the *Dorset County Chronicle*. His chief studies, however, were philological; and in 1829 he published *An Etymological Glossary of English Words of Foreign Derivation*. In 1832 a strolling company of actors visited Mere, and Barnes was so pleased by their performance that he wrote a farce, *The Honest Thief*, which they produced, and also a comedy which was played at Wincanton. Barnes also wrote a number of educational books, such as *Elements of Perspective*, *Outlines of Geography*, *An Essay on the Advantages of the Study of Mathematics*, and in 1833 first began his poems in the Dorsetshire dialect in the pages of the local paper. In 1835 he left Mere and returned to Dorchester, where he started another school, which, after its removal in 1837 into more commodious quarters, flourished satisfactorily. The year 1844 is a landmark in Barnes's life, for it was then that he published his first series of Dorsetshire poems. They made considerable literary success, the Hon. Mrs Norton busying herself with the advocacy of their claims. Three years later Barnes took holy orders, and was appointed to the care of Whitcombe, three miles from Dorchester. He had been for some years upon the books of St John's College, Cambridge, and took the degree of B.D. in 1850. He resigned Whitcombe in 1852, finding the work too hard in connexion with his mastership; and in June of that year he lost his wife, whom he never ceased to mourn with an intensity of devotion. Continuing his studies in the science of language, he published his *Philological Grammar* in 1854, a remarkable compilation, drawing examples from more than seventy languages. For the copyright of this erudite work he received £5. The second series of dialect poems, *Hwomely Rhymes*, appeared in 1857, and the third in 1863. *Hwomely Rhymes* contained some of his best-known pieces, and in the year of its publication he first began to give readings from his works, which were extremely successful. As their reputation grew he travelled all over the country, delighting large audiences with his quaint humour and natural pathos. In 1861 he was awarded a civil list pension of £70 a year, and at the close of the same year published *Tiw*, the most striking of his philological studies, in which an attempt is made to trace the English language to a Teutonic origin. In the next year he broke up his school, and removed to the rectory of Winterborne Came, to which he was presented by his old friend, Captain Damer. Here he worked continuously at verse and prose, contributing largely to the magazines. He was persuaded in 1868 to publish a series of *Poems of Rural Life* in ordinary English, but he was less successful in verse which abandoned dialect. His poems were collected into a single volume in 1879, and on 11th October 1886 he died at Winterborne Came. Barnes's poetry is

essentially English in character; no other writer has given quite so simple and sincere a picture of the homely life and labour of rural England. His work is full of humour and the clean, manly joy of life; and its rusticity is singularly allied to a literary sense and to high technical finish. He is indeed the Victorian Theocritus; and, as English country life is slowly swept away before the advance of the railway and the telegraph, he will be more and more read for his warm-hearted and fragrant record of rustic love and piety. (A. WA.)

Barnet.—Three English towns in the St Albans parliamentary division of Hertfordshire bear this name: (1) CHIPPING or HIGH BARNET, a market town 11 miles north of London by rail; population of parish (1881), 4283; (1891), 4563. (2) EAST BARNET, a village 2 miles south of the above; population of East Barnet Valley urban district (1891), 7715; (1901), 10,094. (3) NEW BARNET, a town formed by portions of the two preceding parishes, with a station 9 miles north of London. The urban district of Barnet has an area of about 690 square miles, and had a population of 6437 in 1891 and 7876 in 1901.

Barnfield, Richard (1574-1627), an English poet, whose obscure though close relationship with Shakespeare has long made him interesting to students, has attracted of late years further attention from the circumstance that important discoveries regarding his life have been made. Until recently nothing whatever was known about the facts of Barnfield's career, whose very existence had been doubted. It was, however, discovered by the late Dr Grosart that the poet was the son of Richard Barnfield (or Barnefield) and Maria Skrymsher, his wife, who were married in April 1572. They resided in the parish of Norbury, in Staffordshire, on the borders of Salop, where the poet was baptized on the 13th of June 1574. The mother died in giving birth to a daughter early in 1581, and her unmarried sister, Elizabeth Skrymsher, seems to have devoted herself to the care of the children. In November 1589 Barnfield matriculated at Brasenose College, Oxford, and took his degree in February 1592. He "performed the exercise for his master's gown," but seems to have left the university abruptly, without proceeding to the M.A. It is conjectured that he came up to London in 1593, and became acquainted with Watson, Drayton, and perhaps with Spenser. The death of Sir Philip Sidney had occurred while Barnfield was still a school-boy, but it seems to have strongly affected his imagination, and to have inspired some of his earliest verses. In November 1594, in his twenty-first year, Barnfield published anonymously his first work, *The Affectionate Shepherd*, dedicated with familiar devotion to Lady Penelope Rich. This was a sort of florid romance, in two books of six-line stanza, in the manner of Lodge and Shakespeare, dealing at large with "the complaint of Daphnis for the love of Ganymede." As the author expressly admitted later, it was an expansion or paraphrase of Virgil's second eclogue—

"Formosum pastor Corydon ardebat Alexin."

This poem of Barnfield's was the most extraordinary specimen hitherto produced in England of the license introduced from Italy at the Renaissance. Although the poem was successful, it did not pass without censure from the moral point of view. Into the conventional outlines of *The Affectionate Shepherd* the young poet has poured all his fancy, all his epithets, and all his coloured touches of nature. If we are not repelled by the absurd subject, we have to admit that none of the immediate imitators of *Venus and Adonis* has equalled the juvenile Barnfield in the picturesqueness of his "fine ruff-footed doves," his "speckled flower call'd sops-in-wine," or his desire "by the bright glimmering of the starry light, to catch the long-bill'd woodcock." Two months later, in January 1595, Barnfield published his second volume, *Cynthia, with certain Sonnets*, and this time signed the preface, which was dedicated, in terms which imply close personal relations, to William Stanley, the new Earl of Derby. This is a book of extreme interest; it exemplifies the earliest study both of Spenser and Shakespeare. "Cynthia" itself, a panegyric on Queen Elizabeth, is written in the Spenserian stanza, of which it is probably the earliest example extant outside *The Faerie Queene*. This is followed by a sequence of twenty sonnets, which have the extraordinary interest that, while preceding the publication of Shakespeare's sonnets by fourteen years, they are closer to them in manner than are any others of the Elizabethan age. They celebrate, with extravagant ardour, the charms of a young man whose initials seem to have been J. U. or J. V., and of whom nothing else seems known. These sonnets, which preceded even the *Amoretti* of Spenser, are of unusual merit as poetry, and would rank as high in quality as in date of publication if their subject-matter were not so preposterous. They show the influence of Drayton's *Idea*, which had appeared a few months before; in that collection also, it is to be observed, there had appeared amatory sonnets addressed to a young man. If editors would courageously alter the sex of the pronouns, several of Barnfield's glowing sonnets might take their place at once in our anthologies. Before the publication of his volume, however, he had repented of his heresies, and had become enamoured of a "lass" named Eliza (or Elizabeth), whom he celebrates with effusion in an "Ode." This is probably the lady whom he presently married, and as we find him a grandfather in 1626, it is unlikely that the wedding was long delayed. In 1598 Barnfield published his third volume, *The Encomion of Lady Pecunia*, a poem in praise of money, followed by a sort of continuation, in the same six-line stanza, called "The Complaint of Poetry for the Death of Liberality." In this volume there is already a decline in poetic quality. But an appendix of "Poems in diverse Humours" to this volume of 1598 presents some very interesting features. Here appears what seems to be the absolutely earliest praise of Shakespeare in a piece entitled "A Remembrance of some English Poets," in which the still unrecognized author of *Venus and Adonis* is celebrated by the side of Spenser, Daniel, and Drayton. Here also are the sonnet, "If Music and sweet Poetry agree," and the beautiful ode beginning, "As it fell upon a day," which were until recently attributed to Shakespeare himself. In the next year, 1599, *The Passionate Pilgrim* was published, with the words "By W. Shakespeare" on the title-page. It was long supposed that this attribution was correct, but Barnfield claimed one of the two pieces just mentioned, not only in 1598, but again in 1605. It is certain that both are his, and possibly other things in *The Passionate Pilgrim* also; Shakespeare's share in the twenty poems of that miscellany being doubtless confined to the five short pieces which have been definitely identified as his. In the opinion of the present writer, the sonnet beginning "Sweet Cytherea" has unmistakably the stamp of Barnfield, and is probably a gloss on the first rapturous perusal of *Venus and Adonis*; the same is to be said of "Scarce had the sun," which is *aut Barnfield, aut diabolus*. One or two other contributions to *The Passionate Pilgrim* may be conjectured, with less confidence, to be Barnfield's. It has been stated that the poet was now studying the law at Gray's Inn, but for this the writer is unable to discover the authority, except that several members of that society are mentioned in the course of the volume of 1598. In all probability Barnfield now married and with-

drew to his estate of Dorlestone (or Darlaston), in the county of Stafford, a house romantically situated on the river Trent, where he henceforth resided as a country gentleman. In 1605 he reprinted his *Lady Pecunia*, and this was his latest appearance as a man of letters. His son Robert Barnfield and his cousin Elinor Skrymsher were his executors when his will was proved at Lichfield; his wife, therefore, doubtless predeceased him. Barnfield died at Dorlestone Hall, and was buried in the neighbouring parish church of St Michael's, Stone, on the 6th of March 1627. The labours of Dr Grosart and of Professor Arber have thrown much light on the circumstances of Barnfield's career. He has taken of late years a far more prominent place than ever before in the history of English literature. This is due partly to the remarkable merit of his graceful, melodious, and highly-coloured verse, which was practically unknown until it was privately printed in 1876 (Grosart), and at length given to the public in 1882 (Arber). It is also due to the mysterious personal relation of Barnfield to Shakespeare, a relation not easy to prove in detail, as it is built up on a great variety of small indications. It is, however, obvious that Barnfield warmly admired Shakespeare, whose earliest imitator he may be said to have been, and that between 1595 and 1600 the younger poet was so close to the elder that the compositions of the former could be confused with those of the latter. Barnfield died, as a poet, in his twenty-fifth year. Up to that time he had displayed a talent which, if he had pursued it, might have placed him very high among the English poets. As it is, he will always interest a certain number of readers as being, in his languid "Italianate" way, a sort of ineffectual Meleager in the rich Elizabethan anthology. (E. G.)

Barnsley, or Black (more properly Bleak) Barnsley, a municipal borough in the Barnsley parliamentary division of Yorkshire, England, 15 miles N. of Sheffield. The borough received a separate commission of the peace in 1895. Modern erections are a church, a new court-house, a public hall, an institute, and a free library (cost about £27,000). The hospital has been enlarged. Area, 2386 acres; population (1881), 29,790; (1891), 35,427; (1901), 41,083.

Barnstaple, a municipal borough, port, and market town, in the Barnstaple parliamentary division (since 1885) of Devonshire, England, on the Taw, 6 miles from its mouth, and 40 miles N.W. of Exeter by rail. The ancient church of St Peter and St Paul has been restored, that of St John the Baptist enlarged, and the infirmary twice extended. Registered shipping in 1900, 43 vessels of 1915 tons; in 1899, 3202 vessels of 212,873 tons entered, and 3167 of 210,822 tons cleared. Area of municipal borough, 1837 acres. Population (1881), 12,282; (1891), 13,058; (1900), 14,137.

Baro River. See NILE.

Baroda, a native state of India, within the Gujarat province of Bombay, but in direct relations with the governor-general. It consists of four isolated divisions, each of which is surrounded by British territory or by other native states. Three of these—Kari, Baroda, and Nausari—are in Gujarat proper; the fourth, Amreli with Okhamandal, is in the peninsula of Kathiawar. The total area covers 8226 square miles. In 1881 the population was 2,185,005; in 1891 it was 2,415,346, giving an average density of 294 persons per square mile, compared with 301 for the Gujarat division of Bombay. Classified according to religion, Hindus numbered 2,137,568; Mahommedans, 188,740; Jains, 50,332; Parsis, 8206; Christians, 646; aborigines, 29,854. In 1901 the population was 1,950,927, showing a decrease of 19 per cent., compared with an increase of 11 per cent. in the preceding decade.

The last Gaekwar, Mulhar Rao, was deposed in 1875 for gross misgovernment; but the widow of his brother and predecessor, Khande Rao, was permitted to adopt an heir from among the descendants of the founder of the family. This heir, by name Sayaji Rao, then a boy of twelve years, was educated by an English tutor, the administration being meanwhile placed for eight years under the charge of the late Sir Madhava Rao, formerly Diwan of Travancore, one of the ablest and most enlightened of Indian statesmen. The result was a conspicuous success. The Gaekwar has been a model prince, and his territories are as well governed and prosperous as a British district. He has repeatedly visited Europe in company with his wife. In 1887 the Queen-Empress conferred upon him at Windsor the insignia of G.C.S.I., and in 1892 upon his wife the Imperial order of the Crown of India.

In 1894-95 the gross revenue amounted to Rs.1,68,14,810, or more than a million sterling. The total expenditure was Rs.1,62,36,227. The amount of silver coined in 1894-95 was Rs.31,80,000; but in 1901 the state currency of Babashai rupees was withdrawn, and the British rupee was introduced. The regular military force consists of 1 field battery, 4 regiments of cavalry, and 5 battalions of infantry: total strength, 5000 men, of whom 13 are Europeans. In addition, there is an irregular force of 2000 horse and 1800 foot. The police numbers 4304 men, being 1 for every 547 of the population. In 1897-98 the total number of vernacular schools was 1356, attended by 78,101 boys and 14,892 girls. The proportion of boys at school to those of school-going age is 42 per cent., compared with 27 per cent. for the Bombay presidency; and the proportion of girls 7·2 per cent., compared with 4·2 per cent. For a few years compulsory education has been enforced in 30 villages of the Amreli division with apparent success, the compulsory age being 7 to 12 for boys and 7 to 10 for girls. Special measures are also adopted for the education of low castes and aboriginal tribes. There is a female training college under a Christian lady superintendent. In 1894-95 the Baroda college was attended by 164 students. There were 2 high schools, 13 Anglo-vernacular schools, and 5 aided schools, with a total of 5334 pupils, of whom 51 passed the matriculation. The Kala Bhavan, or technical school, with departments for drawing, carpentry, dyeing, weaving, and agriculture, was attended by 139 students. There is also a state museum under a European director, and a state library of about 6000 volumes. The number of hospitals and dispensaries is 51, which were attended in 1894-95 by 5837 indoor and 339,844 outdoor patients. Portions of the state are crossed by the Bombay and Baroda and the Rajputana railways. In addition, the state has constructed three railways of its own, on three different gauges: total length, 177 miles. Other railways are in contemplation. The state supports a cotton mill, with 260 looms and 12,734 spindles, employing 600 hands. Baroda has suffered considerably from the plague, the total number of deaths down to July 1897 having been 2950; and also from the famine of 1899-1900, the persons in receipt of relief averaging about 60,000 a month.

The city of BARODA is situated in 22° 17′ N. lat. and 73° 16′ E. long., on the river Viswamitri, a station on the Bombay and Baroda railway, 247 miles north of Bombay. The population in 1881 was 106,512; in 1891 it was 116,420; and in 1901 it was 103,782. The municipal area is about 8 square miles, giving a density of 14,059 persons per square mile. The municipal expenditure in 1894-95 was Rs.2,69,273, almost entirely contributed by the state. The whole aspect of the city has been

changed by the construction of handsome public buildings, the laying-out of parks, and the widening of the streets. An excellent water-supply is provided from the Ajwa lake. The cantonments, garrisoned by a native infantry regiment, are under British jurisdiction, and have a population of 4000. They contain an Anglo-Indian school, and 2 vernacular schools for boys and girls. In 1894-95 the Baroda high school was attended by 560 boys, of whom 38 passed the Bombay matriculation; and the Anglo-vernacular school by 351 boys. There are also 31 vernacular schools, with 4984 pupils. The chief hospitals are called after the countess of Dufferin, Jamnabai, and Sayaji Rao, with a total of 2856 indoor patients. (J. S. Co.)

Barotse.—This is the name given to a country and a people in South-Central Africa. The name is sometimes spelt Barutse, and is said to be derived from a corruption of Bahurutse, the name of a Bechuana tribe. The word is also given with a different plural prefix as Marotse. It will probably survive for general use in the form which heads this article. Barotseland lies along both banks of the upper Zambezi, from the junction of the Kabompo and the Liambai to the junction of the Kwando and the main Zambezi at Kasungula. Politically, it may be also held to include the adjoining countries inhabited by the Batoka and the Bashukulumbwe—in short, the basins of the upper Zambezi and of the Kafue rivers. On the north it is bounded by Portuguese West Africa and the Congo Free State, on the east by British Central Africa (of which it is sometimes considered to form a geographical part), on the south by Rhodesia, and on the west by the German and Portuguese possessions. Barotseland proper is the very marshy and unhealthy country along the banks of the upper Zambezi, which at certain seasons of the year spreads its floods far and wide. The extreme north of Barotseland is densely forested; elsewhere trees are few and far between. The Batoka and the Bashukulumbwe countries chiefly consist of plateaux with an average elevation of about 2500 feet, here and there rising into hills and mountain ranges of no great altitude. The river Kafue, which is also known as the Kafukwe and the Luenge, is the second most important river of Barotseland, and is by some geographers considered to have been the original head-waters of the Zambezi, in the days before the present upper Zambezi by means of the crack known as the Victoria Falls was deflected towards the Indian Ocean.

The indigenous Negro race of Barotseland proper is known as the Baloi or Balui. They are Bantu Negroes, speaking dialects more nearly related to those of the southern Congo basin than to the Zambezi tongues. Their country was invaded in the early part of the 19th century by ravagers from Bechuanaland across the Zambezi, a people who generally went by the name of Mokololo, but who eventually adopted the term Barotse. These Bechuana conquered Barotseland, and ruled it for about forty years, when an uprising among the indigenous Baloi drove them from power and replaced them by a native dynasty. Nevertheless, Bechuana influence in the country is very marked, and for some time the Bechuana language was the Court tongue. The present king of Barotseland is named Lewanika, and his capital city on the upper Zambezi is Lialui. Lewanika is a very enlightened monarch as African princes go, and rules his country with wisdom, and much under the advice of a Resident of the British South Africa Company and of French Protestant missionaries, who have long been settled in the country. Lewanika's hold upon the Batoka and the Bashukulumbwe is very dubious, but it is probable that for political purposes it may be strengthened, as the best means of bringing these wild tribes under reasonable subjection. There is a good deal of the West African strain in the manners and customs, trade and religion, of the Barotse, or more properly speaking, of the Baloi. Having, however, for many years past (from the Bechuana invasion and the settlement of the French Protestant missionaries) been brought into connexion with British South Africa commercially, and finally politically, there is a certain amount of "Cape" influence in the new civilization which is springing up. On the other hand, the Batoka, and still more the Bashukulumbwe, are in a completely savage state. The men go absolutely naked (as was formerly the case with allied tribes in West Nyasaland) and wear their hair with artificial additions in a tremendously long peak which is drawn to a fine whip-like point. Physically, they are a fine, handsome race, though the Barotse are not so, resembling rather the West African Negroes in appearance. It is probable that the Bashukulumbwe are in remote origin nearly allied to the Zulu Kaffirs. The Batoka and Bashukulumbwe country is fairly healthy, and adapted for European settlement as much as the Rhodesian territory to the south. On the other hand, Barotseland proper is exceedingly unhealthy, and quite unfitted for European occupation. In flora and fauna Barotseland is closely connected with British Central Africa, though in the north-west there is a marked infusion of West African forms. Politically, the country lies within the limits of the British Empire. It remains under the government of its king, but the British South Africa Chartered Company has by treaty a certain interest in its government, and maintains a Resident at the court of King Lewanika. For geographical reasons it is probable that Barotseland will one day form part of the South African congeries of states, and will be administered quite independently of its eastern neighbour, British Central Africa, which in peoples, languages, history, and methods of administration tends much more towards Eastern Africa and Zanzibar.

See Livingstone. *Missionary Travels and Researches in South Africa.* London, 1857.—Major Serpa Pinto. *How I Crossed Africa.* London, 1881.—Coillard. *On the Threshold of Central Africa.* London, 1897.—Major St H. Gibbons. *Exploration and Hunting in Central Africa.* London, 1898.—"Journeys in Barotseland," *Geographical Journal*, 1901.—Bertrand. *Aux Pays des Barotse, Haut Zambèze.* Paris, 1898.—Décle. *Three Years in Savage Africa.* London, 1898. (H. H. J.)

Barquisimeto, capital of the state of Lara, in Venezuela, in a valley, 1711 feet above the level of the sea. Its population numbers 40,000. It is an important commercial centre, having great facilities for communication with the states of Carabobo, Zamora, and Falcón, and is connected by rail with the port of Tucacas. It is the seat of an episcopal chair, has many colleges and schools, both public and private, hospitals, &c. The main buildings are the Government palace, the barracks, the market, the cathedral, and several other churches.

Barrackpore, or North Barrackpore, a town of British India, in the Twenty-four Parganas district of Bengal, lies on the left bank of the Hooghly, 15 miles above Calcutta. Population, about 21,000. It is the largest cantonment in Lower Bengal, having accommodation for two batteries of artillery, the wing of a European regiment, and two native battalions. It is a station on the Eastern Bengal railway. A fine park along the river contains the country residence of the Viceroy. The English high school was attended in 1896-97 by 201 pupils.

Barracks.—Barracks are necessary accompaniments of a standing army. As long as operations in the field were carried on by means of troops levied especially for the war in hand, no barracks apart from fortifications

were required except those for the royal body-guard; and even after the standing army exceeded those limits, the necessity for additional barracks was often avoided by having recourse to the device of billeting, *i.e.*, quartering the soldiers on the populations of the towns where they were posted. This, however, was a device burdensome to the people, subversive of discipline, and prejudicial to military efficiency in many ways, while it exposed the scattered soldiers to many temptations to disloyalty. Hence, instead of billeting soldiers, there were gradually provided for them barracks, which, in the case of the British empire, were first erected at stations where such an arrangement was most necessary owing to the paucity of the population, or where concentration of troops was most important owing to the disaffection of some of the inhabitants. These barracks sometimes formed part of fortifications and their character was subordinate to considerations of defence. Generally, however, they were separate, and it is such only that are dealt with in this article.

It was in France, where, in the reign of Louis XIV., provision had to be made for the housing of a huge standing army, that barracks were first built upon an organized plan. In 1680 Vauban devised and introduced a system of barrack construction which became universally adopted in France, and maintained its position there for nearly two centuries. Its leading features may be briefly described as follows:—The barrack was a square building of masonry of two or more storeys, with a courtyard in the centre. Staircases connected from the ground with each floor. On either side of the staircase-landings two parallel barrack rooms opened—the one lying to the front and the other to the back (the courtyard side), separated from each other by a stout partition wall. These wards were the barrack rooms of the men for all purposes—living, sleeping, eating, and the furbishing of accoutrements. In process of time the partition wall was removed, and both rooms being thus thrown into one, better ventilation was gained. After an unbroken existence of nearly two centuries the "Vauban" system was modified by that known as the "Belmas," which introduced a corridor in place of the discarded partition wall. The evils attendant upon this change in internal construction were, from the hygienic point of view, soon apparent. Not only was the corridor dark and incapable of ventilation, but there was a constant interchange of effluvia from one ward to the other through the doors opening into the passage, and the result was soon seen in increased sickness and mortality. Germany and Austria followed in the main the Spanish system, the characteristics of which were an open gallery running round the courtyard quadrangle on every floor, upon which the barrack rooms opened.

Continental systems.

The year 1874 inaugurated a new era in barrack construction for the two leading military nations of Europe. With the lessons of the field hospitals in the Franco-German war fresh upon them, and in view of the beneficial results attained in them, each country set itself to work to devise a better sanitary system of housing troops than had hitherto obtained. A new departure was made from the quadrangular systems above described. The "Front" system was now introduced, and became almost universally adopted in the case of new erections. Barracks were now built upon the following plan:—The main building was an oblong front block of at most three storeys, with wings running back at each end, but not exceeding in depth one-third of the frontage. The advantages of this system were increased light and air, and the greater facility afforded for keeping outhouses, such as latrines, wash-houses, kitchens, and harness rooms, away from the living and sleeping accommodation for the men. The floor- and air-space allotted to each man in the German barracks under the new system is about 550 cubic feet air-space and 49 square feet floor-space. Barracks on this plan have been built in France to accommodate as many as 5000 men under one roof. But perhaps the most perfect arrangement of the kind is to be found in Dresden. The so-called "Albertstadt," situated about two miles from the centre of that city, consists of seven or more of such barracks, erected on a spacious and even sumptuous scale, with a total frontage of close upon two miles. Indeed, it is only in Germany and in the United States of America where as yet provision has been made for separate living and sleeping accommodation for the soldiers. But in spite of all that the best architects and builders could devise, it has been found, even in the model "Albertstadt" of Dresden, that the sanitary conditions of any system of complete centralization leave much to be desired, as compared with the decentralization exemplified in the pavilion system, which was first established in England after the Crimean war. A somewhat similar system to this, known as the *Tollet*, was introduced in France in 1875, going further in the direction of decentralization even than the English. Its main characteristics are the following:—1. Every pavilion to be of one storey, to have a pitched roof, and to contain at most seventy men. 2. The blocks to be built on stone foundations, and the structure of iron skeleton framework filled in with non-porous bricks. The materials used to be non-inflammable, and capable of being thoroughly cleansed. 3. The blocks to be built outside towns, and 55 square yards space to be allowed per head within the area assigned to the whole of the barrack erections, whilst in the barrack rooms 33 square feet floor-space and 760 cubic feet air-space are allowed for each foot soldier, and 41 square feet floor-space and 860 cubic feet air-space for each trooper. 4. Each block to have separate wash-houses and latrines; whilst the furniture of all rooms must be such as permits of thorough and rapid cleansing and disinfecting. 5. Every block has in the centre an anteroom fitted with all appliances for washing, whilst to the right and left lie the barrack rooms, each 63 feet long and 21 feet broad, lighted by eight large windows, and with ventilators in the roof. At the end of each ward are two rooms occupied by the under-officers responsible for the discipline and general supervision of the rooms. The hygienic results of this change of barrack system in France have been considered very satisfactory.

British Army.—The earliest barracks of which there is record, as regards England, were those for the royal body-guard, *i.e.*, those for the foot-guards, erected in 1660. Among the earliest of those still existing were the Royal Barracks at Dublin, dating from the beginning of the 18th century, about which time barracks were built in several parts of Ireland, but the great barrack-building era in England was the end of the 18th and the beginning of the 19th century, *i.e.*, during the great wars with France. That period saw the erection of a very large number of barracks in towns in Great Britain and Ireland and in the colonies. Communication being slow and difficult, while there was much distress owing to the war, and consequently frequent riots, the barracks were generally placed in large or market towns, where the troops could be most easily supplied, where they would be at hand for putting down disturbances, and where recruits could be most readily obtained. Few barracks were built on a large scale during the next forty years, but the same policy held the field, in spite of the introduction of railroads and steamships, the invention of the electric telegraph, and the establishment of organized and efficient police forces. On the other hand, those forty years

were a critical period. Apart from the violence of strikes and anti-machinery riots, and the excitement of parliamentary elections, there was the tension caused by the Roman Catholic Emancipation Bill, the great Reform Bill, and the abolition of the Corn Laws, besides the catastrophe of the Irish famine, and the Chartist upheaval of 1848, while the effect of the fundamental alteration in the matter of communication had not as yet been fully realized.

The Crimean war and the adoption of rifled guns and small arms brought about a great change. It was recognized that, after the necessary garrisons of fortresses had been provided for, the leading principle of barrack policy must in the future be to facilitate in peace time the training of the army for war; and that this could only be done by barracking troops in large bodies, including all branches of the service, in positions where they would have space for training, gun and rifle practice, and manœuvring. The camps at Aldershot, Colchester, Shorncliffe, and Curragh were accordingly started between 1856 and 1860, and the same policy has been since pursued by the acquisition of Strensall Common, near York, Kilworth domain, near Fermoy, the lease of a portion of Dartmoor and a large area at Glen Imaal, county Wicklow, for the Horse and Field Artillery, and finally the purchase of a great part of Salisbury Plain. It is not at all these places that there are or will be regular barracks. In some cases the troops are encamped while training; but the principle remains that, when permanent barracks are built, they should as a rule be for a force of all arms in a locality where they can be trained. With the present means of communication support to the civil power in case of disturbances can always be afforded in time, without permanently stationing troops in the actual locality where their assistance may be needed.

Old-type barracks.

Unfortunately, however, the old barracks, such as those of the beginning of the 19th century, exist in many towns, and for economy's sake must for the present be utilized. These barracks were built before the true principles of sanitary science were known, and the health of the troops stationed in them was very bad, while the accommodation they afforded was insufficient in many respects. Hardly any provision was made for married men, who were generally placed with their wives and families in ordinary barrack rooms, the space allowed for four single soldiers being allotted to each family, with no privacy beyond that afforded by screens of blankets erected by the occupants. Even for single men the accommodation was inadequate, the space allowed per man being seldom over 450 cubic feet, and sometimes as low as 258 feet, while most of the rooms had windows only on one side, and there were no special means of ventilation. The latrines were often mere privies; the ablution arrangements were very rough, and baths there were none, while the only means of cooking provided for the soldiers was by boiling. There was no sergeants' mess or recreation establishment, while the accessories that were provided were far short of the modern standard. The buildings were often arranged so as to interfere with the proper circulation of air, and the drainage was almost invariably bad.

The result of this state of affairs was disastrous. As late as 1857 the annual rate of mortality in the army at home per 1000 men was 17·5, while the rate among the civil male population of corresponding ages was only 9·2. Contrast with this the rate of mortality in the army at home forty years later, in 1897, which was only 3·42 per 1000. It is not contended that improvement in barracks was the only factor in thus reducing mortality. There have been other causes at work, such as better clothing, better food and cooking, greater temperance, education, amusements, careful supervision of health, and the introduction of short service; but still, the most effectual cause has probably been the improvement in barrack accommodation. The disasters of the Crimean war directed public attention to the health of the army, and resulted in the appointment of the "Official Committee on Barrack Accommodation for the Army," presided over by Viscount Monk, M.P., which reported in 1855. This was followed by a Royal Commission in 1857, resulting, in October 1857, in the appointment of the Barrack and Hospital Improvement Commission to go into the matter in detail as regards the United Kingdom and the Mediterranean stations. The reports of this commission, presented in 1863, besides containing valuable recommendations for the improvement of almost every barrack inspected by them, laid down the general sanitary principles applicable to the arrangement and construction of military barracks and hospitals, and in spite of the lapse of time they may be still regarded as text-books of sanitary science as applied to the construction and improvement of such buildings. The labours of many contributed to that result, but beyond all others should be remembered the names of Sidney Herbert (afterwards Lord Herbert of Lea), Captain (afterwards Sir Douglas) Galton, R.E., F.R.S., and John Sutherland, M.D. The Barrack and Hospital Improvement Committee was constituted as a standing body in 1862 to continue the work of the commission, changed its name to that of the Army Sanitary Committee in 1865, was reconstituted in 1890, and remains to this day the principal adviser of the Secretary of State for War on sanitary matters. In accordance with the recommendations of these bodies great changes have been made from time to time in those old barracks which were required for constant occupation, while under the same inspiration a high standard for new work was established by the erection of numerous regimental depots and other barracks under the Military Forces Localization Act of 1872. Later a further advance was made when the Barracks Act (1890) was passed, in order to deal with barracks generally, and especially to replace with permanent buildings the worn-out wooden huts at Aldershot, Colchester, Shorncliffe, and Curragh; and under the Military Works Acts of 1897, 1899, and 1901 still further improvements have been introduced. This raising of the standard of barrack accommodation is doubtless bound to continue; for in a country where a short-service army is kept up by a large annual number of voluntary enlistments, in order to encourage recruiting it is necessary to provide for the soldier such advantages as will compare favourably with what he might expect in civil life, and thus make up for the smaller pay and restricted liberty to which he will have to reconcile himself. Hence in dealing with this question there are three great objects to keep in view, viz., the training, the health, and the comfort of the soldier, while in addition financial considerations ordain due regard to economy.

Reforms.

A description of a modern barrack for a battalion of infantry will show how at present these objects are sought to be attained. The general locality for the barrack having been determined by military considerations, especially with regard to proper facilities for rifle practice, training and manœuvring, the selection of a suitable site becomes a matter of the first importance.

Infantry barracks.

In the United Kingdom an ideal site should be airy, open, and dry in itself, should slope gently towards the south, and be protected from cold winds by trees or rising ground. It should be free from local mists, and from smells from gas or chemical works, brickfields, sewage farms, etc. The levels and situation should be such as to afford ample falls for sewers and subsoil drains, and to prevent flooding or waterlogging by surface or subsoil water from adjacent areas. The surface soil should be light but fairly fertile, uncontaminated by sewage, heavy manuring, or previous occupation. The subsoil, if not rock, should be porous, such as gravel, or absorbent, such as chalk, and it is desirable that the level of the subsoil water should be low and fairly constant throughout the year. Clay, whether as surface or subsoil, should be avoided if possible, especially in the case of barracks for mounted troops, for which sand or gravel are the best soils, as being the least muddy. Finally, there should be a good and ample water supply, facilities for obtaining gas and electricity, means of disposing of sewage in a satisfactory manner, preferably into public sewers, and easy access by road and rail. It cannot be expected that any site would possess all these characteristics, which are not all of equal importance, while the absence of some of them can be remedied. For instance, trees can be planted to give shelter; insufficient drainage-fall can be made up for by pumping; flooding can be prevented by intercepting drains; contaminated surface soil can be purified by burning; and if there are no public sewers or natural sewage-outfalls available, no companies for the supply of water, gas or electricity, insufficient roads or railways, in that case sewage works can be established, wells can be sunk and pumping machinery erected, gas or electricity can be manufactured, roads and railways can be constructed; but the general airiness and salubrity of position, satisfactory subsoil, freedom from noxious and insanitary surroundings, and purity and sufficiency of water sources, are essentials, defects in which cannot be remedied by mere expenditure. These essentials generally indicate a country site, although the proximity of a small town is advantageous for supply, and for residences and lodgings for married officers and soldiers, and also for the sake of the sewers, water and lighting companies, and railway communication that would probably become available. The barrack, however, should not be too near the town, but should be isolated from it if necessary by the purchase of intervening land. The area required for the regimental buildings and parade of an infantry battalion is about 22 acres. A cavalry regiment, or a brigade division of horse or field artillery requires about 30 acres, and a company of garrison artillery, engineers, army

service corps, or army ordnance corps, 3 acres and upwards, according to the number of horses and waggons to be provided for. In addition to these areas, space is required for recreation ground and soldiers' gardens, and for garrison accessories, such as offices for the staff, garrison church, hospital and school establishments, engineer workshops and yard, stores of the army service corps and army ordnance corps, provost or military prisons, with the necessary quarters in each case, apart from any land required for rifle or gun practice, military training and manœuvring. The whole site, perhaps omitting the recreation ground and soldiers' gardens, may be enclosed by a wall or iron railings, although such enclosure is often omitted in the open country, or where there are a number of barracks together, as at Aldershot. Taking the case of an infantry barrack for a single battalion, on a site of about 22 acres, a suitable portion, about 450 feet by 300 feet, is set apart for a parade for forming-up purposes, it being assumed that, as is generally the case, ground is available near at hand for battalion or brigade drill. Round the parade are arranged the several buildings, the men's barracks with their immediate accessories and the canteen being probably on the upper side, the officers' quarters on the opposite side or at one end of the parade, the guard-room, regimental offices, stores and shops, sergeants' mess and recreation establishment, at the other end, the drill shed facing the parade, where convenient, and the married soldiers' quarters either behind the single men's barracks, or in one corner of the site near but not overlooked by them. If garrison accessories are to be provided for, the site would be larger, and they would probably be disposed sympathetically, as it were, *i.e.*, with staff officers' quarters near the officers' quarters, garrison offices, stores and shops near the regimental ones, schools convenient for access both for men and children, church and gymnasium facing the parade, married men's quarters with those for the battalion, the hospital establishment, with quarters, in as isolated and airy a position as the site affords, and any prison buildings in an inconspicuous corner.

Such would be a fairly typical arrangement of the buildings of an infantry barrack; and it would be somewhat similar in other cases, except that with mounted troops the foot parade might be smaller, in which case there might be a stable square or mounted parade, probably behind or flanking the men's barracks, the stables being on the side nearest the men, with forage stores, forges, shops, riding school, waggon or gun sheds round or abutting on the square, infirmary stables isolated but not far from a forge, and exercising ground and manèges farther in rear, the latter, however, near the riding school. In all cases the general of the district obtains the opinions of an engineer officer, of a medical officer, of the officer in charge of the barracks, and of an officer of the branch of the service for which the building is intended, and he forwards these opinions with his own to the War Office for approval. In the more important cases additional opinions and local information as to climatology are obtained, the site is explored by excavation and boring, and the water sources are tested. Frequently the site is also inspected by officers of the headquarters staff, in order that they may have personal local knowledge to assist them in dealing with the proposals put before them, which are then submitted to the Army Sanitary Committee, who in all important cases inspect and consider them on the spot. Finally, on the buildings, when completed, the general calls for reports as in the case of sites, and they are only taken into occupation if they satisfy the officers consulted.

Scales of floor-space and air-space have been laid down for men in their barrack rooms, in hospital, in school and lecture rooms, in chapel and in confinement, the more important of these scales embracing all climates. The provision of proper arrangements for ventilation is assumed, and the initial point, so to speak, is an allowance of 57 feet of floor-space and 600 cubic feet of air-space per man in a permanent barrack room in England, the allowance for ordinary hospital patients being one and a half that amount of floor-space and twice that amount of air-space. With these scales as a guide it is easy to ensure sufficient spaciousness in all other rooms. To secure dryness of site subsoil drainage is resorted to when necessary, and is always provided for unmetalled surfaces used by horses, such as exercising grounds and manèges. Parades, roads and paths are paved, metalled, or gravelled, according to use, and are provided with surface channels and storm-water drains. Surfaces not exposed to much traffic are laid down in grass, as being generally less costly than gravel, less dusty, and more easily kept in order by the troops. To secure dryness of buildings asphalt damp-courses are provided, and the area of each building is covered with an impervious coating of cement-concrete or paving, to prevent ground-air and damp from rising and to keep out vermin. Hollow external walls were generally adopted for the sake of warmth and dryness during the last 30 years of the 19th century, and are still used in exposed positions. When well built these are quite satisfactory for buildings not exceeding two storeys in height, but their erection requires much care and supervision. The present tendency, therefore, is to have solid walls, which are unobjectionable for most buildings and situations, if of sufficient thickness to keep out damp. With a view to cleanliness, hollows which might harbour dirt or vermin are avoided as far as possible. With this object, during the last decade of the 19th century, different kinds of water-proof and dirt-proof floors were used, so as to keep the space under them dry and clean. None of them were free from objections of one kind or another, and their use is abandoned for the present; but the sanitary importance of providing such floors is so great that it is to be hoped that renewed efforts will be made to devise a form suitable for barracks.

As for sanitation, the recognized principles of good drainage are adhered to, viz., that well-ventilated air-tight and water-tight pipe drains should be laid in straight lines and with even inclinations from point to point, where there should be manholes for inspection and cleansing, in which changes of direction and inclination and junctions with other drains should take place. No drains are allowed to run under buildings, and the sanitary apparatus therein is doubly cut off from the drains by water-trap and air-disconnexion, the drains themselves being disconnected from the sewers in the same way. The water-supply is to cisterns containing sufficient for two days at the rate of 20 gallons per head and per horse. Water is laid on for all necessary services, that for sanitary purposes being always drawn from separate cisterns. Only cast or wrought iron is, as a rule, used for supply or service pipes. The purity of the water, both as received and as delivered, is guarded by periodical testing and analysis. When pure water is scarce, there is sometimes a separate supply-system of inferior water for sanitary and fire purposes. With regard to the supply of pure air, the principle that holds the field is that of through-ventilation, partly by means of windows on opposite sides of every building and of almost every room, and partly by a system of inlet and outlet ventilation that cannot be completely closed. Half of the air admitted by inlets is brought directly to ventilating grates, which in cold weather warm it before passing it into the rooms. The clear sectional area of fresh air inlets is approximately equal to that of the outlet shafts, and is at the rate of 10 square inches per man in barrack rooms and 20 square inches per patient in hospital wards. With this as a guide it is easy to judge what special ventilation should be provided in other rooms, according to their use and occupation, bearing in mind that no room that is slept in should be without a fresh air inlet and a chimney flue or extracting shaft. As for light, the allowance in open positions is 1 square foot of glass to 100 cubic feet of air-space, but this proportion is exceeded in dark situations, in rooms that are thronged at times, such as recreation- and tap-rooms, and also in lavatories and bath-rooms, kitchens and scullories, which cannot be made too light. For the sake of both light and air, buildings facing each other are placed at least as far apart as twice the height from ground floor to eaves, and the ends of the spaces or lanes between them are kept open. With regard to sunshine, officers' quarters are planned so that no rooms intended for habitation should face north, while all other blocks of inhabited buildings, especially the ward-blocks of hospitals, are arranged to run approximately north and south, so that the majority of windows may face east and west and receive sunshine at some time during the day. As also bearing on the question of health it should be mentioned that, except a few attic bedrooms in one type of married quarters, no rooms are less than 9 feet high, the great majority being from 9 feet 6 inches to 11 feet 6 inches high.

Sanitation.

The amenity of a barrack is secured partly by planting trees, especially round the parade and recreation ground, and by providing a certain amount of shrubbery and grass-plot in connexion with such buildings as the officers' quarters and mess, sergeants' mess, recreation establishment, hospitals, &c.; and partly by such attention to architecture as is fairly consistent with economy, the result aimed at being to avoid a sordid or repellent appearance, and to emphasize the different buildings according to their occupation and importance. In some conspicuous situations, such as facing Southsea Common, and on some historic sites, such as the Tower of London and Edinburgh Castle, the attention paid to architecture has rightly far exceeded this limit. Soundness of construction is a matter of course, for barracks are built to last and not to sell. The only points worth mentioning, besides those already noticed, are that stairs are almost always of stone or iron, and that, in order to keep down repairs, few buildings have plastered walls except those used by officers and warrant officers, school-rooms, and hospitals. Barracks are generally lighted by gas, both internally and externally, or by mineral oil when gas is not available. At some stations, however, electric light is being introduced, especially for hospitals, and it is doubtless the light of the future. For habitation, buildings of two storeys are preferred to those of one storey, as being warmer and more convenient, while they occupy somewhat less space, and are a little less costly, taking all things into consideration. It is only on restricted sites that buildings of more than two storeys are adopted.

For the lieutenant-colonel commanding there is provided a house, generally detached, of ten rooms of moderate size, besides offices. Majors get two good-sized rooms and a servant's room;

captains and subalterns get half that amount, a portion of the officer's room, with a window in it, being often partitioned off for sleeping in. The quartermaster gets a seven-roomed house with small rooms, and the riding-master gets similar accommodation. Special quarters for married officers are also in future to be occasionally provided. The officers' mess contains a mess-room, ante-room, and billiard-room, with the necessary offices, and the block of officers' quarters and mess is so designed that the officers can reach the mess under cover. For general, staff, and departmental officers, quarters are provided as may be required, generally in detached houses, and varying in size according to the probable rank of the occupant, from the house for the general, with twenty rooms besides offices, to the six- or seven-roomed cottage of the married aide-de-camp or staff captain. Warrant officers get quarters consisting of a living-room, kitchen, scullery, and three bedrooms. Married sergeants and rank and file, numbering about fifty in the case of an infantry battalion, get quarters consisting of a living-room, small kitchen or scullery, and one, two, or three bedrooms, according to the number of children. There have been several types of married soldiers' quarters, each an improvement on the last. In the latest type each quarter is self-contained and opens off a verandah, each family having its own water-closet, reached by a ventilated lobby from the quarter itself. Near the quarters is a good laundry with washing-room, heated drying-closet, ironing-room, and drying-ground. The proportion of quarters of each size is arrived at from statistics as to 10,000 soldiers' families, and, though based solely on the number of children, it varies according to rank, and even according to the character of the barrack. For sergeants are, on the whole, men of longer service than the rank and file, and therefore have larger families, and the married sergeants and rank and file at depots have, as a rule, more years' service than those at headquarters. The proportion of quarters with one bedroom ranges from 52 to 68 per cent.; with two bedrooms, from 35 to 27 per cent.; with three bedrooms, from 5 to 13 per cent. Out of the 10,000 families referred to, no less than about 24 per cent. had no children, about 20 per cent. had only one child, about 19 per cent. had two children, about 14 per cent. had three children, under 10 per cent. had four children, and only about 13 or 14 per cent. had more than four children living with the parents, *i.e.*, under 14 years of age if boys, and under 16 years if girls.

Officers' quarters.

Married soldiers.

For the single non-commissioned officers and men of each half-battalion, according to the latest designs, two parallel two-storeyed blocks are built facing each other, and about 200 feet apart, with verandahs on both floors, and each containing two companies. Midway between these blocks is the cook-house for the half-battalion, and attached to it is a bath-house and four company drying-rooms for wet clothes. Close to the cook-house, and between it and each barrack block, are company dining-rooms, with wash-up sculleries. These five blocks of buildings are connected by verandahs, so that from any barrack-room a man can go under cover to any room in that block, to his dining-room and drying-room, to the bath-house and kitchen. The barracks for a half-battalion occupy a square plot, and can therefore be turned to face in the direction that may best suit the site. The barrack blocks contain for each company two sergeants' rooms, two store-rooms, eight men's rooms 30 feet by 23 feet 6 inches, each for twelve men, and four ablution-rooms. Thus not only each company, but each section or quarter-company, has its own separate accommodation. The barrack-rooms, 10 feet 6 inches in height, afford 57 square feet of floor-space and 600 cubic feet of air-space per man. They have windows on opposite sides of the rooms, so as to give through-ventilation, and the beds are arranged with their heads to an external wall, seldom less than 18 inches apart, and generally in pairs, with a window and an inlet ventilator to each pair. An arm-rack and shelves for each man's arms, kit, and belongings are fixed at the head of each bedstead, which can be shortened to half its length in the day-time, when it serves as a seat. Each man has a box with a lock beside his bed, and tables and forms are provided as required. In the ablution-rooms water is laid on and basins provided at the rate of one to six men. In the cook-house is apparatus for all ordinary modes of cooking, except roasting before an open fire. The bath-house, with one bath for the sergeants and four for the men of the half-battalion, has hot and cold water laid on, as also have the wash-up sculleries, and the drying- and dining-rooms are heated with hot water. Water-latrines and urinals are provided, with all due regard to decency, in convenient positions not far from the barrack blocks, at the rate of 5 per cent. on the accommodation for single sergeants and men, those for sergeants being kept separate. When water-drainage is not available, the earth-closet system is adopted.

Barrack room.

Such is the approved design at the commencement of the 20th century. Up to that time each company had a separate block, and there were no dining-rooms with sculleries, no drying-rooms, and no covered communication with the kitchen, while hot water laid on to baths was only allowed at stations where many recruits were received. Such barracks were good in essentials, but the new type gives much greater comfort. Any further advance in barrack-room construction is likely to be in the direction of providing separate cubicles for each man, a system which, some hope, will improve recruiting in consequence of the greater privacy afforded; against which advantage, however, must be set disadvantages of a hygienic, disciplinary, and social character.

The guard-house, situated at the main entrance to the barrack, contains a guard-room, with a prisoners' room opening off it, and four cells. A small-arm ammunition store, fire-engine house and ladder-shed, form part of the same block, or are near it. Close to the guard-room are the regimental offices, embracing the commanding officer's office, or orderly-room, the clerk's office, and an officers' waiting-room. Here also is the telegraph- or telephone-room, when such is required. A medical-inspection-room, with waiting-room, is also provided if the hospital is too far off for the sick to be marched thither for examination. The drill-shed, facing the parade ground, and 150 feet long by 30 feet wide, is usually open on one side and floored with gravel. When there is no gymnasium it is closed on the fourth side, has a wood-block floor and a little gymnastic apparatus, and is lighted with gas. The shooting-gallery is sometimes combined with the drill-shed. The sergeants' mess, in a pleasant situation not too close to the canteen or men's barracks, but convenient for access both for single and married sergeants, contains a mess-room, about 40 feet by 24 feet, and the necessary adjuncts and offices, including a jug-department with separate entrance for sergeants' families.

Miscellaneous buildings.

The regimental institute consists of two parts, the canteen and the recreation establishment. The former contains a bar, a tap-room, about 48 feet by 25 feet, with a stage at one end for music and entertainments, and a room for corporals, with a separate entrance. There is also a separate jug-department for soldiers' wives, the necessary cellars and accessories, and a quarter for the manager. The recreation establishment, in a cheerful position and quite separate from the canteen, though often near it, contains a recreation- or games-room, a reading-room with library, a coffee-room and coffee-bar, kitchen and offices, a grocery shop and store, with separate entrance, and quarters for the manager. The public-rooms have an area of about 2500 square feet, and are about 15 feet high. Attached to the building, and capable of being used for recreation when required, is a lecture-room for the instruction of companies by their officers. Additional means of recreation are provided in the shape of a fives-court, a shooting-gallery, and, when land is available, a cricket-ground and soldiers' gardens.

The regimental stores and shops include an office for the quarter-master, stores for bread and meat, clothing, general purposes, coal, musketry, and pioneers, and for oil, if the barrack is not lighted by gas or electricity. The shops are for tailors, shoemakers, armourers, carpenters, plumbers, painters and glaziers. Transport stables for six horses, with harness-room and forage store, and sheds with gates for the waggons and carts used in peace time, for mobilization vehicles and for two machine guns, complete the purely regimental buildings. In addition, there are the garrison accessories, arranged to serve all the barracks at an ordinary station, or groups of barracks at such a station as Aldershot.

The army service corps buildings may comprise only the ordinary stores for bedding, utensils, unserviceable stores, &c., and for forage for any mounted troops, or they may include a bakery with flour and bread stores, an abattoir with cattle byres and meat stores, and reserve provision stores, according to the circumstances of the station. A chapel is seldom built for a single barrack if arrangements can be made for divine services for the troops at neighbouring places of worship. Gymnasia vary in size from 80 feet by 40 feet to 150 feet by 50 feet, according to the force they have to serve. Military prisons for the longer sentences are few in number, and provost prisons for the shorter sentences are less necessary than used to be the case. They are both constructed in accordance with the regulations of the Prison Department of the Home Office, modified as necessary to meet military requirements, and are certified as fit for occupation by the inspector-general of military prisons.

For the engineers there are ordinarily stores for tools, &c., for field-works, and a building yard, with shops, stores, and offices, while sometimes pumping establishments and sewage, gas, electric, and railway works have also to be provided.

Schools are of two kinds, one for men and for children over seven years of age, under masters, and the other for the younger children, under mistresses. They are built in accordance with the principles and regulations of the Committee of Council for Education, modified slightly to suit military requirements. School seats in the adult and elder children's school are provided according to a sliding scale which works out at 10½ per cent. for a battalion, but gives a somewhat higher percentage for smaller bodies of troops and a lower percentage for larger bodies. In infant schools

the provision of seats is at the rate of about one per family on the married establishment, with a similar variation in the case of large and small numbers.

Hospitals are fenced off from the rest of the barrack buildings, and are constructed in accordance with the approved principles of modern hospital construction, avoiding, however, the extravagance with which they are often applied. As there are no facilities for treating in their quarters men who are slightly ill, many patients are admitted to military hospitals who, in civil life, would be out-patients, or would be treated in their own homes. The number of beds provided is at the rate of 5½ per cent. on the strength of the garrison, exclusive of officers. In civil life the provision of hospital beds, at the rate of one per 1000 of population, is considered by some authorities to be fairly sufficient; and even if this proportion is multiplied fivefold, nothing more emphasizes the difference of character between civil and military hospitals than the contrast of such a number with the 58 beds per 1000 provided for the army. In the United Kingdom the allowance of floor-space and air-space for patients is as follows:—

Hospitals.

	Floor-space.	Air-space.
For light cases	65 square feet	900 cubic feet
For ordinary cases	85 ,,	1200 ,,
For infectious cases	110 ,,	1500 ,,

The construction adopted is the pavilion system. In a large hospital the light-case wards are for about 28 beds each, and the ordinary large wards are for 22 beds, one of them specially fitted up and warmed for pneumonia cases. There are smaller wards for cases under observation, for prisoners, lunatics, ophthalmia, itch, and serious cases requiring quiet and special nursing. General reading-rooms and dining-rooms are provided for patients able to avail themselves of them. There are the usual accessories of a hospital, namely, the administrative department, the stores, kitchens, quarters for medical staff and hospital orderlies, and for nursing sisters in the larger hospitals, in which also are provided an operating-room, lift for recumbent patients, and apparatus for disinfection and destruction, unless these processes can be carried out in existing local establishments. The isolation wards for infectious cases form a separate hospital as far as nursing goes, cut off from the rest by double fences with neutral space between, and there is no covered communication between the different wards or ward blocks, which are at least two, and often three, in number, so that the three prevalent diseases, scarlet fever, diphtheria, and typhoid, can be kept separate. At some large stations a separate isolation hospital is provided, with its own staff and administration, and divided into two portions, one for men and one for women and young children, if the latter cannot be provided for in local hospitals. Occasionally a hospital for women and children is also provided, with a general wing and a maternity wing.

The barracks for other branches of the army are very similar to those for infantry as far as officers and men are concerned, with the addition of stables and their accessories, sheds for waggons and guns, stores and shops, to meet their several requirements. In stables each horse is allowed at least 1500 cubic feet of air-space and from 85 to 110 feet of floor-space. The stalls, 11 feet long by 5 feet 6 inches to 6 feet wide, are arranged against the outer walls, with windows over them. In addition to inlet ventilation at the eaves, fresh air is brought to each horse when lying down by ducts at a height of 15 inches above the floor. Windows and skylights are provided to give 9 square feet of glass-space per stall, and the windows are arranged on each side of the stable, and are all made to open, so as to give cross ventilation. Stables generally have open roofs with roof ventilation, but if there are rooms over them they have concrete ceilings and large extracting shafts to carry off vitiated air. Paving is generally of cement concrete, as being unabsorbent and free from joints. It is grooved to prevent slipping as far as possible, the grooves being arranged to run to surface channels and to be easily swept out. Infirmary stables are similar but larger, giving 1800 cubic feet per horse; but half the infirmary accommodation of 6 per cent. on the total number of horses is in the shape of loose boxes, some of them fitted with slings, and giving at least 2000 cubic feet per horse. Two of these boxes are in a separate building for isolation purposes.

Stables.

For a cavalry regiment a riding-school 150 feet by 53 feet 6 inches, 8 open manèges each 180 feet by 60 feet, and courses for jumping and "heads and posts" exercise, about 1100 or 1200 feet long by 150 feet wide, are also provided, as well as shops for saddlers and saddle-tree makers, and a four-fire forge with a couple of enclosed shoeing sheds. Each horse and field artillery battery, besides its barrack and stable accommodation, has its own battery office, store, shops for collar-makers and wheelers, forge, harness rooms, gun-shed and manège; while all other accessories are for joint use, on a scale proportionate to the number of batteries stationed together; and a system similar in principle prevails in barracks for garrison artillery, engineers, army service corps, army ordnance corps, and army medical corps, in all which branches of the service the troop or company is the administrative unit, instead of the battalion or regiment.

At foreign stations similar accommodation is provided for white troops, and the same general principles hold both for European and native troops, but the air-space and floor-space allowed, and the details of construction, vary greatly according to climate and locality. The main difference is that in tropical and sub-tropical countries provision is made for the freest possible circulation of air below the ground floors of inhabited buildings, which are raised at least 4 feet above cement concrete paving covering the site. All such buildings are provided with verandahs, generally on all four sides within the tropics, and on the sunny side, at any rate, at sub-tropical stations. These verandahs are commonly used for dining in, and as they take the place of passages, the internal arrangement of the buildings is, as a rule, simpler than at home. The space for Europeans allowed in barrack rooms varies from 60 square feet of floor-space and 630 cubic feet of air-space in Nova Scotia and a hill-station in Mauritius to 80 feet of floor-space and 1000 feet of air-space at the hottest or unhealthiest stations, such as Port Louis in Mauritius, Sierra Leone, Ceylon, Singapore, &c.; while in hospitals the allowance varies between 85 feet of floor-space with 1200 feet of air-space and 110 feet of floor-space with 1600 feet of air-space, or 150 feet of floor-space with 2100 feet of air-space for infectious cases. For native troops in all climates the normal 57 feet of floor-space and 600 feet of air-space in barracks is generally adhered to.

Foreign stations.

The aspect of buildings in hot climates is in most cases either north and south instead of east and west, or else such as to catch the prevailing winds. In some places it is necessary, especially in the case of hospitals, to fill the openings of the verandahs with movable louvres; and in some stations, such as Sierra Leone, where tornadoes are common, it is found advisable to enclose the verandahs to a considerable extent to prevent the rooms from being flooded by driven rain, or to provide hurricane shutters. The mode of construction varies greatly, according to the custom and resources of the country, both as regards labour and materials, the local construction being generally adopted, provided it gives sufficiently sound sanitary and vermin-proof buildings. For several stations, however, it has been found cheaper as well as better to send many of the materials from England, even including bricks. In hurricane countries, if wooden buildings are used, they should not be more than one storey in height. In earthquake countries one-storeyed wooden buildings with iron frames are the best, and they should have wooden ceilings instead of plaster. In white-ant countries as little wood should be used as possible, and that should be ant-proof.

Outside India British barracks have to satisfy the manifold needs of all the branches and establishments of an army of upwards of 200,000 men; or, in other words, they form a landed and house estate of the value of somewhere about 40 million pounds, scattered in many hundreds of localities all over the world, with all kinds of varieties of climate, position, and altitude, subject to many different systems of law and government, and adapted to meet the customs, prejudices, and religious requirements of many different races. (H. Lo.)

India.—The changes which have led up to the present status of barracks and military sanitation in India are directly traceable to the recommendations of the Royal Commission of 1859, and are primarily accountable for a net decrease in the annual army death-rate in India, since that date, of about 54 per mille, *i.e.*, from 69 to 15 per mille. In the upkeep of the necessary standard plans and regulations, whether for British or native troops, in hills or plains, the Government of India is guided by the Royal Engineers and medical services. Further assistance in these matters is given by special sanitary commissioners, who report annually on the health of the troops, and incidentally on the military works carried out in each Presidency, and by the Army Sanitary Committee at home; Parliament being kept informed of all Indian sanitary measures in a consolidated report framed every year by the India Office. Present practice, so far as it differs materially from that of the United Kingdom, is briefly described below.

The common difficulty of obtaining sufficient gradients or suitable outfall for ordinary pipe drainage has resulted, except in rare cases, in the adoption of the primitive methods of conservancy known as the "removal" and "trench" systems. In the former, which is common to private quarters and dwelling-houses as well as to public latrines, the foul matter is removed by a native "sweeper" in constant attendance, and transported nightly to

isolated plots of ground, where it is lightly buried in a series of shallow trenches. In the "trench" system, which is commonly used by natives and in camp, the latrines themselves are on the disposal ground, and consist of light screens which are daily shifted over the trenches, the ground in either system being subsequently cultivated. Incineration is also sometimes used. Waste water from cook-houses and baths is carried in channels to, or poured from receptacles over, patches of grass or neighbouring gardens. Although readily open to inspection, and well suited to a country where space is often unlimited, these operations require the most rigid regimental supervision; and the necessary precautions to this end, together with the proper sanitary policing of all native lines and bazars, are among the most important safeguards of the health of the army in India.

While pipe systems for water supply are now being generally introduced, the older method of direct carriage from wells or reservoirs by hand, bullock, or cart is still practised. Special care is taken to ensure a pure as well as a plentiful supply in the immediate neighbourhood of every barrack.

Sites for barrack and hospital buildings, being more extensive, allow greater dispersion and consequently freer circulation of air among buildings than is either necessary or possible at home; parade and cricket grounds and soldiers' gardens are easily provided, and tree planting is general. For British troops double-storeyed barrack blocks, with sleeping rooms above and day-rooms and other regimental accessories below, were very generally introduced after 1859. Single-storeyed barracks, while more convenient, are, however, found to be equally sanitary if sufficiently raised from the ground, and are now the ruling type. Each standard block (for half-company, half-troop, etc.) consists of two dormitories 20 feet high, giving 90 square feet and 1800 cubic feet per man (this allowance was frequently given before 1859), with central mess-room affording 30 square feet per man, and a sergeants' quarter of two rooms and bath-room at either end. A store for each barrack room is provided in the verandahs, which are 12 feet in width. Detached lavatories, which are provided at the rate of one to each two barrack blocks, contain fixed basins at 20 per cent. and private ablution-rooms at 8 per cent., water being laid on from outside cisterns. A large plunge-bath is also generally supplied to every half-battalion. Cook-houses are arranged in blocks for 2 companies, and have each 2 kitchens, 2 cooking places, and 2 cooks' rooms. Native cooks are still generally employed, and the apparatus is of the simplest.

Married quarters are of six classes, three for sergeants, varying with rank, and three for men, varying with size of families, as follows:—*Sergeants' quarters.*—Class A, 1 sitting- and 2 bed-rooms; class B, 1 sitting- and 1 bed-room; class C, do. (smaller). *Men's quarters.*—Class 3, 1 sitting- and 1 bed-room; class 2, do. (smaller); class 1, 1 bed-sitting-room. There is a bath-room in the verandah in all cases. Although the married establishments in India are liberal—viz., 100 per cent. for sergeants and 4 per cent. for rank and file—it is found in practice that these figures are never worked up to; and the percentage of married quarters actually provided is as follows for the different arms:—

	Infantry. Per cent.	Cavalry. Per cent.	Artillery. Per cent.
Sergeants . . .	36	40	56
Rank and file . . .	1·25	3	4

Warrant officers' quarters consist of 1 large sitting-, 2 bed- and 2 bath-rooms, besides cook-house and outside latrine.

The institute contains a liquor bar (now invariably in a separate building), a library, and a recreation and refreshment portion, corresponding to the English canteen and recreation establishments, but on a slightly more lavish scale. The remaining accessories are also more liberal, notably in the case of the voluntary shops, which include tinsmith's, printing, painting, bookbinding, and watchmaking shops. Furniture stores in charge of the royal engineers, who make the furniture, are an extra; whilst laundries are never found except in hospitals, owing to the general adoption of the native outdoor system of washing.

Stables for mounted branches consist of long double rows of stalls 14 feet by 7 feet, in which the horses are picketed, facing inwards to a central passage; the construction is light, and mangers are dispensed with. The floors are normally of earth, periodically renewed, or of more permanent material if readily available. Open terraces for use of horses in temperate weather are often built regimentally. Separate harness-rooms, stores, and night picquet guard-rooms are invariably provided. Infirmary stables generally include a casting shed. Closed riding-schools are unusual, and the open manèges are fewer than in the United Kingdom. All mounted corps are allowed dummy waggons and trucks for practice in entraining horses and guns.

Besides the usual station buildings, a reading-room for religious literature is invariably provided. School accommodation is at the rate of 120 adults and 64 children per battalion, as compared with 84 and 60 at home. Lines or huts for native followers are a necessary adjunct of every barrack. Transport lines or standings for pack animals are also necessary where the latter are kept regimentally.

In hill stations or convalescent depots the scale of accommodation is somewhat reduced, the individual allowance being 60 square feet and 600 cubic feet. The type buildings are light permanent huts designed in bays, capable of being combined in any numbers, with or without verandahs, closed or open.

Native barracks are, except in special cases, built by the sepoys with materials provided by themselves, as in the cavalry, or as in the infantry, out of a hutting allowance granted by Government, the buildings, when completed, becoming in the former case the property of the men, and in the latter that of Government. The forms of construction are, owing to the native mode of life, essentially simple, and vary slightly in different parts of the country. Quarters for married non-commissioned officers and men consist of lines of huts 12 feet to 14 feet high, slightly raised off the ground, and divided into separate single rooms, about 12 feet by 10 feet, with verandahs, bath-rooms, and court-yards, whereby privacy and individual responsibility for cleanliness and protection of property are ensured. For unmarried men, continuous huts or "pendals," with non-commissioned officers' rooms, are provided, giving a minimum of 60 square feet and 810 cubic feet per man in the plains, and 45 square feet and 400 cubic feet in the hills. In some cases two single men are allotted to a married man's quarter. Native officers have separate establishments similar to the married men's quarters, but with a varying number of rooms and proportion of servants' huts and outhouses, according to rank. The remaining accessories of a native barrack, which are provided and built by Government, are on the same simple scale, no permanent latrines, cook-houses for married men, ablution-rooms, mess- or recreation-rooms being required, and no furniture, &c., being provided.

Native cavalry have open standings for their horses (which are their own property) adjoining their quarters, and sheds for camels and saddle-rooms are provided. In the native mountain artillery stables are generally built for the mules.

Quarters and messes for European officers are occasionally provided by Government at reasonable rents, according to rank; but more often officers make their own arrangements for hiring, their pay being intended, except in special cases, to cover either contingency. Where neither of these courses is possible Government occasionally advances the necessary money for building at a moderate rate of interest.

Hospitals for British troops are allotted on the station system. The typical ward block consists of a single-storeyed building in the style of a half-company barrack, and containing, besides the necessary wards, one attendants'- and one day-room, with bath-rooms, &c., at the ends. The beds, reckoned at 10 to 12 per cent. of garrison, are allowed 120 square feet and 2400 cubic feet in ordinary wards, and 150 square feet and 3000 cubic feet in separate isolation blocks. These latter, in common with officers' wards, are provided at special stations only. A women's and children's ward, with a matron's quarter to every ten beds, is usually an adjunct of every hospital, the beds being calculated at ·8 per cent. of the men in garrison. Wards for followers, for severe cases or accidents, at fixed proportions for different units, are built and kept up by the departments concerned. The remaining hospital buildings comprise quarters for lady nurses and medical subordinates, with outhouses and stables; lines for hospital servants, an administration block, with stores, cow-shed, ambulance-shed, lamp-room, guard-room, mortuary, disinfector and latrines, ablution-rooms and laundry. In the hills provisions are similar, but somewhat curtailed, the allowance per bed being 102 square feet.

In the case of native troops, although the station hospital system is approved for new barracks, the existing hospitals are chiefly regimental. The main building, which follows generally the lines of the ward block for British troops, includes the wards, giving 60 square feet and 810 cubic feet per bed, as well as the administration offices, stores, and bath-rooms. The cookhouses, latrines, washing-well, mortuary, and quarters are provided separately. Hut wards for contagious diseases, giving 110 square feet and 1800 cubic feet per man, are also provided when required.

Although the standard types for barracks and hospitals are essentially adhered to, climatic conditions and local resources govern the materials used to a certain extent. Periodical repairs are more frequent than in the United Kingdom. Walls are usually of burnt brick, built hollow, or of solid sun-dried bricks or stone. Raised plinths are commonly filled in, but are sometimes arched. Roofs are either flat, or single- or double-tiled, or occasionally of corrugated or plain sheet iron at hill stations—thatched roofs nowadays being forbidden, except in the case of unimportant outhouses, on account of the danger from fire. Verandahs, which are a necessary accompaniment of every inhabited building, may be double or single, clerestory windows being usually provided above them. Fireplaces are provided where required, designed without projections, so that they can be filled in and the wall space utilized if necessary. Fuel, when required, is issued according to a fixed scale. Cooling devices in the plains

consist of punkahs pulled in series, or of tatties or fibre hurdles in the doorways kept continually wet, or of therm-antidotes by which air is artificially forced through wet fibre into the rooms. Where electric or other mechanical power is not available for working these appliances, a special staff is hired for this purpose. Except at very large stations where gas is specially made, the lighting of barracks is almost universally by oil lamps, the standard pattern lamp being considered sufficient to light 200 square feet of floor, and each British soldier in barracks being allowed 45 square feet of such illuminated area. For other military buildings lighted by Government the number of lamps is regulated by a fixed scale. Barracks for native troops are not lighted by Government. (E. H. H.)

AUTHORITIES. — *The Army Book for the British Empire.* London, 1893.—F. RICHTER. "Gebünde für Militär. Zwecke" (in *Handbuch der Architektur*). Darmst., 1887.—BROCKHAUS. *Konversation's Lexicon*, 14th ed. 1895.—MEYER'S *Konversation's Lexicon*, 5th ed. 1898.

Barrafranca, a town of Sicily, in the Italian province of Caltanissetta, 11 miles S.E. from Caltanissetta. It has sulphur mines, olive-oil mills, and sulphur springs. Population (1881), 9052; (1891), about 10,000.

Barranquilla, the capital of a province of the same name in the department of Bolivar, Colombia, South America, and the great commercial centre of the republic, situated on a slightly sloping plain on the left bank of the Magdalena river, about 7 miles from its mouth, and about 85 miles N.E. of Cartagena. The river below the town being dangerous for large steamers, it is connected with the ocean by a railway running to Puerto Colombo (Sabanilla), where there is a steel pier 4000 feet in length, permitting the approach of vessels drawing 26 feet of water, and affording accommodation for five large ocean steamers. Situated at the initial point of the navigation of the Magdalena river, on which there is an excellent service of steamboats to Honda 592½ miles distant, Barranquilla now more than rivals Cartagena as a commercial centre. Originally founded in 1629, it is only within recent years that it has risen into importance. It is regularly laid out, and the better-class houses are surrounded by beautiful gardens, while the business portion contains many fine warehouses. A few of the houses are constructed of wood, those of the better classes being built of brick with tile roofs, and those of the poorer classes of clay supported by a framework of split guadua cane, the roofs being thatched with rushes. There are three Roman Catholic churches and a Protestant mission, the other principal public buildings being the market, the hospital, and the theatre. The city is supplied with water from the Magdalena river, and possesses a telephone system, and a street railway with cars drawn by mules. There are large tanneries, shoe factories, hat factories, tin shops, soap and candle works, brick and tile works, match works, furniture works and rum distilleries. The population now approaches 50,000. (T. F. H.)

Barre, a city of Washington county, Vermont, U.S.A., north of the centre of the state, a few miles south of Montpelier, the state capital, on branches of the Central Vermont and of the Montpelier and Wells River Railways. Formerly a village in Barre town, it has been separated from the latter and given a city charter. Population (1890), 4146; (1900), 8448.

Barrett, Lawrence (1831-1891), American actor, was born of Irish parents in Paterson, N.J., 4th April 1838. Beginning as a call-boy, he advanced steadily in his profession, gradually coming into prominence in leading parts. At the age of twenty he was acting with Charlotte Cushman and Edwin Booth. He served with distinction in the civil war as captain in a Massachusetts regiment. From 1867 to 1870 he managed the California theatre, San Francisco, together with John M'Cullough. He rendered the drama of his country a special service by successfully producing new plays at a time when the American playwright was almost without recognition. He frequently supported Edwin Booth, who was a close personal friend, playing always with admirable intelligence and distinction. Among his many and varied parts may be mentioned Hamlet, Lear, Macbeth, Shylock, Richard III., Wolsey, Benedick, Richelieu, David Garrick, Hernani, Alfred Evelyn, Lanciotto; and his performance of *Richelieu* was one which attracted considerable attention when he appeared in London. He wrote a life of Edwin Forrest in the American Actors Series (Boston, 1881), and an admirable sketch of Edwin Booth in *Edwin Booth and His Contemporaries* (Boston, 1886). He died 20th March 1891.

Barrhead, a police burgh of Renfrewshire, Scotland, 8¾ miles S.W. of Glasgow by rail. Iron and brass works, calico-printing, cotton-spinning, and the manufacture of sanitary appliances are all now important. A drainage scheme has been inaugurated. Population (1891), 8215; (1901), 9855.

Barrie, the capital of Simcoe county, Ontario, Canada, 53 miles N. of Toronto, on Lake Simcoe. It is an important railway centre on the Grand Trunk Railway, and has steamboat communication with various points on Lakes Simcoe and Conchiching. It contains railway shops, agricultural implement works, and saw and grist mills. Population (1881), 4804; (1899), 5980.

Barrow-in-Furness, a civil parish, municipal, county (1888), and parliamentary borough (1885), seaport and market town of Lancashire, England, including the isle of Walney; 87 miles N.N.W. of Manchester by rail. The corporation consists of a mayor, 8 aldermen, and 24 councillors. The cemetery, with three mortuary chapels, covers 55 acres. The educational institutions include a school of science and art, a girls' high school, a higher-grade board school, and a technical school (1901). The principal building is the new town hall, which is fronted by a statue of Lord Frederick Cavendish (assassinated in Dublin, 1882). The main reservoirs of the water supply, 90 acres in area, will hold 578,000,000 gallons. The Bessemer steel works now have only 9 blast furnaces in use, but the works of one firm of shipbuilders cover 82 acres, and the slipways allow of the building of 14 vessels at a time. There have come into importance a petroleum establishment holding over 22,500 tons of oil, and a paper-pulp factory employing about 450 hands. Sailing vessels at port in 1888 were 88 of 10,599 tons; steam vessels, 51 of 53,487 tons: in 1899—sailing vessels, 227 of 31,255 tons net reg.; steam vessels, 1162 of 444,957 tons net reg. Vessels entering port in 1888 were 2283 of 460,579 tons; clearances, 2296 of 452,202 tons; in 1899 — entrances, 1389 of 476,212 tons net reg.; clearances, 1377 of 455,408 tons net reg. The imports of foreign and colonial produce for 1899 amounted to the value of £721,519 against £396,240 in 1888. Population of the civil parish, the municipal and county borough, and the parliamentary borough, which are all three co-extensive, covering an area of 21,009 acres (including 11,000 acres of sand and water) (1881), 47,259; (1891), 51,712; (1901), 57,589.

Barry, a town and seaport of England, on the Bristol Channel, opposite Barry Island, 8 miles S.W. of Cardiff, in the southern parliamentary division of Glamorganshire. In 1894 the parishes of Barry, Cadoxton, Merthyr Dovan, and part of St Andrews and of Sully, were constituted the urban sanitary district of Barry and Cadoxton. A village of no significance till 1888, Barry is now, in conjunction with Cadoxton, owing mainly to the docks, a

populous and important town. Besides the churches of St Nicholas (1876) and St Paul (1893) there are numerous dissenting places of worship. There are also three board schools, a county school, a seamen's institute, a free library, and a market, and two weekly newspapers. Area of urban district, 3323 acres. Population (1891), 13,278; (1901), 27,028. Barry docks, the first of which was opened in 1889, lie about 8 miles S.W. of Cardiff, and 4 miles S.W. of Penarth. The following are the dimensions of the docks:—

Docks, &c.	Area.	Length.	Width.	Quayage.	Width of Entrance Gates.	Depth of Water on Sill.	
	Acres.	Feet.	Feet.	Feet.	Feet.	H.W.O.S.T.	H.W.O.N.T.
Dock No. 1	73	3100	1100	10,500	80	37′ 8″	29′ 4″
Dock No. 2 (in construction)	40	3300	400	7000	80	37′ 8″	29′ 4″
Basin	7	600	500	2040	80	37′ 8″	29′ 4″
Deep Lock Entrance	...	647	65	...	65	...	...
Barry Railway Co.'s Commercial Graving Dock	...	743	at bottom 100′ 0″ at top 113′ 6″	...	60	26′ 8″	18′ 4″
Barry Graving Dock Co.'s Graving Dock	...	732	at bottom 100′ 0″ at top 113′ 6″	...	60	24′ 8″	16′ 4″
Timber-Float (in construction)	7	800	400	2000			
Entrance Channel from the Breakwater Heads to Deep Lock Gates	...	1500					

Barry Railway Company's graving dock can be divided into outer and inner docks of 384 and 359 feet respectively: depth on outer sill H.W.O.S.T., 26′ 8″; H.W.O.N.T., 18′ 4″. Barry Graving Dock Company's graving dock can be divided into outer and inner docks of 354 feet each: average depth on sill, spring tides, 24′ 8″; neap tides, 16′ 4″. No. 1 Dock and Basin are provided with 11 high- and 10 low-level fixed, 2 high- and 3 low-level movable, coal staiths; and 31 cranes, including 20 movable and 4 fixed hydraulic ballast cranes and one 50-ton crane. The total tonnage increased from 567,958 for half-year ending 1889, to 1,290,665 for half-year ending 1895. When the dock was opened in 1889 all the railway service was between Barry and Cogan. Now there is a through-service between Barry, Cardiff, and the Bute docks, between Barry and Perth in the Rhondda valley; and between Cardiff, Barry, and Bridgend. There are altogether about 29½ miles of railways of the Barry Railway Company connecting the dock with the various collieries and with the Taff Vale Company's lines at Penarth Dock. When completed, the Bute, Penarth, and Barry docks, all comprised within the Port of Cardiff, will have 14 miles of quayage, and about 200 miles of sidings.

Barry, Sir Redmond (1813-1880), British colonial judge, son of Maj.-Gen. H. G. Barry, of Ballyclough, county Cork, was born in 1813. He was educated at a military school in Kent, and at Trinity College, Dublin, where he graduated B.A. in 1833, and was called to the Irish bar in 1838. He emigrated to Australia, and after a short stay at Sydney went to Melbourne, with which city he was ever afterwards closely identified. After practising his profession for some years, he became commissioner of the court of requests, and after the creation in 1851 of the colony of Victoria, out of the Port Phillip district of New South Wales, was the first solicitor-general with a seat in the legislative and executive councils. Subsequently he held the offices of judge of the supreme court, acting chief-justice, and administrator of the Government. He represented Victoria at the London International Exhibition of 1862, and at the Philadelphia Exhibition of 1876. He was knighted in 1860 and was created K.C.M.G. in 1877. Sir Redmond Barry was the first person in Victoria to take an interest in higher education, and induced the local government to expend large sums of money upon that object. He was the founder of the University of Melbourne, of which he was the first chancellor, was president of the Melbourne public library, national gallery and museum, and was one of the first to foster the volunteer movement in Australia. To his exertions is due the prosperity of the two institutions with which his memory is identified. The university was founded in 1854, and was thrown open to women in 1880. It has three affiliated colleges, Trinity (Anglican), Ormond (Presbyterian), Queen's (Wesleyan), and a conservatorium of music. The total number of graduates is 2066, about half being in arts, and the remainder in medicine, law, and science. The total number of persons attending lectures in 1898 was 668, and 147 took degrees. The teaching staff numbers 35, and about 1100 persons present themselves for matriculation every year, of whom about 500 pass, but a large proportion do not pursue their studies any farther. The total income of the university in 1898 was £30,110, of which £9000 was contributed by the Government. The Melbourne public library was opened 3rd July 1853, is free to every one, contains 480,000 volumes including pamphlets and periodicals, ranks as the tenth library in the British dominions, and is visited by about half a million of people every year. The national gallery of Victoria contained, in 1898, 434 oil paintings, 3451 statues and works of art. The total sum expended by the trustees has been £600,000. (G. C. L.)

Barsi, a town of British India, in the Sholapur district of Bombay, lying within a tract entirely surrounded by the Nizam's dominions. It is situated in 18° 13′ N. lat. and 75° 44′ E. long. Population about 20,000. Barsi is a flourishing centre of trade, exporting to Bombay large quantities of cotton and oilseeds. It has eight factories for ginning and pressing cotton—some on a large scale. It is connected with the main line of the Great Indian Peninsula Railway by a light railway of 22 miles, the property of a company, which will be extended 32 miles in another direction to Pandharpur.

Barth, a seaport town of Prussia, province Pomerania, on a coast lagoon, 19 miles by rail W. by N. from Stralsund. It has a mercantile fleet and a school of navigation, and carries on shipbuilding, sugar manufacture, the export of herrings, &c. Population (1895), 6223.

Barthélemy Saint-Hilaire, Jules (1805-1895), French scholar and statesman, was born at Paris 19th August 1805. In his early days he was connected with the *National* newspaper, and in its office he formed

the intimate friendship with Thiers and Mignet which continued all his life. In 1833 he quitted politics for a time to devote himself to literature, and especially the study of ancient philosophy. Victor Cousin had won fame as the translator of Plato, Barthélemy Saint-Hilaire in like manner attached himself to Aristotle, and undertook a translation of his works. The first of thirty-five volumes appeared in 1837 and the last in 1892. This great work gained him the patronage of Cousin, a seat in the Academy, and the professorship of ancient philosophy at the College of France. During its progress he published a treatise on *The Logic of Aristotle*, 1839, and another on *The School of Alexandria*, 1845. The revolution of 1848 brought him back for a while to public life; he entered the Assembly, and was president of the commission on public instruction, but upon Louis Napoleon's *coup d'état* he again gave up concern in public affairs. Absorbing himself in Sanskrit studies he produced important works on the *Vedas*, 1854, and on *Buddhism*, 1858. In 1855 he travelled in Egypt, and in the following year published a book on the country, warmly vindicating his friend Lesseps's project, at that time much contested, for the construction of the Suez Canal. After the disasters of 1870 M. Barthélemy Saint-Hilaire reappeared in politics, exerted his utmost efforts to secure the election of Thiers as provisional President of the Republic, and upon this taking place became his secretary, and continued his most intimate confidant and counsellor until the statesman's death. In 1875 he was made perpetual senator, and he was Minister of Foreign Affairs in Jules Ferry's cabinet, from September 1880 to November 1881. The most important event of his administration was the annexation of Tunis under the form of a French protectorate, which he actively promoted. His latter years were chiefly employed in writing the life and publishing the correspondence of his former patron, Victor Cousin, who had bequeathed him a handsome fortune; he also commenced a new edition of Cousin's translation of Plato, which he did not live to complete. He died, labouring to the last, on 24th November 1895. Among his other works may be named *Mahomet et le Coran*, 1865, a translation of Marcus Aurelius, and a metrical version of the *Iliad*. (R. G.)

Bartlett, John (1820——), American publisher and compiler, was born in Plymouth, Massachusetts, on the 14th of June 1820. He became the university bookseller (and also a publisher) in Cambridge, Massachusetts, and from 1865 to 1889, when he retired, was a member of the bookselling and publishing firm of Little, Brown, and Co., in Boston. In 1855 he published the first edition of his dictionary of *Familiar Quotations*, long the best-known collection of the sort, and in 1894 (although it had been copyrighted five years before), after many years' labour, he published his *New and Complete Concordance or Verbal Index to Words, Phrases, and Passages in the Dramatic Works of Shakespeare; with a Supplementary Concordance to the Poems*—surpassing any of its predecessors in the number and fulness of its citations from the poet's writings.

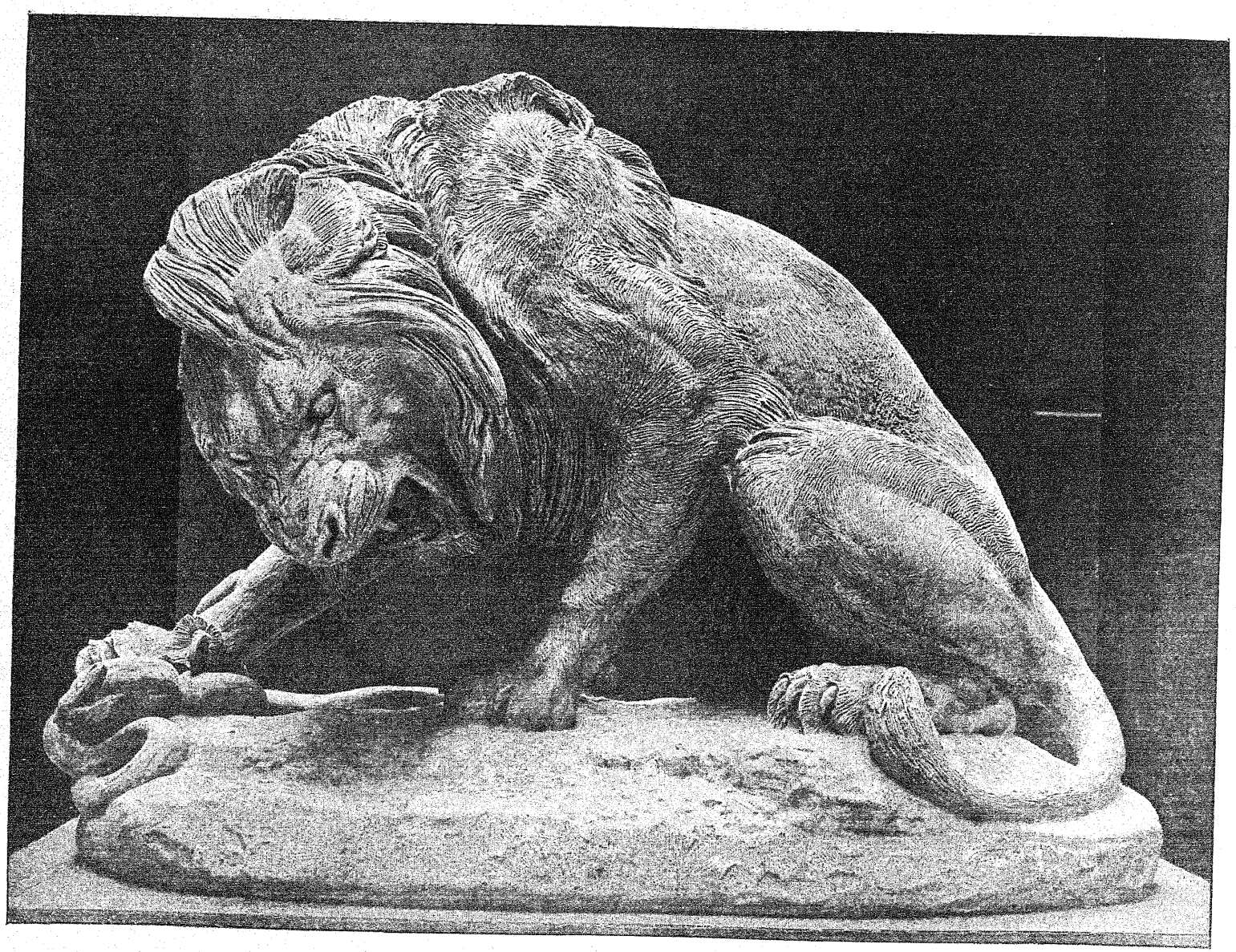
Bartlett, John Russell (1805-1886), American historical and linguistic student, was born in Providence, Rhode Island, 23rd October 1805, and died there 28th May 1886. Several of his minor writings were devoted to matters connected with the earlier or later history of Rhode Island, of which he was secretary of state between 1855 and 1872; but his place in American scholarship is chiefly due to his *Dictionary of Americanisms*, of which the first edition appeared in 1850; a pioneer work which, although later dialect-changes have of course deprived it of completeness or final authoritativeness, was long of value to students of language, and remains the chief contribution to the subject.

Barwani, a native state of India, in the Bhopawar agency. It lies in the Satpura Mountains, south of the Narbada. Area, 1362 square miles; population, about 80,000; average density, 59 persons per square mile. Many of the inhabitants are Bhils. Revenue (1897-98), Rs.3,14,246; subsidy to Bhil corps, Rs.4000. The chief, whose title is Rana, is a Rajput of the Sesodia clan, connected with the Udaipur family. The forests are under an English official. The town of Bhawani is situated near the left bank of the Narbada. Population, about 5500.

Barye, Antoine Louis (1795-1875), one of the greatest sculptors of the French school, was born in Paris in 1795. Like many of the sculptors of the Renaissance he began life as a goldsmith. After studying under Bosio, the sculptor, and Gros, the painter, he was admitted to the École des Beaux Arts. But it was not till 1823, when he was working for Fauconnier, the goldsmith, that he discovered his real bent from watching the wild beasts in the Jardin des Plantes, making vigorous studies of them in pencil drawings worthy of Delacroix, and then modelling them in sculpture on a large or small scale. In 1830 he exhibited a "Tiger," and in 1832 had mastered a style of his own in the "Lion and Snake" (see Plate). Thenceforward Barye, though engaged in a perpetual struggle with want, exhibited year after year these studies of animals—admirable groups which reveal him as inspired by a spirit of true romance and a feeling for the beauty of the antique, as in "Theseus and the Minotaur," "Lapitha and Centaur," and numerous minor works now very highly valued. Barye was no less successful in sculpture on a small scale, and excelled in representing animals in their most familiar attitudes. As examples of his larger work we may mention the Lion of the Column of July, various Lions and Tigers in the Gardens of the Tuileries, and the four groups—War, Peace, Strength, and Order. The fame he deserved came too late to the sculptor. He was made professor at the museum in 1854, and was elected to the Academy of Fine Arts in 1868. He died 25th June 1875. The mass of admirable work left to us by Barye entitles him to be regarded as the greatest artist of animal life of the French school, and as the creator of a new class of art which has attracted such men as Frémiet, Peter, Cain, and Gardet, who are regarded with justice as his worthiest followers.

See Emile Lamé. *Les Sculpteurs d'Animaux: M. Barye*, Paris, 1856.—Gustave Planche. "M. Barye," *Revue des Deux Mondes*, July 1851.—Theophile Silvestre. *Histoires des Artistes Vivants*, Paris, 1856.—Arsène Alexandre. *Les Artistes Célèbres: A. L. Barye*, Paris, 1889. (H. Fr.)

Base-ball.—Base-ball, especially in the United States, has two distinct phases—one professional, and the other amateur. The sport itself has been traced back through various forms of trap ball, "one old cat," and rounders, to a comparatively early period. While England was developing cricket, America developed base-ball. The principal feature in the American pastime, as distinguished from cricket, is the limited time in which a game can be finished. One other vital point in which the two sports differ is that in base-ball if the ball is knocked in a certain direction it is called a foul, and the player who knocked it has not the privilege of making a run, but he may be caught out. This rule seems to a cricket lover a blunder in legislation, because if a player is not privileged to take advantage of the hit by making a run he ought not to be put to the risk of being caught out. Professional base-ball in the United States began soon after 1850; but the sport itself was not regarded then as a pro-



"Lion and Snake." By Antoine Louis Barye.

fession. A man who played for a financial consideration always had some other means of a livelihood, as the income to be derived from playing ball in the summer time was not nearly enough to support him throughout the year. While the game grew for a time in popularity, it soon acquired certain adjuncts which were by no means desirable. The betting evil became prominent, as did also pool selling, and before long the game had little standing in respectable communities. It was not only generally supposed that the matches were not played on their merits, but it was known that players themselves were not above selling contests. At that time many of the journals of the day foretold the speedy downfall of the sport. A convention of those interested in the game, both financially and otherwise, was accordingly held in 1867 in Philadelphia, and an effort was made to effect a reformation. That the sport even then was by no means insignificant can be seen from the fact that in that convention some 500 organizations were represented. While the work done at the convention did not accomplish all that was expected, it did produce certain reforms, and the sport grew rapidly thereafter both in the eastern and in the middle western part of the United States. In the next five years the interest in the game became so great that it was decided to send a representation of American base-ball players to England; and two clubs, the Bostons, who were the champions that year, and the Athletics, former champions, went over and played several exhibition games with each other. While successful in exciting some interest, the trip did not succeed in popularizing base-ball in Great Britain. Fifteen years later two other Nines, representing American base-ball players, made a general tour of Australia and various other countries, completing their trip by a contest in England. This too, however, had little effect, and later attempts to establish base-ball in England have likewise been unsuccessful. But in America the game continued to prosper. In 1876 was formed the National League, of eight clubs, which contained the expert ball-players of the country. There were so many people in the United States who wanted to see professional base-ball that this organization proved too small to furnish the desired number of games, and hence in 1881 the American Association was formed. For a time it seemed that there would be room for both organizations; but there was considerable rivalry, and it was not until an agreement was made between the two organizations that they were able to work together in harmony. They practically controlled professional base-ball for many years, although there were occasional attempts to overthrow their authority, the most notable being the formation of a Brotherhood of players, organized for the purpose of securing some of the financial benefits accruing to the managers, as well as for the purpose of abolishing black-listing and other supposed abuses. The Brotherhood proved not sufficiently strong for the task, and fell to pieces. For the last few years professional base-ball has been somewhat under a cloud, owing to questionable practices and rowdyism on the field, as well as quarrels among the managers. Whether it will ever again be as popular as it once was is a question which time alone can determine. Careful legislation only can effect the desired end.

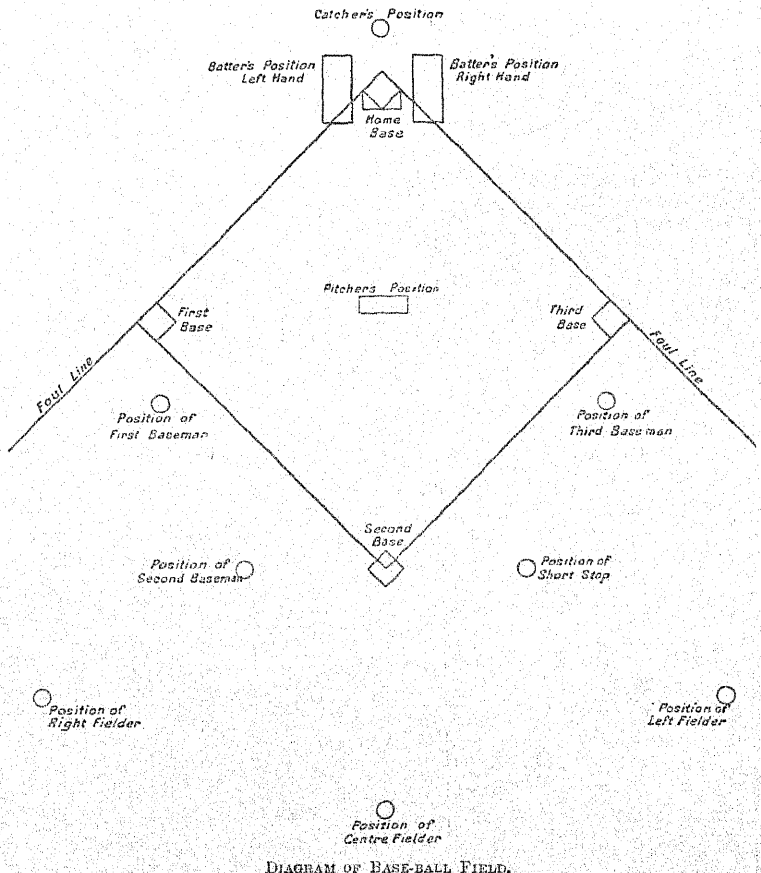


DIAGRAM OF BASE-BALL FIELD.

Amateur base-ball in America dates back to the time of the formation of the professional clubs, and the two have progressed along similar lines so far as rules and style of play are concerned. Frequently, however, the amateur rules, and especially the college rules, have differed from those of the professional in minor points. The history of college base-ball has been marked by the formation and dissolution of leagues and by individual championships between universities or colleges, and by some quarrels and disagreements, but never by anything like the unpleasant practices which have at times crept into the professional games. For this reason the sport has maintained its hold more strongly during the last few years, and while the attendance at games by no means equals that at the younger sport of football, it has fully as constant a following and apparently an equally long lease of life.

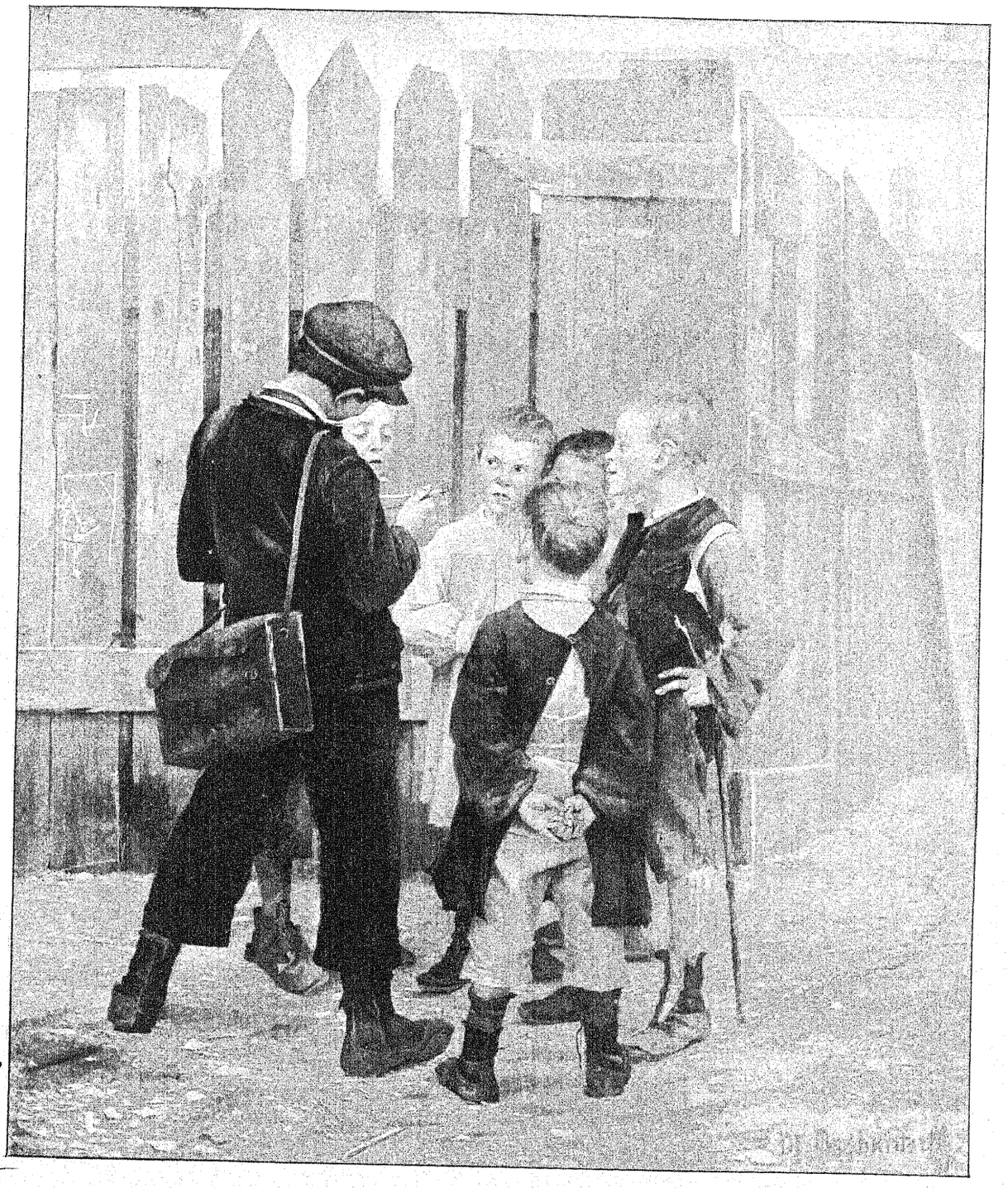
Any comparatively level field over 100 yards square will serve for a base-ball ground. Upon this field is marked out a square, commonly called the "diamond," whose sides measure 30 yards each, and whose nearest corner is distant about 90 feet from one end of the field (see diagram). This corner is marked by a white plate a foot square, sunk level with the ground, and called the home base. At the other three corners are canvas bags 15 inches square, and called, beginning at the right as one looks into the field from the home plate, the first, second, and third bases respectively. The lines from home base to first, and from home base to third, indefinitely prolonged, are called the foul lines. The game is played by two sides of nine men each, one of these taking its turn at the bat while the other side is in the field endeavouring, as provided by certain rules, to

retire or put out the side at bat. Each side has nine turns at the bat. The arrangement of the men in the field, with the exception of pitcher and catcher, is in the form of two arcs, facing the home plate, whose radii are, roughly speaking, 30 and 60 yards. The arc with the lesser radius consists of four men called the in-fielders, and named the first, second, and third basemen and the short-stop. The last-named player stands midway between the second and third basemen. The other arc is composed of the out-fielders, and they are named, right, centre, and left fielders. Inside the diamond, and distant in a straight line in front of the home plate some 55 feet, is the pitcher's position, upon which he is obliged to stand when delivering the ball to the batsman. The catcher's position is not thus defined, but according as necessity requires he stands either close behind the batsman, or, when no runner is on the bases, and the batsman has not reached his last strike, some 70 feet behind the plate. When standing thus he simply performs the duty of returning the ball to the pitcher, as it is then unnecessary for him to catch it. The players of the side at the bat take their turn in regular rotation, and continue until three of them have been put out by the opponents. This retires that side to the field, and the other comes in to the bat. The batsman has a certain space marked off in which he must stand when striking at the ball. The batsman becomes a base-runner immediately he has made a "fair hit" (that is, knocked the ball so that it will fall in front of the foul lines), or when he has had "three strikes" (that is, three fair opportunities of hitting the ball), or, finally, when the pitcher has delivered "four balls," none of which have passed over the plate at the proper height, or have been struck at by the batsman. In this latter case he is entitled to occupy first base without being put out. In the other cases, *i.e.*, when he has made a fair hit or has had three strikes, he must start to make the round of the bases, which are to be taken in regular order (first, second, third, and home), and the first of which at least he must reach before he is temporarily safe from being put out. When he completes this circuit and crosses the plate without being put out, he scores a run; and the number of runs thus scored in nine innings decides the match. A batsman is put out if he hits the ball and the ball is caught by an opponent before touching the ground, or if he make three foul bunts (that is, attempts to block the ball with the bat). (By recent legislation a foul counts as a strike until a batsman has had two strikes.) A base-runner may be put out in any one of the following ways—if, having made a fair hit, the ball be caught by an opponent before touching the ground, or, having touched the ground, be held by a fielder any part of whose person is touching the first base, before the runner reaches the base; if, after three strikes, the ball be caught before it touches the ground, or, having touched the ground, be held at first base as above described; and, finally, if he be touched by the ball in the hands of a fielder at any time during his circuit of the bases when he is not touching the base which he is legally entitled to occupy. To provide for the satisfactory conduct of the game an umpire is agreed upon by the contesting Nines, and it is his duty to see that all the provisions of the rules are observed. He is also the judge of good and bad balls, put-outs, and runs. Any other point liable to become a point of dispute comes under his jurisdiction. Sometimes two umpires act at the same time, one at the plate and the other at the bases. (W. CA.)

Basel, or BÂLE (Basle is a wholly erroneous form), one of the Swiss cantons, which since 1833 has been divided into two half cantons—Basel-Stadt (urban Basel)—which besides the town includes three country districts—and Basel Landschaft (rural Basel). The total area of *Basel Stadt* is 13·8 square miles, of which 11·7 square miles are reckoned as "productive." Of this 1½ square miles are covered by woods, and 0·19 square miles by vineyards. The statistics of this half canton are as follows:—*Population.*—(1880) 64,207, (1900) 112,246. In 1900 there were 8133 inhabitants to each square mile, the highest rate of density in Switzerland. *Religious.*—Protestants, (1880) 44,236, (1888) 50,081, (1900) 73,126; Romanists, (1880) 19,288, (1888) 22,132, (1900) 36,987; Jews, (1880) 830, (1888) 1086, (1900) 1903. *Linguistic.*—German-speaking, (1880) 62,644, (1888) 71,113, (1900) 107,205; French-speaking, (1880) 1901, (1888) 2040, (1900) 2741; Italian-speaking, (1880) 338, (1888) 346, (1900) 2361. The capital of this half canton is Basel. The cantonal constitution dates from 1889. The executive of seven members and the legislature of 130 members are elected by a popular vote, each for three years. Since 1875 the "obligatory referendum" obtains for all laws, while 1000 citizens can exercise the right of "initiative" in legislative matters, or demand the revision of the cantonal constitution. In 1897 the state revenue was 9,359,412 frcs. (a rise of 101 per cent. since 1885), and the state expenditure 9,352,414 frcs. (a rise of 99 per cent. since 1885), while in 1898 the surplus was 461,519 frcs.; but in 1900 there was a deficit of 1,190,631 frcs. In 1897 the public debt was 30,050,800 frcs.

The total area of *Basel Landschaft* is 163·8 square miles, of which 158·8 square miles are classed as "productive." Of this 55·9 square miles are covered by forests and 1·7 square miles by vineyards. The statistics of this half canton are as follows:—*Population.*—(1880) 59,171, (1900) 68,451. In 1900 there were 411 inhabitants to each square mile. *Religious.*—Protestants, (1880) 46,670, (1888) 48,698, (1900) 52,617; Romanists, (1880) 12,109, (1888) 12,921, (1900) 15,775; Jews, (1880) 223, (1888) 165, (1900) 135. *Linguistic.*—German-speaking, (1880) 58,961, (1888) 61,507, (1900) 66,581; French-speaking, (1880) 217, (1888) 303, (1900) 598; Italian-speaking (1880) 72, (1888) 115, (1900) 1470. (Earlier figures are untrustworthy.) The capital of Basel Landschaft is Liestal. The cantonal constitution dates from 1892. The executive of five members and the legislature (one member per 800 inhabitants or fraction over 400) are elected by a popular vote. The "obligatory referendum" obtains in the case of all laws, while 1500 citizens have the right of "initiative" whether in legislative matters or in demanding the revision of the cantonal constitution. In 1897 the state revenue was 1,496,726 frcs. (a rise of 123 per cent. since 1885) and the state expenditure 1,480,684 frcs. (a rise of 126½ per cent. since 1885), while the surplus in 1898 was 49,382 frcs.; the public debt in 1897 was 56,000 frcs. (W. A. B. C.)

Basel, or BÂLE, the capital of the Swiss half canton of Basel Stadt or urban Basel. It is now the largest city in the Swiss confederation except Zürich. It is also the richest city in Switzerland, having vastly increased in wealth and importance since the opening of the St. Gotthard railway in 1882. Its statistics are as follows:—*Population.*—(1880) 60,550, (1900) 107,287. *Religious.*—Protestants, (1880) 41,308, (1888) 47,007, (1900) 70,520; Romanists, (1880) 18,556, (1888) 21,312, (1900) 36,524; Jews, (1880) 801, (1888) 1047, (1900) 1898. *Linguistic.*—German-speaking, (1880) 59,002, (1888) 67,265, (1900) 104,155; French-speaking, (1880) 1867, (1888) 1997, (1900) 2720; Italian-speaking, (1880) 324, (1888) 305, (1900) 2348. The university library now contains 220,000 volumes and 4000 MSS., while in the



"The Meeting." By Marie Bashkirtseff.

winter of 1898-99 the matriculated students of the university numbered 332, and in that of 1899-1900, 603 (including "hearers"). A number of new buildings (*e.g.*, the Bernouillianum and the Vesalianum) for the purposes of natural science have of late years been erected in Basel. In modern days it has become known as a centre of missionary enterprise.

LITERATURE.—*Basler Chroniken* (original chronicles), 5 vols. Leipzig, 1872-90.—BOOS. *Geschichte d. Stadt Basel.* Basel (from 1877).—GEERING. *Handel u. Industrie d. Stadt Basel,* 1885.—*Rechtsquellen von Basel Stadt u. Land,* 2 vols. Basel and Biel, 1856-65.—STÜRBY. *Die Weidewirthschaft im Kant. Baselland.* Soleure, 1894.—*Urkundenbuch d. Landschaft Basel* (from 1881) and ditto for the city of Basel (from 1890). (W. A. B. C.)

Bashahr, or BISAHIR, a native state of India, within the Punjab, amid the Himalayan mountains, with an area of 3300 square miles, and a population of about 75,000. The estimated gross revenue is Rs.70,000; the tribute is Rs.39,450. The administration is temporarily in charge of a British official.

Bashan, a country on the E. side of the Jordan valley, often mentioned in the Bible. It included the Roman districts Ituræa, Gaulanitis, Trachonitis, Auranitis, and Batanæa, the present Jeidûr, Jaulân, Lejá, Haurân, and Ard el-Batanîeh. The region is now remarkable for the fertility of its friable volcanic soil, and for the character of its archæological remains. It is for the most part a plateau, 1500-2000 feet above the sea, with small isolated volcanic hills rising above its surface, and near its eastern extremity the Jebel Haurân, or Jebel ed-Druz mountains. The climate is healthy and the summer heat is mitigated by the prevailing westerly winds. The soil is peculiarly suitable for the growth of wheat and barley, especially the highly-prized hard wheat. The area under cultivation has increased greatly since the railway was opened in 1894, from Damascus to Mezeîrîb; but much of the produce is still sent by camel to Acre and Haifa. Fruit trees and eucalyptus have been introduced on the Haurân property of Baron Edmond de Rothschild, and thrive well. At Adrââh (*Edrei*) there are subterranean dwellings which are evidently of very early date. Great interest attaches to the stone houses, built without using wood, and to the numerous temples, mausolea, reservoirs, and conduits, all constructed with basalt. Most of the buildings are the work of the Ghassanide Arabs, who came under Greco-Roman influence, and at an early period embraced Christianity. The decorative details of the temples show strong local influence, and they and the dwelling-houses have many points in common with the temples and houses, built about the same time, in the treeless districts of Moab and Edom, where, however, the material is usually limestone or sandstone. The usual identification of the Lejá with the Argob of the Bible is now rejected by some scholars.

Schumacher, *Across the Jordan,* 1886; *the Jaulân,* 1888; *Northern 'Ajlûn,* 1890. (C. W. W.)

Bashkirtseff, Maria Constantinova (Marie), (1860-1884), Russian artist and writer, was born at Gavrontsi in the government of Pultowa in Russia, on the 23rd of November 1860. When Marie was seven years old, as her father (marshal of the nobility at Pultowa) and her mother were unable through incompatibility to live together, Madame Bashkirtseff, with her little daughter, left Russia, to spend the winters at Nice or in Italy, and the summers at German watering-places. Marie acquired an education superior to that given to most girls of her rank. She could read Plato and Virgil in the original, and write four languages with almost equal facility. A gifted musician, she at first hoped to be a singer, and studied seriously in Italy to that end; her voice, however, was not strong enough to stand hard work and failed her. Meanwhile she was also learning to draw. When she lost her voice she devoted herself to painting, and in 1877 settled in Paris, where she worked steadily in Tony Robert-Fleury's studio. In 1880 she exhibited in the salon a portrait of a woman; in 1881 she exhibited the "Atelier Julian"; in 1882 "Jean et Jacques"; in 1884 the "Meeting" (see Plate), and a portrait in pastel of a lady—her cousin—now in the Luxembourg gallery, for which she was awarded a *mention honorable.* Her health, always delicate, could not endure the labour she imposed on herself in addition to the life of fashion in which she became involved as a result of her success as an artist, and she died of consumption on the 31st of October 1884, leaving a small series of works of remarkable promise. From her childhood Marie Bashkirtseff kept an autobiographical journal; but the editors of these brilliant confessions (*Journal de Marie Bashkirtseff,* 1890), aiming apparently at captivating the reader's interest by the girl's precocious gifts and by the names of the various distinguished persons with whom she came in contact, so treated certain portions as to draw down vehement protest. This, to some extent, has brought into question the stamp of truthfulness which constitutes the chief merit of this extraordinarily interesting book. More recently a further instalment of Marie Bashkirtseff literature has been published in the shape of letters between her and Guy de Maupassant, with whom she started a correspondence under a feigned name and without revealing her identity.

See MATHILDE BLIND, *A Study of Marie Bashkirtseff.* T. Fisher Unwin, 1892.—*The Journal of Marie Bashkirtseff: an Exposure and a Defence.* By "S." (Showing that there is throughout a mistake of four years in the date of the Diary). *Black and White,* 6th Feb. and 11th April 1891, pp. 17, 304.—*The Journal of Marie Bashkirtseff.* Translated,—with an Introduction. By MATHILDE BLIND (2 vols.), London, 1890.—*The Letters of Marie Bashkirtseff,* 1 vol. (B. K.)

Basilicata, a territorial division of S. Italy, lying between Apulia, Calabria, Campania, and the sea, contains the one province of Potenza, with an area of 3845 sq. miles, and a population of (1901) 490,000. Marble, lignite, and chalk are the most important minerals worked. Mineral springs, especially sulphur springs, are abundant. Industrial activity is but little developed. Its towns are mostly small, the more important being Potenza, Avigliano, Rionero, Melfi, Matera, and Lauria.

Basim, a town and district of India, in Berar or the Haidarabad assigned districts, under British administration. The town is 52 miles south from Akola railway station. Population, about 12,000; municipal income in 1897-98, Rs.14,868.

The district of BASIM has an area of 2956 square miles. The population in 1891 was 398,179, being 135 persons per square mile. Classified according to religion, Hindus numbered 371,537; Mahommedans, 23,020; Christians, 88, of whom 17 were Europeans; "others," 3534, chiefly Jains. In 1891 the population was 353,522, showing a decrease of 11 per cent., compared with an increase of the same amount in the preceding decade. The land revenue and rates in 1897-98 were Rs.6,76,026, the incidence of assessment being nearly 9 annas per acre; the number of police was 426. The principal crops are millet, wheat, other food grains, pulse, oilseeds, and cotton. There is some manufacture of cotton-cloth and blankets. There is no railway, but the district is traversed from north to south by an old military road. In 1896-97 the number of schools was 118, attended by 4127 pupils, the proportion of boys at school being 13 per cent. of the male population of school-going age. The death-rate in 1897 was 42·7 per 1000.

Basingstoke, a municipal borough (extended 1891) and market town, in the Basingstoke parliamentary division of Hampshire, England, 19 miles N.E. by N. of Winchester by rail. A cottage hospital and a "home" for women have been built. Area, 4194 acres; population on this area (1891), 8213; (1901), 9793.

Basque Provinces, an old division of Spain, now subdivided into the provinces of Viscaya or Biscay, Alava, and Guipuzcoa, for particulars of each of which see under the separate headings. The total area is 2958 square miles; population about 570,000. The second Carlist insurrection (1870 to 1876) led to some curtailment of the almost complete local self-government previously enjoyed by these provinces, and especially to their forfeiting exemption from conscription. When the three provinces sent in their first contingent of 2046 conscripts in 1877 it was found that all but about 60 knew how to read and write, and succeeding contingents have kept up to this average of primary education. After the close of the civil war in 1876, the representatives of the three provincial councils, assisted by the senators and deputies of the Basque provinces in the Cortes, negotiated several successive pacts, each lasting some years, and the last still in force, securing for the three provinces their municipal and provincial self-government, the administration of their local affairs, and the assessment, distribution, and collection of their principal taxes and octroi duties, on the understanding that a lump sum, agreed upon beforehand, but subject to increase whenever the national taxation of other provinces was augmented, should be paid annually. These pacts have been scrupulously observed, and as the local authorities levy the contribution after their own ancient customs, landed property and the industrial and commercial classes are less heavily taxed in these territories than in the rest of Spain. Enough is raised, however, besides the amount handed over to the Government, to enable the schools, roads, harbours, and public works of every kind to be maintained at a standard which compares very favourably with that maintained elsewhere in Spain. The present provincial deputations of the three provinces have less power than the ancient "foral diputaciones"; they are now elected like the rest of the Spanish provincial councils, and are subject to the ordinary interference of the civil governors in their deliberations. (A. E. H.)

Basra, or Bussorah. (1) A viláyet of Asiatic Turkey formed in 1884 by detaching the southern districts of the Baghdad viláyet. It includes the great marshy districts of the Lower Euphrates and Tigris, and of their joint stream the Shatt el-Arab, and a sanjak, Nejd, on the western shore of the Persian Gulf. The climate is humid and unhealthy. There are large numbers of sheep, camels, and cattle. The exports are dates, wool, cereals, and indigo. Population, 950,000 (Moslems, 940,000, of whom 664,000 are Shiás; Christians, 6000; Jews, 4000).

(2) The capital of the viláyet, situated two miles from the right bank of the Shatt el-Arab, was founded by Midhat Pasha. It is reached from the river by a narrow winding creek, but the British Consulate and the merchants' houses are at Margil on the bank of the river. The water supply is bad, the climate trying and at times unhealthy, and there is much malarial fever. The country on both banks is liable to floods, which sometimes, as in 1896, when 2,000,000 date trees were destroyed, do much damage. The ruins of the Basra of the Khalifs and of the Arabian Nights are to the south-west of the present town. Basra is the port of transhipment from river boats to ocean steamers which run to England and India, and is the seat of a British Consul. The principal exports are wool, dates, cereals, gum, liquorice root, &c. Most of the exports and imports are from and to Baghdad. The average exports of the five years 1894-98 were valued at £996,224, and the imports at £1,103,356.

Bassam, Grand. See Ivory Coast.

Bassano, a town of the province of Vicenza, Venetia, Italy, picturesquely situated at the foot of the Venetian Alps and on the torrential Brenta, 24 miles N.E. from Vicenza by rail. Its most important building is the museum, which contains a picture gallery and a library. Bassano also possesses a bronze statue of Garibaldi, a monument to Victor Emmanuel, and a school of industrial design. Population, about 8000; of commune, about 15,000.

Bassein, a district in the Irrawaddy division of Lower Burma, in the delta of the Irrawaddy. It has been reduced to 4090 square miles, from 8954 square miles in 1871, having given up a large tract to the district of Myaungmya formed in 1896. In 1871-72 the population of the larger area amounted to 316,883 in 1554 villages. In 1891 the smaller district had 1439 villages, with a total population of 311,262, paying in 1898-99, Rs.14,98,772 revenue. Of the population 284,349 were Buddhists and Jains, 6315 Hindus, 4741 Mahommedans, and 15,857 Christians, of whom 15,610 were natives, chiefly Karens. Of a total area of 2,617,600 acres, 472,357 were cultivated in 1898-99, and 1,125,935 acres were not available for cultivation, the cultivable area apart from fallow being 927,833 acres. The rainfall in 1898-99 was 124·56 inches. Apart from Bassein the chief town is Ngathainggyaung, which had a population in 1891 of 5608. It is a municipal town. Bassein, the chief town and port, which had 19,577 inhabitants in 1871, had 30,177 in 1891. It has a municipal committee of 16 members, of whom 12 are elective, and there is a central jail capable of holding 1242 prisoners. There is a large rice export from Bassein, with several steam rice mills. In 1898-99 forty sea-going vessels with a burden of 78,123 tons entered Bassein port, and 42 with a tonnage of 78,058 cleared. The vessels of the Irrawaddy Flotilla Company ply between Rangoon and Bassein by inland waters.

Bastar, a feudatory state of British India, in the Chhattisgarh division of the Central Provinces, with an area of 13,062 square miles. In 1881 the population was 196,284, and in 1891 it was 310,884, being 24 persons per square mile. In 1901 the population was 306,544, showing a decrease of 1 per cent., compared with an apparent increase of 58 per cent. in the preceding decade. The estimated revenue was Rs.2,50,162; the tribute Rs.17,200. The chief town and residence of the Raja is Jagdalpur, on the river Indravati. The principal products are rice, oilseeds, lac, tusser silk, horns, hides, wax, and a little iron. Teak timber is floated down the rivers to the Madras coast. The state is (1901) under British administration, while the young Raja is being educated at the Rajkumar college at Raipur. A good road will shortly bring Jagdalpur into connexion with the railway at Raipur.

Basti, a town and district of British India, in the Gorakhpur division of the North-West Provinces. The town, a collection of villages, is on the river Kuana, 40 miles from Gorakhpur by railway. The population in 1891 was 13,630. It has no municipality. The district has an area of 2767 square miles; the population in 1891 was 1,785,944, being 645 persons per square mile. Classified according to religion, Hindus numbered 1,510,149; Mahommedans, 275,729; Christians, 66, including 23 Europeans. In 1901 the population was 1,845,758,

showing an increase of 3 per cent. The land revenue and rates were Rs.24,26,828, the incidence of assessment being R.1:8:10 per acre; the number of police was 2476. There are no canals, but the country is watered by rivers from the hills. In 1896-97, out of a total cultivated area of 1,169,887 acres, 494,814 were irrigated from wells, tanks, &c. A railway from Gorakhpur to Gonda runs through the district; and the river Gogra is navigable. A large trade is conducted with Nepal.

Bastia, chief town of arrondissement in the island of Corsica, 94 miles N.E. of Ajaccio, by rail. The new port has 1100 feet of quayage, served by a railway, and with a depth alongside of 25 feet. The total number of vessels entered and cleared in 1899 was 620, with a tonnage of 279,823. Population (1896), 28,357.

Bastian, Adolf (1826-——), German ethnologist, was born at Bremen 26th June 1826. From his early years he devoted himself to travel. Proceeding to Australia in 1851 as surgeon on a vessel, he had visited almost every part of the world before his return in 1859. In 1861 he departed on an expedition to the Far East, which lasted five years. Upon his return he commenced the publication of his great work on *The Peoples of Eastern Asia*, an immense store-house of facts owing little to arrangement or style. He settled in Berlin, where he was made keeper of the Ethnographical Museum; but at various times undertook further scientific travels in Africa, South America, and India. The results of these explorations were made public in a long series of separate publications, comprising several on Buddhism, and on the psychological problems presented by native superstitions. Bastian also edited the *Zeitschrift für Ethnologie* from 1869, in conjunction with Virchow and Robert von Hartmann. On his seventieth birthday, 1896, he was presented with a volume of essays composed by the most distinguished ethnologists in celebration of the event, and dedicated to him.

Bastien-Lepage, Jules (1848-1884), French painter, was born in the village of Damvillers, Meuse, France, on the 1st of November 1848, and spent his childhood there. He first studied at Verdun, and prompted by a love of art went in 1867 to Paris, where he was admitted to the École des Beaux Arts, working under Cabanel. After exhibiting in the Salons of 1870 and 1872 works which attracted no attention, in 1874 he made his mark with his "Song of Spring," a study of rural life, representing a peasant girl sitting on a knoll looking down on a village. His "Portrait of my Grandfather," exhibited in the same year, was not less remarkable for its artless simplicity, and received a third-class medal. This success was confirmed in 1875 by the "First Communion," a picture of a little girl minutely worked up as to colour, and a "Portrait of M. Hayem." In 1875 he took the second Prix de Rome with his "Angels appearing to the Shepherds," exhibited again in 1878. His next endeavour to win the Grand Prix de Rome in 1876 with "Priam at the Feet of Achilles" was again unsuccessful (it is in the Lille gallery), and the painter determined to return to country life. To the Salon of 1877 he sent a full-length "Portrait of Lady L." and "My Parents"; and in 1878 a "Portrait of M. Theuriet" and "The Hayfield." The last picture, now in the Luxembourg gallery, is regarded as a typical work from its stamp of realistic truth. Thenceforth Bastien-Lepage was recognized in France as the leader of a school, and his "Portrait of Mme. Sarah Bernhardt," 1879, painted in a light key, won him the Cross of the Legion of Honour. In 1880 he exhibited a small portrait of M. Andrieux and "Joan of Arc listening to the Voices"; and in the same year, at the Royal Academy, the little portrait of the "Prince of Wales." In 1881 he painted "The Beggar" and the "Portrait of Albert Wolf"; in 1882 "Le Père Jacques"; in 1883 "Love in a Village," in which we find some trace of Courbet's influence. His last dated work is "The Forge," 1884. The artist, long ailing, had tried in vain to re-establish his health in Algiers. He died in Paris, 10th December 1884, when planning a new series of rural subjects. Among his more important works may also be mentioned the portrait of "Mme. J. Drouet," 1883; "Gambetta on his Death-bed," and some landscapes; "The Vintage," 1880, and "The Thames at London," 1882. "The Little Chimney-Sweep" was never finished. An exhibition of his collected works was opened in March and April 1885.

A Sketch-model for Joan of Arc.
(From the Statuette by Bastien-Lepage.)

A. Theuriet. *Bastien-Lepage.* 1885. (English Edition. 1892.) L. de Fourcaud. *Bastien-Lepage.* 1885. (H. Fr.)

Basutoland, a British protectorate in South Africa occupying the upland region enclosed by the Drakenberg range on the south, and northwards by the Caledon affluent of the Orange river. It is thus coterminous towards the south with Cape Colony, north-eastwards with Natal, and on the north and south-west with Orange River Colony, and has an area of about 10,300 square miles, with a population which increased from over 218,000 in 1891 to 250,000 in 1895, and in 1900 was estimated at nearly 300,000. The "Switzerland of South Africa," as it has been called, forms a continuous rugged and broken plateau at a mean altitude of about 6000 feet, and is traversed in its entire length by the Maluti ("Blue") range, running north of and parallel with the Drakenberg. Towards Natal the two systems converge in the huge table-shaped Potong (Antelope), to which the French missionaries have given the name of *Mont aux Sources*, because on its slopes have their rise the head-streams of the Tugela flowing to the Indian Ocean, and of the Orange flowing to the Atlantic. Above Potong, itself over 10,000 feet high, tower other mountains, such as Cathkin or Champagne Castle (10,520), and Hamilton (10,700?), culminating point of Africa south of the Zambesi. Besides the Caledon, Basutoland is watered by the Senku ("Black Water") and the Kornet-spruit, which descend from Potong, and after traversing the plateau between the Drakenberg and Maluti ranges, converge in a single channel to form the Orange above Herschel. Owing to the abundance of running waters and a sufficiently copious rainfall, the uplands form excellent grazing grounds for vast numbers of cattle and horses (the hardy and sure-footed "Basuto ponies"), while the finest crops of cereals in South Africa are raised on the fertile banks of the Caledon. The country takes its name from its Basuto inhabitants, a brave and highly intelligent branch of the Bechuana nation, who have been evangelized by French Protestant missionaries, and now form perhaps the most orderly and most flourishing Christian community in Africa. The Basutos were not originally confined to their present highland territory, but ranged over both banks of the Caledon, and beyond them in the direction of the Vaal. In fact, the whole region corresponding to the present Orange River Colony formed part of the Basuto domain until they were dispossessed and driven to the uplands by the early Boer settlers. For fiscal and judicial purposes the country is divided into the seven districts of Maseru, Leribe, Mohale's Hock, Berea, Mafeking, Quthing, and Qacha's Nek, and each district is subdivided into wards ruled by hereditary chiefs, all members of the Moshesh family. Maseru, the capital and largest town, lies on the left bank of the Caledon, a little below Ladybrand on the opposite side, and has an estimated population of about 1000 (Europeans, 120). There are indications of iron and copper, while coal of a fair quality occurs in several parts, and is worked for the local supply. But agriculture is the chief resource of the people, the yield of grain, cattle, and wool being sufficient to support a brisk export trade, valued in 1898 at £138,500. In the same year the imports (saddlery, clothes, groceries, iron and tin ware) exceeded £100,000, and in 1899 the revenue (£46,847) more than balanced the expenditure (£46,417). The hut tax yielded £23,678, although, owing to the scarcity of food during 1899, only ten shillings a hut was levied instead of the one pound that is chargeable. There is no public debt. The 144 schools (chiefly missionary) are regularly attended by about 9000 pupils, and supported by a grant in aid of £4440. Many of the Basutos speak and write English fluently, and dress in the European manner.

WIDDICOMBE, J. *Fourteen Years in Basutoland.* London, 1892. —BARKLEY, Mrs. *Among Boers and Basutos.* London, 1894.—RECLUS, E. *Universal Geography,* new issue, "Africa," vol. iii. London, 1901. (A. H. K.)

Recent History.—The Basutos belong to the mountain tribes of the great Bantu race. They appear to combine in a remarkable manner the fighting qualities of the coast tribes, such as the Zulus, with the higher intelligence and cunning of the interior tribes, such as the Bechuanas. They are hardy and industrious; Moshesh, the founder of the Basuto tribe, and for a long lifetime the leader of his people, was a striking example of the strongest qualities to be found in a Bantu chief. The Basuto tribe formed itself under the leadership of Moshesh, out of remnants of various other Bantu tribes, which had been broken up by the Zulu chief Chaka. There is no people among whom personal *kudos* counts for more than it does amongst the Bantu, and the rising reputation of Moshesh as a hunter and warrior brought him, while quite young, many followers from the surrounding tribes. The Basutos at the outset acquired an unenviable notoriety as a race of bold cattle lifters and raiders, and in their early settlements the emigrant Boers found them extremely troublesome neighbours. At the same time, if the Basutos were eager for cattle, it is equally certain that the Boers were eager for land; and their encroachments on the territories of the Basutos led to a proclamation in 1842 from Sir George Napier, the then Governor of Cape Colony, forbidding further encroachments on Basutoland. In 1843 a treaty was signed with Moshesh on the lines of that already arranged with Waterboer, the Griqua chief, creating Basutoland a native state under British protection. Notwithstanding this treaty, the cattle-stealing propensities of the Basutos continued to manifest themselves; and a commando, consisting of British troops, farmers, and natives, was sent against Moshesh in 1849. This commando did not prove strong enough to accomplish its end, and was repulsed by Moshesh.

The ambition of Moshesh led him to endeavour to regain if possible the territories south of the Vaal and west of the Drakensberg, which had been at one time occupied by those very Bantu tribes from whom many of his retainers were drawn. In 1852 General Cathcart, who succeeded Sir Harry Smith as governor of Cape Colony, decided to take strong measures with the tribe, and proceeded with three small divisions of troops against Moshesh. The expedition was by no means a success, but Moshesh, with that peculiar statecraft for which he was so famous, saw that he could not hope permanently to hold out against the British troops, and followed up his successful skirmishes with General Cathcart by writing him a letter, in which he said: "As the object for which you have come is to have a compensation for Boers, I beg you will be satisfied with what you have taken. You have shown your power, you have chastised; I will try all I can to keep my people in order in the future." In this instance Moshesh displayed similar cunning strategy to that which he had used so successfully against the Matabele warrior, Moselekatze, twenty years before, when he followed up his victory by sending a letter after the retreating enemy couched in the following terms: "Moshesh salutes you. He sends you these cattle as a recognition of your bravery. . . . He desires to live at peace with you." This diplomatic letter was so successful in its object that Moselekatze never attacked him again. In reference to this letter and to the other diplomatic correspondence of this astute chief, it is only fair to state that he owed a good deal to the assistance of two missionaries attached to the French Protestant Mission in Basutoland, Mr Dyke, an Englishman, and M. Cassalis, a Frenchman. At the same time revelations of recent date show that while these gentlemen believed themselves to be guiding Moshesh, they were

frequently used by this wily chief when occasion served him.

In 1865 a fresh feud occurred between the Orange Free State Boers and the Basutos. The latter applied to Sir Philip Wodehouse at the Cape for protection, but he declined to interfere. The Boers proved more successful than they had been in the past, and occupied several of the Basuto strongholds. They also annexed a certain fertile portion of Basuto territory, and finally terminated the strife by a treaty at Thabo Bosigo, by which Moshesh gave up the tract of territory taken by the Boers and professed himself a subject of the Free State. Seeing that the struggle against the Boers was hopeless, no fewer than 2000 Basuto warriors having been killed, Moshesh again appealed for protection to the British authorities, saying: "Let me and my people rest and live under the large folds of the flag of England before I am no more." In response to this request, the British authorities decided to take over Basutoland, and a proclamation of annexation was issued. At the same time the Boer commandoes were requested to leave the country. The Free State strongly resented the British annexation of Basutoland, and in 1869 the treaty of Aliwal North was concluded between the Free State and the High Commissioner. This treaty defined the boundary between the Free State and Basutoland, whereby the fertile strip of country west of the Caledon River was finally transferred to the Free State, and the remainder of Basutoland was recognized as a portion of the British dominions. It further dealt with cattle thefts, and made special provisions enabling the Free State Boers to trace and recover at any time stock which the Basutos might steal.

Moshesh, who for nearly fifty years had led his people so skilfully and well, died in 1870. In 1871 Basutoland was annexed to Cape Colony, the area at that time being given as 10,300 square miles. The turbulent Bantu warriors did not remain quiet for any length of time, and in 1879 Moirosi, a chief residing in the southern portion of Basutoland, openly repudiated colonial rule. An expedition was despatched from Cape Colony and severe fighting followed. Moirosi's stronghold was captured and the chief himself was killed. Immediately after the war, strife occurred among the Basutos themselves over the question of the partition of Moirosi's territory, which had been decided on as one of the results of the war. In 1880 the Cape Government felt sufficiently strong to extend to Basutoland the Cape Peace Preservation Act of 1878. This Act provided for the disarmament of natives, and had already been put in force successfully among some of the Kaffir tribes on the Cape eastern frontier. Its execution in Basutoland, however, proved an extremely difficult task, and was never entirely accomplished. Desultory warfare was carried on between the colonial troops and the Basutos until 1881, when the intervention of the High Commissioner, Sir Hercules Robinson, was asked for. Peace in Basutoland was not announced until the end of 1882. In the following year a form of self-government was established, but was once more followed by internal strife among the petty chieftains.

The subjection of Basutoland to the control of the Cape Government had by this time proved unsatisfactory, both to the Basutos and to Cape Colony. The Basutos on their part found that self-government involved not only strife amongst themselves, but also serious danger from their Free State neighbours, and they appeared desirous that Basutoland should be taken under the direct administration of the Imperial Government. The Cape Government found, that owing to their endeavour to disarm the Basutos, including the "gun war" of 1880, they had incurred an expenditure of three millions, and they were by no means pleased at the prospect of a continued governing of the country. They therefore offered no opposition to the appeal made by the Basutos themselves to the Imperial Government to take them over, and, moreover, Cape Colony undertook to pay towards the cost of administration an annual contribution of £18,000. Consequently, in 1884, Basutoland ceased to be a portion of the Cape Colony and became a British Crown Colony. A period of comparative quiet followed, and in 1891 Basutoland was admitted to the Customs Union, which already existed between Orange Free State, Cape Colony, and British Bechuanaland. The country has since been administered by a Resident Commissioner and a small staff of officials, and when Lord (then Sir Alfred) Milner visited Basutoland in 1898, on his way to Bloemfontein, he was received by fifteen thousand mounted Basutos. The chiefs also attended a large meeting at Maseru, and gave expression to their gratitude for the beneficent character of Queen Victoria's rule and protection. On the outbreak of the Boer war in 1899, these same chiefs, at a great meeting held in the presence of the Resident Commissioner, gave a further protestation of their loyalty to Her Majesty. There can be no question that the conversion of Basutoland into a Crown Colony, administered by a British Resident Commissioner responsible to the Colonial Office, has contributed alike to the prosperity of the Basutos, the security of the property of neighbouring colonists, and a peaceful condition among the natives of South Africa generally. The annual report of the resident commissioner, Sir Godfrey Lagden, for the year 1899, is adequate testimony to this success. During the year no less than 37,371 passes were given to natives who visited the neighbouring states and colonies in search of work. With regard to the influence of education amongst the Basutos, Sir Godfrey Lagden reported as follows:—"The ability to imbibe technical knowledge and earn good wages, the desire to possess money, to wear decent clothes, to have respectable houses and furniture, to educate the children and have their own churches and schools, are automatically working social changes which no laws can so well effect."

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Batabano, a small village on the south coast of Cuba opposite Havana and the terminus of the south coast steamer trade of Havana. The original settlement of Havana made under Diego Velasquez about 1517 was near this place. Population, 1025.

Bataisk, a wealthy village of South Russia, 5 miles south of Rostov-on-Don. It has a population of more than 10,000, and is a centre for trade in grain and cattle.

Batala, a town of British India, in the Gurdaspur district of the Punjab, with a station on a branch of the North-Western Railway, 24 miles from Amritsar. The population is about 27,000; the municipal income in 1897-98 was Rs.33,664. It is an important centre of trade, with manufactures of cotton and silk goods, shawls, brass-ware, and leather. There are two mission schools.

Batalpashinsk, a district town of Russia, North Caucasia, province of Kubañ, on the left bank of Kubañ river, 27 miles S. of Nevinnomysskaya station on the North Caucasian railway. Timber is exported, and there is an important sawmill. Salt is obtained from lakes of the same name, situated 10 miles from the town. Population (1897), 8100.

Batangas, a well-built town of some 40,000 inhabitants, in the island of Luzon, Philippine Islands, and capital of the province of Batangas. It is well

situated on the eastern coast of the Gulf of Batangas, and is the most important port of a province noted for the fertility of its soil and the industry of its inhabitants. Its exports, which are large, include rice, coffee of excellent quality, cacao, sugar, Indian corn, horses, and cattle. The horses of Batangas are unusually strong and active. Good cotton is also produced, and is woven into fabrics by the women. The language is Tagalog.

Batavia, a residency on the north coast of West Java, consisting of the districts of Batavia (town and suburbs), Meester Cornelis, Tangerang, and Buitenzorg. It is bounded on the S. by the mountains and volcanoes of the residency of Preanger, in which the rivers (which, with the sea, have formed the broad band of alluvium in the north of the residency) Jidani, Jilivong, Jitarum, take their rise. In this fertile region are situated the private estates of Europeans and Chinese, and the orchards and fruit gardens near the capital. On the higher lands of the residency coffee, tea, cloves, and cinnamon are cultivated. Area, 2595 square miles. Population in 1898, 1,313,383, including 12,434 Europeans, 82,510 Chinese, 3,279 Arabs, 147 other Asiatic foreigners.

The capital, of the same name, is the chief town of all the Dutch East Indian Colonies, and lies in 106° 50′ E., 6° 8′ S. Since 1874 the progress of the commerce and shipping of the town must be mainly attributed to the improvement in its communication with other residencies and its harbour improvements. Since 1873 the old and new towns have been connected by steam tramways. The Batavia-Buitenzorg railway passes the new town, thus connecting it with the main railway which crosses the island from west to east. But the construction of the new harbour at Tanjong Priok, to the east of the old one, is of the first importance. The works, commenced in 1877 and completed in 1886, connect the town with Tanjong ("cape") Priok by a canal and include an outer port formed by two breakwaters 6072 feet long, with a width at entrance of 408 feet and a depth of 27 feet throughout. The inner port has 3282 feet of quayage; its length is 3609 feet, breadth 573 feet, and depth 24 feet. There is also a coal dock, and the port has railway and roadway connexion with Batavia. The total cost of these works has been £2,250,000. The tonnage of vessels clearing from Batavia to countries beyond the archipelago has increased from 879,000 tons in 1887 to 1,224,000 tons in 1898. The population of the town in 1880 was 96,957; in 1898, 115,567; including 9423 Europeans, 26,433 Chinese, 2828 Arabs, and 132 other Asiatic foreigners.

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Batavia, capital of Genesee county, New York, U.S.A., situated in 43° 00′ N. lat., and 78° 11′ W. long., in the western part of the state, 36 miles east of Buffalo, on Tonawanda Creek, at an altitude of 890 feet. It is on three railways, the New York Central, the Lehigh Valley, and the New York, Lake Erie, and Western. Its manufactures consist largely of agricultural tools and machines. Population (1880), 4845; (1890), 7221; (1900), 9180.

Bates, Harry (1850-1899), English sculptor, was born at Stevenage, Herts, on 26th April 1850. Before beginning the regular study of plastic art he passed through a long apprenticeship in architectural decoration. In 1879 he came to London and entered the Lambeth School of Art, studying under Jules Dalou, and winning a silver medal in the national competition at South Kensington. In 1881 he was admitted to the Royal Academy schools, where in 1883 he won the gold medal and the travelling scholarship of £200 with his relief of "Socrates teaching," which showed the qualities of grace of line and harmony of composition which always distinguished his work. He then went to Paris and studied under Rodin. A head and three small bronze panels (the "Odyssey") executed by Bates in Paris were exhibited at the Royal Academy, and selected for purchase by the Chantrey Trustees; but the selection had to be cancelled because they had not been modelled in England. His "Æneas" (1885), "Homer" (1886), three "Psyche" panels, and "Rhodope" (1887), all showed marked advance in form and dignity; and in 1892, after the exhibition of his vigorously designed "Hounds in Leash," Bates was elected A.R.A. His "Pandora" in the same year was bought for the Chantrey Bequest, and is now in the Tate Gallery. Among his later work was the colossal equestrian statue of Lord Roberts (1896), cast in bronze and set up in Calcutta; and a statue of Queen Victoria for Dundee. But perhaps his masterpiece, showing the sculptor's delicate fancy and skill in composition, was an allegorical presentment of "Love and Life"—a winged male figure in bronze, with a female figure in ivory being crowned by the male. Bates died in London 30th January 1899, his premature death robbing English plastic art of its most promising representative at the time.

Bates, Henry Walter (1825-1892), English naturalist and explorer, was born at Leicester on 8th February 1825. His father, a manufacturing hosier, intended him for business, and for a time the son yielded to his wishes, escaping as often as he could into the neighbouring country to gratify his love of botany and entomology. This determined his future, and in 1844, meeting a congenial spirit in Alfred Russel Wallace, the result was discussion and execution of a plan to explore some then little known region of the globe. The banks of the Amazons was the district chosen, and in April 1848 the two friends sailed in a trader for Pará, which was reached in a month. They had little or no money, and, as the expenses were to be met by the sale of duplicates of specimens, work was begun on arrival. After two years Bates and Wallace agreed to collect independently, Wallace taking the Rio Negro and the upper waters of the Orinoco, while Bates continued his route up the great river for 1400 miles. He remained in the country eleven years, during which time he collected no fewer than 8000 species of insects new to science. His long residence in the tropics, with the privations which it entailed, undermined his health, and he returned to England the victim of chronic dyspepsia. Nor had the exile from home the compensation of freeing him from financial cares, which hung heavy on him till he had the good fortune to be appointed in 1864 assistant secretary of the Royal Geographical Society, a post which, to the inestimable gain of the Society, and the advantage of a succession of explorers, to whom he was alike Nestor and Mentor, he retained till his death on 16th February 1892. So far as an authoritative position in the scientific world was concerned, Bates had secured this by two publications the importance and interest of which are abiding. He is best known as the author of one of the most delightful books of travel in the English language, *The Naturalist on the River Amazons* (1863), the writing of which, as the correspondence between the two has shown, was due to Darwin's persistent urgency. "Bates," wrote Darwin to Lyell, "is second only to Humboldt in describing a tropical forest." But his most memorable contribution to biological science, and more especially to that branch of it which deals with the agencies of modification of organisms, was his paper on the "Insect Fauna of the Amazon Valley," published in vol. xxiii. of the *Linnean Society's Transactions.* He therein, as Darwin

testified, clearly stated and solved the wonderful problem of "mimicry," as it is conveniently called, or the superficial resemblances between totally different species; and the likeness between an animal and its surroundings, whereby it evades its foes or conceals itself from its prey. The species which has varied most from the normal type of its group is far rarer than the form which it resembles, while the mimicked is abundant and well defended by such devices as unpleasant taste or smell, or the power of stinging or wounding. The basis of mimetic analogies lies in the origination of some slight variation in the mimicker, which tends in the direction of likeness to the mimicked, upon which variation natural selection operates. Bates's other contributions to the literature of science and travel were sparse and fugitive, but he edited for several years a periodical of *Illustrated Travels*. A man of varied tastes, he devoted the larger part of his leisure to entomology, notably to the classification of coleoptera. Of these he left an extensive and unique collection, which, fortunately for science, was purchased intact by M. René Oberthur of Rennes. (E. CL.)

Bath, a city, municipal, county, and parliamentary borough, market town, and fashionable watering-place, in the county of Somerset, England, on the Avon, 107 miles W. of London by rail. The borough is divided into seven wards under a mayor, 14 aldermen, and 42 councillors. The corporate property yields a gross income of £8500. The new municipal buildings, costing £38,000, were erected in 1894. Other recent buildings include a Roman Catholic church, new Queen's Baths, Jubilee Hall, Bath Church Institute, Lyric Theatre, and a handsome art gallery (1900) erected as a memorial of the Diamond Jubilee. A new public park was opened in 1897. To the list of charitable institutions have been added four dispensaries, including the Halnemann Free Dispensary (1888). Bath publishes two daily and five weekly newspapers. Since 1875 excavation has been carried on with the result of exposing the baths erected during the Roman occupation, in wonderful preservation, portions of a church erected in the 9th century, and other antiquities. Area of city and municipal borough, 3382 acres; population (1881), 51,814; (1901), 49,817. Area of parliamentary borough, 3455 acres; population (1881), 53,785; (1901), 52,751.

See KING'S *Municipal Records* (1885); BRITTON'S *History of Bath Abbey Church* (1887); PEACH'S *Bath, Old and New* (1888); and *Collections of Books belonging to the City* (1893); *Handbook to Bath*, edited by J. W. MORRIS (1888); DAVIS'S *Guide to the Roman Baths* (1883); *Excavations of Roman Baths* (1895); and *The Saxon Cross* (1898).

Bath, a city and port of entry of Maine, U.S.A., and capital of Sagadahoc county, situated in the southern part of the state, on the west bank of Kennebec river, 12 miles above its mouth, where it is broad and navigable for all classes of vessels. It was formerly one of the most prominent centres of wooden shipbuilding, and its ships are still found in all parts of the world. In recent years the building of iron ships has become of importance, the Bath Iron Works having constructed a number, among them several smaller ships of the U.S. navy. Population (1880), 7874; (1890), 8723; (1900), 10,477.

Bathgate, a burgh of barony and police burgh of Linlithgowshire, Scotland, 19¾ miles west by south of Edinburgh by rail. The academy had in 1898-99 an average attendance of 831, while a Board school had 352, and a Roman Catholic school 205. Population (1901), 6786.

Bathurst, a city in Australia, New South Wales, 144 miles west of Sydney on the Great Western Railway, in the centre of the chief wheat-growing district of the colony, on the south bank of the Macquarie river. It has been a municipality since 1862. Altitude, 2200 feet. Mean temperature, year, 57·6° F.; January, 72·6°; July, 43·3°. Population about 10,000.

Batley, a municipal borough of Yorkshire, England, distant 8 miles from Leeds by rail, and about the same distance from Wakefield and Bradford. With the adjacent municipal borough of Dewsbury it forms part of the parliamentary borough of Dewsbury. All Saints' Church contains ancient memorials, and there are an ancient grammar school, a technical school (established by public subscription), a town hall, a hospital, a market house, and public baths. The town is the centre of the heavy woollen trade, and has extensive manufactures of army cloths, pilot cloths, druggets, flushings, &c.; also iron foundries, manufactures of machinery, and stone quarries. The borough lies in the south-west Yorkshire coalfield, and there are a number of collieries in the district. Area, 2039 acres. Population (1881), 27,505; (1901), 30,321.

Baton Rouge, a city of Louisiana, U.S.A., capital of East Baton Rouge Parish. It was made the state capital in 1849. In 1862 the seat of government was transferred to New Orleans, and in 1880 it was restored to Baton Rouge. It is the seat of Louisiana State University. Population (1880), 7197; (1890), 10,478; (1900), 11,269, of whom 4660 were white and 6596 negro.

Battaglia, a town of the province of Padua, Venetia, Italy, 11 miles S.S.W. from Padua by the railway to Bologna. It lies on the Euganean Hills, and has much-frequented hydropathic and hot sulphur springs, which supply *inter alia* mud baths and a natural vapour bath. The springs gush out at the foot of Mount Saut' Elena, and have a temperature of 136·4° to 159·8° F. In the immediate vicinity are the castle of Cattajo, built in 1550, and the church of Arqua Petrarca, in which is the tomb of Petrarch; there also is the house in which he lived, now containing relics of the poet. Building stone is quarried. Population, about 3700.

Battambang (locally known as PRATTABAWNG), situated in 103° 13′ E. long. and 13° 6′ N. lat., lies in the great Cambodian plain upon the river Sangk, which drains from the Patat range into the great lake to the eastward. It is the chief town of the Cambodian province of the same name, and was conquered by the Siamese at the end of the 18th century, at the same time as the neighbouring province of Siemrap. If the Pailin district (for which see CHANTABUN) is excepted, the chief products of the province are rice and dried fish. The total value of the export and import trade of the two provinces of Battambang and Siemrap does not at present exceed £100,000 a year. The population of the town is about 5000, and that of the province scarcely 50,000. A hereditary chief of Cambodian descent resides within the brick walls of the old citadel, and since 1893 a commissioner appointed from Bangkok has resided at Sis.

By the terms of the treaty of October of that year between France and Siam, the Siamese Government bound itself not to maintain or navigate ships or armed vessels on the Great Lake, nor to construct any fortified port or military establishment, nor to maintain any armed force in the provinces of Battambang and Siemrap. A clause was introduced to encourage trade between French Cambodia on the south and these lake provinces, but owing to the high tariff imposed in the French colonies the bulk of the trade still goes overland to Bangkok in preference to the easier water route to Saigon.

Battas (Dutch *Battaks*), the inhabitants of the formerly independent Batta country, in the central highlands of Sumatra, now for the most part subjugated to the Dutch government (1832-90). The still independent area extends from 98°-99° 35′ E., and 2°-3° 25′ S. North-east of Toba lake dwell the Timor Battas, and west of it the Pakpak, but on its north (in the mountains which

border on the east coast residency) the Karo Battas form a special group which, by its dialects and ethnological character, appears to be allied to the Gajus and Allas occupying the interior of Achin. The Battas are engaged in agriculture (rice, *kapas*, indigo), in horse and pig breeding, and in gathering the products of the forests.

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Batticaloa, the provincial capital of the eastern province of Ceylon, on the E. coast, 69 miles S.S.E. of Trincomalee. The population of the town in 1901 was about 8000; of the district (2872 square miles), 145,155. The old Dutch "Fort" is a mere name. Batticaloa is the seat of a government agent and district judge; criminal sessions of the supreme court are also held. Rice and cocoanuts are the two staples of the district, and a steamer trading round the island calls once a week at the port. The lagoon is famous for its "singing fish"; the district has a remnant of Veddahs or wildmen of the wood. The average annual rainfall is 55½ inches; the average temperature 80·4°.

Battle Creek, a city of Calhoun county, Michigan, U.S.A., situated on Kalamazoo river, at the mouth of Battle Creek, in the southern part of the lower peninsula, at an altitude of 820 feet. It has three railways, which give communication in all directions. It is the seat of Battle Creek College, contains a sanatorium, and has extensive manufactures, largely of agricultural implements. Population (1880), 7063; (1900), 18,563.

Batu (Dutch *Batoe*), a group of three greater and forty-eight lesser islands between 0° 10′ N. to 0° 45′ S. and 97° 50′-98° 35′ E., belonging to the Ayer-bangi district of the lowlands of Padang (Sumatra). They are separated by the strait of Sibirut from the Mentavei group. Only twenty of the smaller islands are inhabited. The natives are of Malay-Buginese origin.

Batum, a seaport of Russia, Transcaucasia, province and 85 miles by rail S.E. of Kutais, on the south-east shore of the Black Sea, in 41° 39′ N. and 41° 38′ E., near the mouth of the Chorokh; annexed from Turkey in 1878. The bay of Batum is being continually filled up by the sand that is carried into it by several small rivers. It is protected by strong forts, and the anchorage has been greatly improved by artificial works. The town is built on the steep slopes of the hills on its western shore. The climate is very warm, lemon and orange trees, magnolias and palms growing in the open air, but it is extremely wet and changeable. The yearly amount of rain (90 inches) is higher than anywhere in Caucasia, but is very unequally distributed (23 inches in August and September, sometimes 16 inches in a couple of days), and the town is still most unhealthy. Only bridle-paths connect Batum with the interior.

Batum has grown rapidly in recent years. It is now connected by rail with the main line of Transcaucasia, and is the chief port of the whole country for the export of naphtha, paraffin oil, liquorice, wheat, Indian corn, and timber (about £4,000,000 a year). Some 800 vessels are engaged in foreign trade, and 500 coasting vessels visit it every year. Population (1875), 2000; (1897), 28,500, very mixed. The district of Batum (85,576 inhabitants, with Batum town, in 1897), with the districts of Artvin and Ajar (56,456), formerly made a separate province of Batum. They are now two military districts of the province of Kutais.

Bauan, a town of 30,000 inhabitants, in Luzon, Philippine Islands, situated near the head of the Gulf of Batangas. It is noted for having an unusually fine church. The surrounding country is very fertile, and cacao, pepper, cotton, hemp, coffee, and rice are produced in abundance. Cattle and horses are raised for the Manila market. The women weave and dye cotton and hempen fabrics. The language is Tagalog.

Bauchi. See NIGERIA.

Baudry, Paul Jacques Aimé (1828-1886), French painter, was born at La Roche-sur-Yonne (Vendée). He studied under Drolling, a sound but second-rate artist, and carried off the Prix de Rome in 1850 by his picture of "Zenobia found on the banks of the Araxes." His talent from the first revealed itself as strictly academical, full of elegance and grace, but somewhat lacking originality. In the course of his residence in Italy Baudry derived strong inspiration from Italian art with the mannerism of Correggio, as was very evident in the two works he exhibited in the Salon of 1857, which were purchased for the Luxembourg: "The Martyrdom of a Vestal Virgin" and "The Child." His "Leda," "St John the Baptist," and a "Portrait of Beulé," exhibited at the same time, took a first prize that year. Throughout this early period Baudry commonly selected mythological or fanciful subjects, one of the most noteworthy being "The Pearl and the Wave." Once only did he attempt a historical picture, "Charlotte Corday after the murder of Marat" (1861), and returned by preference to the former class of subjects or to painting portraits of illustrious men of his day—Guizot, Charles Garnier, Edmond About. The works that crowned Baudry's reputation were his mural decorations, which show much imagination and a high artistic gift for colour, as may be seen in the frescoes in the Paris Cour de Cassation, at the Château of Chantilly, and some private residences—the Hôtel Fould and Hôtel Paiva—but, above all, in the decorations of the *foyer* of the Paris Opera House. These, more than thirty paintings in all, and among them compositions figurative of dancing and music, occupied the painter for ten years. Baudry died in Paris in 1886. He was a member of the Institut de France, succeeding Schnetz. Two of his colleagues, Dubois and Mercié, co-operating with his brother, Baudry the architect, erected a monument to him in Paris (1890). The statue of Baudry at La Roche-sur-Yonne (1897) is by Gérôme.

See H. DELABORDE. *Notice sur la vie et les ouvrages de Baudry.* 1886.—CH. EPHRUSSI. *Baudry, sa vie et son œuvre.* 1887.

(H. FR.)

Bauer, Bruno (1809-1882), German theological and historical critic, was born 6th September 1809, the son of a painter in a porcelain factory at Eisenberg in Saxe-Altenburg. He was educated at Berlin, where he fell under the then all-powerful influence of Hegel, attaching himself to the "right" of the Hegelian school under Marheineke. In 1834 he began to teach in Berlin as a licentiate of theology, and in 1839 was transferred to Bonn. Meanwhile his opinions had been changing, and in two works, *Kritik der evangelischen Geschichte des Johannes* (1840) and *Kritik der evangelischen Geschichte der Synoptiker* (1841), he announced his complete rejection of his earlier orthodoxy. In 1842 the Government, having taken the opinions of the various Prussian faculties of theology, revoked his license to teach, and he retired for the rest of his life to Rixdorf, near Berlin. Henceforward he took a deep interest in modern history and politics, as well as in theology. Among the fruits of his new studies were *Geschichte der Politik, Kultur und Aufklärung des 18. Jahrhunderts*, in 4 vols. (1843-45), and *Geschichte der Französischen Revolution*, in 3 vols. (1847). He kept up this line of interest till the end, and *Disraelis romantischer und Bismarcks socialist-*

ischer Imperialismus was published in the year of his death. Other critical works are *Kritik der Evangelien und Geschichte ihres Ursprungs*, 4 vols. (1850-52), *Apostelgeschichte* (1850), *Kritik der Paulinischen Briefe*, 3 parts (1850-52). He died at Rixdorf, 13th April 1882. Bruno Bauer's criticism of the New Testament was of a highly destructive type, going far beyond the most sceptical conclusions of the Tübingen school. Strauss in his *Life of Jesus* had accounted for the Gospel narratives as half-conscious products of the mythic instinct working in the early Christian communities. Bauer ridiculed Strauss's notion that a community could produce a connected narrative. "A community has no hands for writing, no judgment for composing." His own doctrine, embodying a theory of Wilke's, was that the original narrative was the Gospel of St Mark; that this was composed in the reign of Hadrian; and that after this, as a type, the other narratives were modelled by other writers. On the same principle the four principal Pauline epistles were regarded as forgeries of the second century. The other main point in Bauer's criticism was his argument for the preponderance of the Greco-Roman element, as opposed to the Jewish, in the Christian writings. The writer of St Mark's Gospel was "an Italian, at home both in Rome and Alexandria"; that of St Matthew's Gospel "a Roman, nourished by the spirit of Seneca"; the Pauline epistles were written in the West in antagonism to the Paul of the Acts, and so on. Christianity is essentially "Stoicism triumphant in a Jewish garb." Needless to say, this line of criticism has not been generally accepted, though it has found occasional supporters, especially in the Netherlands. It certainly had its value in emphasizing the importance of studying the influence of environment in the formation of the Christian Scriptures. Bauer was a man of restless, impetuous activity and independent, though ill-balanced, judgment, one who, as he himself perceived, was more in place as a free-lance of criticism than as an official teacher. He came in the end to be kindly regarded even by opponents, and he was not afraid of taking a line displeasing to his Liberal friends on the Jewish question. (H. ST.)

Bautzen, a town of Germany, on the Spree, 32 miles E.N.E. of Dresden, capital of the circle of Bautzen, kingdom of Saxony, on the Dresden-Görlitz and the Bautzen-Neustadt railways. The town has a clerical college, 2 normal schools (one for Protestant, the other for Catholic teachers), 2 higher, a Wendish, an agricultural, an industrial, a commercial, and other schools. A centre of industry, it has iron foundries, dyeworks, potteries, distilleries, and cigar factories. Population (1890), 21,515; (1895), 23,678; (1900), 26,025.

Bavaria, a kingdom of Germany, ranking next after Prussia in both area (29,284 square miles) and population—5,420,199 (1885); 5,818,544 (1895), of whom 2,846,687 were males and 2,971,857 females, the density being 198·7 inhabitants to the square mile. Of the population 64·5 per cent. were rural and 35·5 per cent. urban. The preliminary results of the 1900 census placed the total population at 6,175,153. During the years 1880 to 1893 the number of emigrants from Bavaria ranged from 8068 to 17,986 per annum; since 1893 it has averaged not more than 3256. Classified according to religion, the population in 1895 was thus distributed:—4,112,623 Roman Catholics (70·7 per cent.), 1,640,133 Evangelical Protestants (28·2 per cent.), 53,750 Jews, and 10,964 of other Christian sects (of whom 3249 were Mennonites). Illegitimacy ranks high, being annually 13 to 14 per cent. of the total births.

Agriculture.—Of the total area of Bavaria close upon 67 per cent. is arable and garden land, and of this again one-fourth is meadow land. Since about the middle of the 19th century considerable attention has been given to the drainage of the bogs and moors of the upper districts of Bavaria. Since 1895 three experimental stations have been established for continuing the work of reclamation, but there still remain over 366,000 acres of unreclaimed bog. The farms in Bavaria, of which there were in all 663,785 in 1895, are mostly small:—23·6 per cent., or 156,971, were each less than 2½ acres; 56·1 per cent., or 372,683, were each between 2½ and 25 acres; 20 per cent., or 133,510, between 25 and 250 acres; and 621 over 250 acres. The total number of persons employed in agricultural operations exceeded 1,437,000, or approximately 25 per cent. of the population. Hay is a long way the most important crop in respect of area and bulk of produce. Next come potatoes; then follow oats, rye, barley, and wheat. But in respect of value, and economic and social importance, the wine, hops, and tobacco crops count amongst the most valuable in the kingdom. In 1899 some 51,000 acres were planted with vines, and the yield was 17,552,000 gallons of wine, valued at £1,360,000. Between 60,000 and 70,000 acres are planted with hops annually; in 1899 the yield was about 11,000 tons, equivalent to nearly one-half of the entire yield of hops in all Germany. Of this amount 35 to 40 per cent. is used in the Bavarian breweries, the rest being exported. The chief hop markets of Southern Germany are Nuremberg and Bamberg. The barley grown is very largely used for malting. Tobacco cultivation is decreasing: from 9500 acres planted in 1890 the area decreased to 4800 acres in 1899. Brewing, although carried on by several gigantic firms in Munich, Erlangen, and other large towns, is also to a very considerable extent a purely agricultural business. For instance, out of over 12,500 breweries in the country in 1898, some 5300 were in the hands of farmers. In 1897, 373,421,400 gallons of beer were brewed, and of these 56,823,300 gallons were exported, leaving a consumption per head of the population (estimated at 5,932,077 in 1897) of 53½ gallons annually. In 1898-99 the 6405 distilleries produced 3,502,620 gallons of pure alcohol. The live stock consisted in 1897 of 3,419,421 cattle, 1,412,579 pigs, 905,916 sheep, and 376,557 horses. Considerable attention is paid to the breeding of cattle, and their numbers have increased by upwards of 233,400 since 1863. On the other hand, the number of sheep decreased by more than 50 per cent. between 1863 and 1897, having in the former year numbered 2,058,638. Pigs, again, have increased from 926,522 in 1863 to the figure quoted above, an increase of 65½ per cent. The State encourages the breeding of horses by the maintenance of stud-stock farms at Augsburg, Landshut, Zweibrücken, and Erding.

Mining and Industry.—In 1897 the mines yielded 1,007,403 tons of coal, valued at £481,850; 41,098 tons of lignite, valued at £5200; and 175,305 tons of iron ore, valued at £36,350, or, in all, 1,223,806 tons of minerals of the value of £523,400. One of the chief sources of graphite in Germany are mines near Passau in Bavaria. This kingdom also exports over 6000 tons of lithographic stones (from Solnhofen, &c.) annually. The salt works and furnaces produced 41,533 tons of salt, valued at £77,600; 83,556 tons of iron, valued at £194,750; and 7041 tons of sulphuric acid, valued at £12,750. The foundries, forges, &c., turned out steel, iron wire, bars, &c., to the weight of 251,989 tons and value of £1,695,600. About 20,000 men are employed in the forests and sawmills, of which last there are about 1400 in the kingdom. Nearly 6½ million acres are covered with forests, of which 36·3 per cent. belong to the State. The total quantity of timber used at home and exported amounts to over £4,000,000 in value per annum. In 1895 some 520,000 persons over 16 years of age were employed in industry and handicraft, and of these 90,000 were females. The chief branches of industry are cotton-spinning (especially in Swabia), linen, hemp, worsted yarn, and other textiles (Augsburg, Bayreuth, &c.), thread and twist, chemicals and aniline dyes (Palatinate), plate glass, porcelain, matches, machinery (Palatinate, Nuremberg), lead pencils (Nuremberg), steel shot, toys (Nuremberg and Furth), wine and beer, lithographic and other printing (Munich), iron foundries, &c., bells, straw hats and baskets, leather, paper, gingerbread, &c. In 1897 the sugar factories and refineries produced 46,630 tons of sugar.

Communications.—The railways extended over a length of 4150 miles in 1899, and of these 3522 miles belonged to the State. The total cost of the State lines up to the end of the year 1897 amounted to £57,915,760. The profits from the railways formed the largest item in the public revenue in 1899, namely, £7,184,734, as also the heaviest item in the public expenditure, namely, £4,956,093, the net profit being thus £2,228,641.

Finances.—For each of the years 1900 and 1901 the public revenue and expenditure were balanced at £21,646,000, the principal sources of revenue being the railways, customs, and indirect taxes. In 1900 the public debt amounted to £72,931,800, of which over 75 per cent. was incurred for railways. The contribution to the imperial exchequer was fixed at £2,959,650 for each of the years 1900 and 1901.

Army.—The peace footing of the Bavarian army in 1899-1900 numbered 66,356 officers and men. A third army corps was raised in 1900. (J. T. BE.)

Bay City, capital of Bay county, Michigan, U.S.A., situated in 43° 36′ N. lat. and 83° 53′ W. long., in the eastern part of the state, on the east bank of Saginaw river, 4 miles from its mouth and at the head of navigation, at an altitude of 592 feet. It has four railways, the Detroit and Mackinaw, the Flint and Pere Marquette, the Grand Trunk, and the Michigan Central. Besides these facilities, it has large commerce on the lakes. It is a manufacturing city of prominence, its leading industries being lumber and salt. It contains many lumber, shingle, and planing mills. Salt is made by evaporating the water of salt springs, the waste from lumber mills being used as fuel. Population (1880), 20,693; (1900), 27,628. The death-rate in 1900 was only 12·7.

Bayamo, an old interior city on the north slope of the Sierra Maestro in Santiago province, Cuba. It was the second of the seven cities of Cuba established by Diego Velasquez, and has been conspicuous in all the wars. It was in 1512 the site of the first Spanish battle in the war in which the Indians were reduced. During the ten years' insurrection it was the scene of a desperate conflict between the Spaniards and Cubans. In the insurrection which resulted in independence, Bayamo was nearly destroyed by the opposing parties. Population, 3022.

Bayard, Thomas Francis (1828-1898), American diplomatist, was born in Wilmington, Delaware, on 29th October 1828, and died on 28th September 1898, in Dedham, Massachusetts. His great-grandfather, Governor Bassett; his grandfather, James Asheton Bayard; his uncle, Richard H. Bayard; and his father, James A. Bayard, all represented Delaware in the United States Senate. Intending to go into business, he did not receive a college education; but in 1848 he decided to study law, and was admitted to the bar in 1851. Except from 1855-57, when he was a partner of William Shippen in Philadelphia, he practised chiefly in Wilmington. He was a senator from Delaware from 1869 to 1885. His abilities made him leader of the Democrats in the Senate, and his views on financial and legal questions gave him a permanent reputation for statesmanship. He was member of the Electoral Commission appointed to decide the dispute as to whether Hayes or Tilden had been elected President of the United States. In the Democratic national conventions of 1872, 1876, 1880, and 1884 he received votes for nomination as the party candidate for the Presidency. He was secretary of state, 1885-89, and pursued a conservative policy in foreign affairs. When ambassador to England, 1893-97, he became exceedingly popular, his tall dignified person, unfailing courtesy, and polished, if somewhat deliberate, eloquence making him a man of mark in all the best circles. He was considered by many Americans to have become too partial to English ways; and, for the expression of some criticisms regarded as unfavourable to his own countrymen, the House of Representatives went so far as to pass a vote of censure on him. The value of Mr Bayard's diplomacy was, however, fully recognized in the United Kingdom, where he worthily upheld the traditions of a famous line of American ministers.

Baybay, a town of 17,000 inhabitants, in the Philippine Islands, near the centre of the western coast of Leyte, of which it is one of the important ports. It exports hemp in large quantities. Other products are sulphur, wax, brea, sugar, coffee, cacao, cattle, and horses. The language is Visayan.

Bayezid, a border fortress of Asiatic Turkey, chief town of a sanjak of the Erzerûm vilâyet, situated on a tributary of the Aras, on the site of the old Armenian town Pakovan. In the Russo-Turkish war of 1877-78, it was taken by the Russians, but was restored to Turkey by the Treaty of Berlin. During the war the Christians were massacred, and the town has since lost any commercial importance it once possessed.

Baynes, Thomas Spencer (1823-1887), English editor and man of letters, was born at Wellington, Somerset, 24th March 1823, and was the son of the minister of the Baptist congregation there. He graduated at the University of London, but received his most important instruction at Edinburgh University under Sir William Hamilton, whom he assisted in the conduct of his class, and of whose views on logic he became the authorized exponent. He was assistant editor of the *Daily News* from 1858 to 1864, when he was appointed professor of logic, metaphysics, and English literature at the University of St Andrews. In 1873 he undertook the editorship of the ninth edition of the *Encyclopædia Britannica,* and conducted it singly until 1880, when the decline of his health rendered it necessary to provide him with a coadjutor in the person of Professor W. Robertson Smith. Baynes, however, continued to be engaged upon the work until his death on 31st May 1887, shortly before its completion. His remarkable article on Shakespeare was republished in 1894, along with other essays on Shakespearean topics and a memoir by Professor Lewis Campbell. He was a man of great and versatile ability, and made valuable contributions to the subjects of logic, grammar, politics, and general literature, which occupied his attention by turns. (R. G.)

Bayonet.—The first known mention of the bayonet occurs in the *Memoirs* of the elder Puységur, published posthumously in Paris, 1747. He says that when commanding the troops at Ypres in 1647 his musketeers used bayonets consisting of a steel dagger fixed in a wooden haft, which fitted into the muzzle of the musket —in fact, plug-bayonets. Courts-martial were held on some English soldiers at Tangier in 1663-64 for using their daggers on their comrades. As bayonets were at first called daggers, and as there were few or no pikemen in Tangier until 1675, the probable conclusion is that the troops in Tangier used plug-bayonets. In 1671 plug-bayonets were issued to the French regiment of fusiliers then raised. They were issued to part of an English dragoon regiment raised in 1672 and disbanded in 1674, and to the Royal Fusiliers when raised in 1685. The danger incurred by the use of this bayonet (which put a stop to all fire) was felt so early that the younger Puységur saw a ring-bayonet in 1678 which could be fixed without stopping the fire. The English defeat at Killiecrankie in 1689 was due (among other things) to the plug-bayonet; and shortly afterwards the defeated leader, General Mackay, introduced a ring-bayonet of his own invention. A trial with badly-fitting socket or zigzag-bayonets was made after the battle of Fleurus, 1690, in the presence of Louis XIV., who refused to adopt them. Shortly after the peace of Ryswick was signed, 20th September 1697, the English and Germans abolished the pike and introduced these bayonets, and plates of them are given in Surirey de St Remy's *Mémoires d'Artillerie,* published in Paris in that year; but owing to a military cabal they were not issued to the French infantry until 1703. This bayonet remained in the British service until 1805, when the present spring-bayonet was introduced by Sir John Moore.

Bayonne, chief town of arrondissement in the department of Basses-Pyrénées, France, 66 miles W.N.W. of Pau, on the railway to Bordeaux and Toulouse. Great improvements have been effected, and the port now extends

inwards to the confluence of the Nive with the Adour, forming an outer and an inner harbour, with areas respectively of 143 and 274 acres, having a total length of quayage of 8758 feet, and a depth at entrance (spring tides) of 19 feet. Including coasting trade, in 1899, 845 vessels of 307,937 tons entered, and 853 of 310,354 tons cleared; of which British vessels numbered 108 entered of 82,387 tons, and 106 cleared of 81,919 tons. Imports were valued at £600,000 and exports at £580,000 in 1899. The port is an entrepôt for colonial produce and Spanish wool. The foreign trade is chiefly with Spain and England. The cathedral, begun in the 13th century, was completed in 1875. The *Allées Marines*, a series of fine promenades bordering the Adour for 1¼ miles, form a special feature of the town. The legend which derives the word *bayonet* from the name of this town is supported by no sufficient evidence. Population (1881), 18,468; (1896), 22,278; (1901), 27,601.

Bayonne, a city of Hudson county, New Jersey, U.S.A., occupying the peninsula between New York harbour and Newark Bay, immediately south of Jersey city. It is traversed by the Central Railway of New Jersey, and has large petroleum refineries and chemical works. Population (1885), 13,080; (1890), 19,033; (1900), 32,722. The death-rate in 1900 was 16·7.

Bayreuth, or BAIREUTH, a town of Bavaria, Germany, district Upper Franconia, 58 miles by rail N.N.E. from Nuremberg. The town is best known in recent years for the performances of Wagner's operas, which are performed in a theatre (1876) exclusively constructed for the purpose, and situated outside the town on the north. In the town is Wagner's house, with his grave in the garden. Franz Liszt (1811-86) is buried here, as well as Richter. Amongst the institutions of the town should also be mentioned the palace of Duke Alexander of Würtemberg, the administrative offices, the statue of King Maximilian II. (1860), a lunatic asylum, an agricultural school, an art society, the collections of the historical society, a convict prison, and a military hospital. Population (1885), 23,559; (1895), 27,693.

The Wagner Theatre.—As the centre of the Wagnerian *cultus*, Bayreuth has assumed an importance altogether new. Among the many advantages which Wagner gained from his intimacy with Ludwig II., king of Bavaria, not the least was the practical support given to his plan of erecting a theatre for the ideal performance of his own music-dramas. The first plan, of building a new theatre for the purpose in Munich itself, was rejected, because Wagner rightly felt that the appeal of his advanced works, like the Nibelungen trilogy, would be far stronger if the comparatively small number of people who wished to hear them were removed from the distractions of a large capital; Bayreuth possessed the desired seclusion, being on a line of railway that could not be approached from any quarter without changing. The municipality furthered Wagner's scheme in every way, and in May 1872 the foundation stone of the Festspielhaus was laid, the event being commemorated by a notable performance of Beethoven's Choral Symphony in the old opera house. The funds for the erection of the theatre were raised in part by the issue of 1000 certificates of patronage ("Patronatsscheine"), but the bulk of the sum was raised by founding "Wagner Societies" from St Petersburg to Cairo, from London to New York; these societies sprang up with such success that the theatre was opened in the summer of 1876 with the first complete performance of "Der Ring des Nibelungen." The theatre, which stands on a height a little under a mile from the town, is built from the plans of Gustav Semper, the idea of the design being Wagner's own, an experiment indeed, but one which succeeded beyond all expectation. Though external ornamentation was cut down to almost nothing, space was more generously granted, and the number of entrances would be ample for an audience of twice the size that can be accommodated; for 1750 seats are all that are available for the public. These are arranged on a kind of sloping wedge, in such a manner that every one has an almost equally good view of the stage, for there are no boxes, and the only galleries are quite at the back, one, the "Fürstenloge," being reserved for distinguished guests, the other, above it, for the townspeople. Immediately in front of the foremost row of seats a hood, or sloping screen of wood, covers a part of the orchestra, and another hood of similar shape starts from the front of the stage at a slightly lower level. Thus there is left a space between the two hoods through which the sound of the orchestra ascends with wonderfully blended effect; the conductor, sitting at the highest point of the orchestra, though under the screen, has a complete view of the stage as well as of his instrumentalists, and the sound of the orchestra is sent most forcibly in the direction of the stage, so that the voices are always well supported. The stage itself has every modern appliance in the way of scenic device and machinery, the illusion presented in each picture being perfect. The pictorial effect, and the wonderful system of lighting, are greatly enhanced by the distance between the front of the stage and the foremost spectator, as well as by the disposition of all the spectators on the same plane, so that the scene has the same effect of perspective, &c. to every one in the audience. After the first set of performances, which were conducted by Hans Richter, and resulted in a loss of £7500, Wagner was compelled to allow performances of the trilogy to be given in the ordinary theatres of Germany; it was brought to England in 1882, the year which saw the production of the crowning work of Bayreuth, and Wagner's masterpiece, "Parsifal," on 28th July. In this great work the master's practical knowledge of the splendid acoustic properties of his theatre, and of its scenic possibilities, enabled him to create effects which could never be realized in the ordinary theatre, even if the character of the subject rendered it suitable for performance in the usual rotation with other operas. For Bayreuth and all that it means, this performance was of the greatest possible value; the impossibility of the work being given elsewhere, unless other theatres on a similar principle should be built for its reception in the future, gradually attracted a larger and larger number of spectators, and though from time to time at subsequent festivals the other works of Wagner have been produced, yet "Parsifal" has very seldom been out of the scheme.

As an important addition to the work of the theatre, a permanent school has been established at Bayreuth for the sake of training young musicians to take part in the festival performances, which were at first exclusively, and then partially, undertaken by artists from other German and foreign theatres. The special feature upon which most stress has been laid, ever since Wagner's death in 1883, has been not so much the musical as the dramatic significance of the works; it is contended by the inmost circle of Wagnerian adherents that none but they can fully realize the master's intentions or hand down his traditions. What is called the "Bayreuth Idea" is set forth in much detail from this point of view by Mr Houston Stewart Chamberlain, in his *Richard Wagner* (1897 and 1900). (J. A. F. M.)

Bazaine, François Achille (1811-1888), marshal of France and senator of the Empire, was born at Versailles, on 13th February 1811. He entered the army as a private soldier in 1831, and received a commission as sub-lieutenant in 1832. By his gallantry in Algeria he won the Cross of the Legion of Honour and was promoted lieutenant. He served two campaigns with the Foreign Legion against the Carlists in Spain in 1837-38,

returning to Africa as captain in 1839. During the succeeding decade he saw much active service in Africa, and rose to be a brigadier-general with the charge of the district of Tlemcen. In the Crimean war he commanded a brigade and maintained his reputation in the trenches before Sebastopol. On the capture of the south side he was appointed governor of the place, and was promoted general of division. He commanded the French forces in the expedition to Kinburn (commander, Legion of Honour). In Lombardy in 1859 he was wounded when in command of the third division of the first corps in the attack upon Melegnano, and took a conspicuous part in the battle of Solferino (grand cross, Legion of Honour). He commanded the first division under Marshal Forey in the Mexican expedition in 1862, succeeded him in supreme command in 1863, and became a marshal and senator of France in the following year. He at first pursued the war with great vigour and success, entering Mexico in 1863, and driving President Juarez to the frontier. He organized a system of guerilla warfare which was carried out with barbarity. He married a rich Mexican lady, whose family were supporters of Juarez, and it was alleged that he was not true to the Emperor Maximilian. At any rate there were grave differences, and finally the French forces were withdrawn. The retreat and embarkation at Vera Cruz were skilfully conducted by Bazaine in 1867. On his return to Paris he was appointed to the command of the third army corps at Nancy, and in 1869 commander-in-chief of the imperial guard at Paris. In the Franco-German war he commanded the army of the Rhine, and, after the sanguinary battles round Metz, was shut up in that fortress with an army of 170,000 men, which surrendered in October 1870. On his return to France he was tried by court-martial, found guilty of negotiating with and capitulating to the enemy before doing all that was prescribed by duty and honour, and sentenced to degradation and death, but recommended to mercy. His sentence was commuted to twenty years' seclusion, and the humiliating ceremonies attending degradation were dispensed with. He was incarcerated in the Île Sainte Marguérite, whence he escaped in 1874 to Italy. He finally took up his abode in Madrid, where he died on the 23rd of September 1888. He published an account of his share in the war and a justification of his conduct. He also wrote *L'Armée du Rhin*, describing its operations to the date of the surrender of Metz. (R. H. V.)

Bazalgette, Sir Joseph William (1819-1891), English engineer, was born at Enfield on 28th March 1819. At the age of seventeen he was articled as pupil to an engineer, and a few years later he began to practise successfully on his own account. His name is best known for the engineering works he carried out in London, especially for the construction of the main drainage system and the Thames embankment. In 1848 the control of London drainage, which had hitherto been divided among eight distinct municipal bodies, was consolidated under twelve commissioners, who were in 1849 superseded by a second commission. Under the latter Bazalgette accepted an appointment which he continued to hold under the three successive commissions which in the course of a year or two followed the second one, and when finally in 1855 these fleeting and ineffective bodies were replaced by the Metropolitan Board of Works, he was at once appointed its chief engineer. His plans were ready, but the work was delayed by official obstruction and formality until 1858. Once begun, however, it was vigorously pushed on, and in 1865 the Prince of Wales was able formally to open the system, which consisted of 83 miles of large intercepting sewers, draining more than 100 square miles of buildings, and calculated to deal with 420 million gallons a day. The cost was £4,600,000. Almost simultaneously Bazalgette was engaged on the plans for the Thames embankment. The section between Westminster and Vauxhall on the Surrey side was built between 1860 and 1869, and the length between Westminster and Blackfriars was declared open by the Prince of Wales in 1870. The Chelsea embankment followed in 1871-74, and in 1876 Northumberland Avenue was formed. The total outlay on the scheme exceeded two millions sterling. Bazalgette was also responsible for various other engineering works in the metropolitan area, designing, for example, new bridges at Putney and Battersea and the steam ferry between North and South Woolwich. He also prepared plans for a bridge over the river near the Tower and for a tunnel under it at Blackwall, but did not live to see either of these projects carried out. He died on 15th March 1891 at Wimbledon.

Bazeilles, a town in the arrondissement of Sedan, department of Ardennes, France, 2½ miles S.E. of Sedan. The town was the scene of one of the earliest conflicts in the war of 1870. After a most sanguinary struggle during two days, Aug. 31-Sept. 1, it was taken by the Prussians and given up to the flames; it was subsequently rebuilt by national subscription. Population (1896), 1276; (1901), 1406.

Beaconsfield, Benjamin Disraeli, Earl of (1804-1881), British statesman, second child and eldest son of Isaac Disraeli and Maria Basevi, who were married in 1802, was born at No. 6 John Street, Bedford Row, on the 21st of December 1804. Of Isaac Disraeli's other children, Sarah was born in 1802, Naphtali in 1807, Ralph (Raphael) in 1809, and James (Jacob) in 1813. None of the family was akin to Benjamin for genius and character, except Sarah, to whom he was deeply indebted for a wise, unswerving, and sympathetic devotion, when, in his earlier days, he needed it most. All Isaac Disraeli's children were born into the Jewish communion, in which, however, they were not to grow up. It is a reasonable inference from Isaac's temperament, character, and history, that he was never at ease in the ritual of Judaism. He was in troubled relations with his synagogue for some years before the death of his father, whom he was naturally unwilling to hurt or offend by declared secession. His father died in the winter of 1816. Soon afterwards Isaac formally withdrew with all his household from the Jewish church. His son Benjamin, who had been admitted to it with the usual rites eight days after his birth, was baptized at St Andrew's Church in Holborn on the 31st of July 1817. One of Isaac Disraeli's reasons for quitting the tents of his people was that rabbinical Judaism, with its unyielding laws and fettering ceremonies, "cuts off the Jews from the great family of mankind." Little did he know, when therefore he cut off the Disraeli family from Judaism, what great things he was doing for one small member of it. The future prime minister was then short of thirteen years old, and there was yet time to provide the utmost freedom which his birth allowed for the faculties and ambitions he was born with. Taking the worldly view alone, of course, most fortunate for his aspirations in youth was his withdrawal from Judaism in childhood. That it was fully sanctioned by his intellect at maturity is evident; but the vindication of unbiassed choice would not have been readily accepted had Disraeli abandoned Judaism of his own will at the pushing *Vivian Grey* period or after. And though a mind like Disraeli's might work to satisfaction with Christianity as "completed Judaism," it could but dwell on a breach of continuity which means so much to Jews and which he was never

allowed to forget amongst Christians. With all, he was proud of his race as truly, if not as vehemently, as his paternal grandmother detested it. Family pride contributed to the feeling in his case; for in his more speculative moods he could look back upon an ancestry which was of those, perhaps, who colonized the shores of the Mediterranean from before the time of the Captivity. More definite is the history of descent from an ennobled Spanish family which escaped from the Torquemada persecutions to Venice, there found a new home, took a new name, and prospered for six generations. The Benjamin Disraeli, Lord Beaconsfield's grandfather, who came to England in 1748, was a younger son sent at eighteen to try his fortune in London. "A man of ardent character, sanguine, courageous, speculative, fortunate, with a temper which no disappointment could disturb"

LORD BEACONSFIELD.
(From a photograph by Hughes and Mullins, Ryde, I.W.)

(so Lord Beaconsfield described him), he soon made the beginnings of a handsome fortune and turned country gentleman. That his grandson exaggerated his prosperity is highly probable; but that he became a man of wealth and consideration is certain. He married twice. His second wife was Sarah Siprout de Gabay, "a beautiful woman of strong intellect" and importunate ambitions, who hated the race she belonged to because it was despised by others. She felt so keenly the social disabilities it brought upon her, and her husband's indifference to them, that "she never pardoned him his name." Her literary son Isaac suffered equally or even more; for though he had ambitions he had none that she could recognize as such. She could ridicule him for the aspirations which he had not and for those which he had; on the other hand, he never heard from her a tender word "though she lived to be eighty." Nor did any other member of her family, according to her grandson.

Isaac Disraeli was devoted to the reading and writing of books in domestic quiet; and his son Benjamin suffered appreciably from his father's gentle preoccupations. As a child—unruly and disturbing no doubt—he was sent to a school of small account at Blackheath, and was there "for years" before he was recalled at the age of twelve on the death of his grandfather. Isaac Disraeli was his father's sole heritor, but change of fortune seems to have awakened in him no ambitions for the most hopeful of his sons. At fifteen, not before, Benjamin was sent to a Unitarian school at Walthamstow—a well-known school, populous enough to be a little world of emulation and conflict, but otherwise unfit. Not there, nor in any similar institution at that illiberal time, perhaps, was a Jewish boy likely to make a fortunate entry into "the great family of mankind." His name, the foreign look of him, and some pronounced incompatibilities not all chargeable to young Disraeli, soon raised a crop of troubles. His stay at Walthamstow was brief, his departure abrupt, and he went to school no more. With the run of his father's library, and the benefits of that born bookman's guidance, he now set out to educate himself. This he did with an industry stiffened by matchless self-confidence and by ambitions fully mature before he was eighteen. Yet he yielded to an attempt to make a man of business of him. He was barely seventeen when (in November 1821) he was taken into the office of Messrs Swain, Stevens and Co., solicitors, in Frederick's Place, Old Jewry. Here he remained for three years—"most assiduous in his attention to business," said one of the partners, "and showing great ability in the transaction of it." It was then determined that he should go to the bar; and accordingly he was entered at Lincoln's Inn in 1824. But Disraeli had found other studies and an alien use for his pen. Though "assiduous in his attention to business" in Frederick's Place, he found time to write for the printer. Dr Smiles, in his *Memoirs of John Murray*, tells of certain pamphlets on the brightening prospects of the Spanish South American colonies, then in the first enjoyment of emancipation—pamphlets seemingly written for a Mr Powles, head of a great financial firm, whose acquaintance Disraeli had made. In the same year, apparently, he wrote a novel—his first, and never published. *Aylmer Papillon* was the title of it, Dr Smiles informs us; and he prints a letter from Disraeli to the John Murray of that day, which indicates its character pretty clearly. The last chapter, its author says, is taken up with "Mr Papillon's banishment under the Alien Act, from a ministerial misconception of a metaphysical sonnet." About the same time he edited a *History of Paul Jones*, originally published in America, the preface to the English edition being Disraeli's first appearance as an author. Murray could not publish *Aylmer Papillon*, but he had great hopes of its boyish writer (Isaac Disraeli was an old friend of his), "took him into his confidence, and related to him his experiences of men and affairs." Disraeli had not completed his twenty-first year when (in 1825) Murray was possessed by the idea of bringing out a great daily newspaper; and if his young friend did not inspire that idea he keenly urged its execution, and was entrusted by Murray with the negotiation of all manner of preliminaries, including the attempt to bring Lockhart in as editor. The title of the paper, *The Representative*, was Disraeli's suggestion. He chose reporters, looked to the setting-up of a printing-office, busied himself in all ways to Murray's great satisfaction, and, as fully appears from Dr Smiles's account of the matter, with extraordinary address. But when these arrangements were brought to the point of completion, Disraeli dropped out of the scheme and had nothing more to do with it. He was to have had a fourth share of the proprietorship, bringing in a corresponding amount of capital. His friend

"The Representative."

Mr Powles, whom he had enlisted for the enterprise, was to have had a similar share on the same conditions. Neither seems to have paid up, and that, perhaps, had to do with the quarrel which parted Benjamin Disraeli and John Murray before a sheet of the luckless *Representative* was printed. Many years afterwards (1853) Disraeli took an active interest in *The Press*, a weekly journal of considerable merit but meagre fortunes.

At the death of the elder Benjamin (1817), his son Isaac had moved from the King's Road, Gray's Inn (now Theobald's Road), to No. 6 Bloomsbury Square. Here he entertained the many distinguished friends, literary and political, who had been drawn to him by his "Curiosities" and other ingenious works, and here his son Benjamin also had their acquaintance and conversation. In Bloomsbury Square lived the Austens, and to their house, a great resort of similar persons, Mrs Austen cordially welcomed him. Murray's friendship and associations helped him in like manner, no doubt; and thus was opened to Disraeli the younger a world in which he was to make a considerable stir. The very much smaller society of that day was, of course, more comprehensible to sight and hearing, when once you were within its borders, than the society of this. Reverberations of the gossip of St James's and Mayfair extended to Bloomsbury in those days. Yet Disraeli's range of observation must have been not only brief but limited when he sat down at twenty or twenty-one to write *Vivian Grey*. It is therefore a probable conjecture that Mrs Austen, a clever woman of the world, helped him from her knowledge. His own strongly perceptive imagination (the gift in which he was to excel every other politician of his time) and the bent of political reading and aspiration from boyhood completed his equipment; and so the wonder that so young a man in Disraeli's social position should write a book like *Vivian Grey* is accounted for. It was published in 1826. The success of this insolently clever novel, the immediate introduction of its author to the great world, and the daring eccentricities of dress, demeanour, and opinion by which he fixed attention on himself there, have always been among the most favourite morsels of Disraeli's history. With them it began, and successive generations of inquirers into a strange career and a character still shrouded and baffling refer to them as settled starting-points of investigation. What was the man who, in such a society and with political aspirations to serve, could thrive by such vagaries as these, or in spite of them? If unaffected, what is to be thought of them as keys to character? If affected, what then? Inquiry still takes this shape, and when any part of Disraeli's career is studied, the laces and essences, the rings over gloves, the jewelled satin shirt-fronts, the guitareries and chibouqueries of his early days are never remote from memory. The report of them can hardly be doubted; and as the last relation was made (to the writer of this article) not with intent to ridicule Mr Disraeli's taste but to illustrate his conquering abilities, the story is repeated here. One of Disraeli's first friends in the world of fashion and genius was Sir Edward Lytton Bulwer. "And," said Sir Henry Bulwer ("Pelham's" brother), "we heard so much at that time of Edward's amazingly brilliant new friend that we were the less inclined to make his acquaintance." At length, however, Sir Edward got up a little dinner-party to convince the doubters. It was to meet at the early hour of those days at one of the Piccadilly hotels. "There was my brother, Alexander Cockburn, myself, and (I think) Milnes; but for a considerable time no Mr Disraeli. Waiting for Mr Disraeli did not enhance the pleasure of meeting him, nor when he did arrive did his appearance predispose us in his favour. He wore green velvet trousers, a canary-coloured waistcoat, low shoes, silver buckles, lace at his wrists, and his hair in ringlets." The description of the coat is forgotten. "We sat down. Not one of us was more than five-and-twenty years old. We were all—if you will allow me to include myself—on the road to distinction, all clever, all ambitious, and all with a perfect conceit of ourselves. Yet if on leaving the table we had been severally taken aside and asked which was the cleverest of the party, we should have been obliged to say 'the man in the green velvet trousers.'" This story is a little lamp that throws much light. Here we see at their sharpest the social prejudices that Disraeli had to fight against, provocation of them carried to its utmost in every way open to him, and complete conquest in a company of young men less likely to admit superiority in a wit of their own years, probably, than any other that could have been brought together at that time.

"Vivian Grey."

Soon after the publication of *Vivian Grey*, Disraeli, who is said by Froude to have been "overtaken by a singular disorder," marked by fits of giddiness ("once he fell into a trance, and did not recover for a week"), went with the Austens on a long summer tour in France, Switzerland, and Italy. Returning to a quiet life at Bradenham —an old manor-house near High Wycombe, which his father had taken — Disraeli put law in abeyance and resumed novel-writing. His weakest book, and two or three other productions, brief, but in every literary sense the finest of his works, were written in the next two or three years. But for *Ixion in Heaven*, *The Infernal Marriage*, and *Popanilla*, Disraeli could not be placed among the greater writers of his kind; yet none of his imaginative books have been so little read as these. The mysterious malady continued, and Disraeli set out with William Meredith, who was to have married Sarah Disraeli, for a tour in southern Europe and the nearer East. He saw Cadiz, Seville, Granada, Athens, Constantinople, Jerusalem, Cairo, Thebes; played the corsair with James Clay on a yacht voyage from Malta to Corfu; visited the terrible Reschid, then with a Turkish army in the Albanian capital; landed in Cyprus, and left it with an expectation in his singularly prescient mind that the island would one day be English. These travels must have profited him greatly, and we have our share of the advantage; not so much, however, in *The Wondrous Tale of Alroy* or *Tancred*, or the "Revolutionary Epic" which he was inspired to write on "the windy plains of Troy," but in the letters he sent home to his sister. These letters, written with the utmost freedom and fulness to the one whose affection and intellect he trusted more than any, are of the greatest value for interpreting the writer. Together with other letters also published some time after Disraeli's death, they tell more of him than anything that can be found in print elsewhere. They show, for example, that his extraordinary exuberances were unforced, leaping by natural impulse from an overcharged source. They also show that his Oriental fopperies were not so much "purposed affectation" as Froude and others have surmised. That they were so in great part is confessed again and again in these letters, but confessed in such a way as to reveal that they were permitted for his own enjoyment of them as much as planned. The "purposed affectation" sprang from an unaffected delight in gauds of attire, gauds of fancy and expression. It was not only to startle and impress the world that he paraded his eccentricities of splendour. His family also had to be impressed by them. It was to his sober father that he wrote, at the age of twenty-six: "I like a sailor's life much, though it spoils the toilette." It is in a letter from Gibraltar to the same hand that we read of his two canes—"a morning and an evening cane"—changed as the gun fires. And

Travel.

the same correspondent must be told that "Ralph's handkerchief which he brought me from Paris is the most successful thing I ever wore."

When Disraeli returned to England in 1831, all thought of the law was abandoned. The pen of romance was again taken up—the poet's also and the politician's. In the next five years he wrote *Contarini Fleming*, the *Revolutionary Epick*, *Alroy*, *Henrietta Temple*, *What is He?* (a pamphlet expository of his opinions), the *Runnymede Letters*, a *Vindication of the British Constitution*, and other matter of less note. The epic, begun in great hope and confidence, was ended in less, though its author was to the last unwilling that it should be forgotten. The novels revived the success he had with *Vivian Grey*, and restored him to his place among the brilliancies and powers of the time. The political writing, too, much of it in a garish, extravagant style, exercised his deeper ambitions, and stands as witness to the working of original thought and foresight. Both qualities are conspicuous in *What is He?* and the *Vindication*, of which it has been truly said that in these pages he "struck the keynote to the explanations he afterwards consistently offered of all his apparent inconsistencies." Here an interpretation of Tory principles as capable of running with the democratic idea, and as called upon to do so, is ingeniously attempted. The aristocratic principle of government having been destroyed by the Reform Bill, and the House of Lords being practically "abrogated" by that measure, it became necessary that Toryism should start from the democratic basis, from which it had never been alien. The filched liberties of the Crown and the people should be restored, and the nation redeemed from the oligarchies which had stolen from both. When at the beginning of all this writing Disraeli entered the political arena as candidate for High Wycombe (1832), he was nominated by a Tory and seconded by a Radical—in vain; and vain were two subsequent attempts in the autumn of 1832 and in 1834. In the first he was recommended to the electors by Daniel O'Connell and the Radical Hume. In his last candidature at Wycombe he stood on more independent ground, commending himself by a series of speeches which fully displayed his quality, though the prescience which gemmed them with more than one prophetic passage was veiled from his contemporaries. Among Disraeli's great acquaintances were many—Lyndhurst at their head—whose expectations of his future were confirmed by the Wycombe speeches. He was "thought of" for various boroughs, Marylebone among the number, but his democratic Toryism seems to have stood in his way in some places and his inborn dislike of Radicalism in others. It was an impracticable situation—no getting on from it; and so, at Lyndhurst's persuasion, as he afterwards acknowledged, he determined to side with the Tories. Accordingly, when in the spring of 1835 a vacancy occurred at Taunton, Disraeli contested the seat in the Tory interest with Carlton Club support. Here again he failed, but with enhanced reputation as a fighting politician and with other consequences good for notoriety. It was at Taunton that Disraeli fell upon O'Connell, rather ungratefully; whereupon the Liberator was roused to retort on his assailant vehemently as "a liar," and humorously as a probable descendant of the impenitent thief. And then followed the challenge which, when O'Connell declined it, was fastened on his son Morgan, and the interruption of the duel by seizure of Mr Disraeli in his bed, and his famous appearance in the Marylebone police court. He declared himself very well satisfied with this episode, but nothing in it can really have pleased him, not even the noise it made.

Literary production.

Here the first period of Disraeli's public life came to an end, a period of preliminaries and flourishes, and of what he himself called sowing his political wild oats. It was a more mature Disraeli who in the general election of 1837 was returned for Maidstone as the colleague of his providential friend Mr Wyndham Lewis. Though the fortunes of the Tory party were fast reviving under Peel's guidance, the victory was denied him on this occasion; but, for once, the return of the Whigs to power was no great disappointment for the junior member for Maidstone. To gain a footing in the House of Commons was all that his confident spirit ever asked, and Froude vouches for it that he succeeded only just in time to avert financial ruin. His electioneering ventures, the friendly backing of bills, and his own expense in keeping up appearances, had loaded him with debt. Yet (mark his worldly wisdom) "he had never entangled his friends in his financial dealings. He had gone frankly to the professional money-lenders, who made advances to him in a speculation on his success": they were to get their money back with large interest or lose it altogether. Such conditions were themselves incitement enough to a prompt redemption of the promise of parliamentary distinction, even without the restless spurring of ambition. And Disraeli had another promise to redeem: that which he uttered when he told O'Connell that they would meet again at Philippi. Therefore when, three weeks after the session began, a debate on Irish election petitions gave him opportunity, Disraeli attempted that first House of Commons speech which imagination still dwells upon as something wondrous strange. That he should not have known better, even by hearsay, than to address the House of Commons in fantastic phrase from the mouth of a fantastic figure is indeed remarkable, but not that he retained self-confidence enough to tell the unwitting crew who laughed him down that a time would come when they would hear him. It was one of the least memorable of his prophecies. The speech was a humiliating but not an oppressive failure. In about a week afterwards he spoke again, which shows how little damage he felt, while the good sense, brevity, and blameless manner of the speech (on a Copyright Bill) announced that he could learn. And for some time thereafter he affected no importance in the House, though not as withdrawing from attention.

Enters Parliament.

Meanwhile, consciously and unconsciously, as is the way with men of genius, his mind was working upon problems of government, the magnitude, the relations, and the natural developments of which he was more sensible of than any known politician of his time. "Sensible of," we say, to mark the difference between one sort of understanding and another which comes of labour and pains alone. Disraeli studied too, no doubt, reading and inquiring and applying set thought, but such means were insufficient to put into his mind all that he found there. It seems that opinions may be formed of inquiry and study alone, which are then constructive; but where intuitive perception or the perceptive imagination is a robust possession, the fruits of research become assimilative—the food of a divining faculty which needs more or less of it according to the power of divination. The better judgment in all affairs derives from this quality, which has some very covetable advantages for its possessor. His judgments may be held with greater confidence, which is an intellectual advantage; and, standing in his mind not so much an edifice as a natural growth, they cannot be so readily abandoned at the call of ease or self-interest. They may be denied assertion or even outraged for a purpose, but they cannot be got rid of,—which is a moral advantage. Disraeli's mind and its judgments were of this character. Its greatest gift was not the romantic

Mental characteristics.

imagination which he possessed abundantly and employed overmuch, but the perceptive, interpretive, judicial or divining imagination, without which there can be no great man of affairs. Breadth of view, insight, foresight, are more familiar but less adequate descriptions of a faculty which Disraeli had in such force that it took command of him from first to last. Although he knew and acted on the principle that "a statesman is a practical character," whose business is to "serve the country according to its present necessities," he was unable to confine his vision to the nearer consequences of whatever policy, or course of action, or group of conditions it rested on. Without effort, and even without intention probably, it looked beyond first consequences to the farther or the final outcome; and to complete the operation, the faculty which detected the remoter consequences did not allow them to remain in obscurity, but brought them out as actualities no less than the first and perhaps far more important than the first. Moreover, it did not allow him to keep silence where the remoter consequences were of that character, and ought to be provided for betimes. Of course silence was always possible. These renderings to foresight might be denied assertion either for the sake of present ease (and Disraeli's prescience of much of his country's later troubles only made him laughed at) or in deference to hopes of personal advancement. But the same divining imagination which showed him these things also showed him the near time when it would be too late to speak of them, and when not to have spoken would leave him irredeemably in the common herd of hand-to-mouth politicians. Therefore he spoke.

Remembrance of these characteristics—remembrance, too, that his mind, which was neither English nor European, worked in absolute detachment—should accompany the traveller through all the turns and incidents of Disraeli's long career. They are sometimes puzzling, often speculative; yet nearly all that is obscure in them becomes clear, much apparent contradiction disappears, when read by these persistent unvarying lights. The command which his idiosyncrasies had upon him is shown, for example, by reproachful speeches on the treatment of Ireland, and by a startling harangue on behalf of the Chartists, at a time when such irregularities could but damage him, a new man, where he hoped for influence and office. At about the same time his political genius directed him to open a resolute critical campaign against the Conservatism of the party he proposed to thrive in, and he could but obey. This he did in writing *Coningsby*, a novel of the day and for the day, but commended to us of a later generation not only by the undimmed truth of its character-portraits, but by qualities of insight and foresight which we who have seen the proof of them can measure as his contemporaries could not. *Sybil*, which was written in the following year (1845), is still more remarkable for the faculties celebrated in the preceding paragraph. When *Sybil* was written a long historic day was ending in England, a new era beginning; and no eyes saw so clearly as Disraeli's the death of the old day, the birth of the new, or what and how great their differences would be. In *Coningsby* the political conditions of the country were illustrated and discussed from the constitutional point of view, and by light of the theory that for generations before the passing of the Reform Bill the authority of the Crown and the liberties of the people had been absorbed and extinguished in an oligarchic system of government, itself become fossilized and soulless. In *Sybil* were exhibited the social relations of rich and poor (the "two nations") under this régime, and under changes in which, while the peasantry were neglected by a shoddy aristocracy ignorant of its duties, factory life and a purblind gospel of political economy embruted the rest of the population. These views were enforced by a startling yet strictly accurate representation of the state of things in the factory districts at that time. Taken from the life by Disraeli himself, accompanied by one or two members of the Young England party of which he was the head, it was the first of its kind; and the facts as there displayed, and Disraeli's interpretation of them—a marvel of perceptive and prophetic criticism—opened eyes, roused consciences, and led direct to many reforms.

"Coningsby," "Sybil."

These two books, the *Vindication*, published in 1835, and his speeches up to this time and a little beyond, are quite enough to show what Disraeli's Tory democracy meant, how truly national was its aim, and how exclusive of partisanship for the "landed interest"; though he did believe the stability and prosperity of the agricultural class a national interest of the first order, not on economic grounds alone or even chiefly. And if Disraeli, possessed by these views, became aggressively insubordinate some time before Peel's proclaimed conversion to Free Trade, we can account for it on reasonable and even creditable grounds. Spite, resentment at being passed over when Peel formed the 1841 Government, is one explanation of these outbreaks, and a letter to Peel, lately published, is proof to many minds that Disraeli's denial to Peel's face in 1846 that he had ever solicited office was daringly mendacious. The letter certainly reads like solicitation in the customary half-veiled *in* [illegible]. All that can be said in doubt is that since the Peel Government came into existence on the 6th of September, and the letter was written on the 5th, its interpretation as complaint of being publicly neglected, as a craving for *some* mark of recognition, is possible. More than possible it is if Disraeli knew on the 5th (as he very well might from his friend Lyndhurst, Peel's lord chancellor) that the appointments were then complete. The pecuniary need of office, if that comes into the question, had been lightened, if not extinguished, two years before by his marriage with Mrs Wyndham Lewis. Mrs Lewis—a lady fifteen years his senior—brought him a considerable fortune, which, however, was but for her life. She lived to a great age, and would gladly have lived longer, in any of the afflictions that time brings on, to continue her mere money-worth to her "Dizzy." Her devotion to him, and his devotion to her, is the whole known story of their private life; and we may believe that nothing ever gratified him more than offering her a coronet from Mr Disraeli.

Disraeli made Peel's acquaintance early in his career and showed that he was proud of it. In his *Life of Lord George Bentinck* he writes of Peel fairly and even generously. But they were essentially antipathetic persons; and it is clear that the great minister and complete Briton took no pains to understand the dazzling young Jew of whom Lyndhurst thought so much, and wished to have little to do with him. Such men make such feelings evident; and there is no reason for thinking that when, after 1841, Disraeli charged at Peel in obedience to his principles he gave himself pain. It was not long after it had settled in office that Peel's Government, the creature of an anxious Conservative reaction, began to be suspected of drifting toward Manchester. That it was forced in that direction we should say rather, looking back, for it was a time of dire distress, especially in the manufacturing districts of the north; so that in his second session Peel had to provide some relief by revising the corn laws and reducing import dues generally. His measures were supported by Disraeli, who understood that Protection must bend to the menacing poverty of the time, though unprepared for

Politics, 1841-67.

total abolition of the corn tax and strongly of opinion that it was not for Peel to abolish it. In the next session (1843) he and his Young England party took up a definitely independent rôle, which became more sharply critical to the end. Disraeli's first strong vote of hostility was on a Coercion Bill for perishing and rebellious Ireland. It was repeated with greater emphasis in the session of 1844, also in a Condition-of-Ireland debate; and from that time forth, as if foreseeing Peel's course and its effect on the country party, Disraeli kept up the attack. Meanwhile bad harvests deepened the country's distress, Ireland was approached by famine, the Anti-Corn-Law League became menacingly powerful, and Peel showed signs of yielding to Free Trade. Disraeli's opportunity was soon to come now; and in 1845, seeing it on the way, he launched the brilliantly destructive series of speeches which, though they could not prevent the abolition of the corn-laws, abolished the minister who ended them. These speeches appeal more to admiration than to sympathy, even where the limitations of Disraeli's protectionist beliefs are understood, and where his perception of the later consequences of free trade is most cordially acknowledged. That he remained satisfied with them himself is doubtful, unless for their foresight, their tremendous effect as instruments of punishment, and as they swept him to so much distinction. Within three years, on the death of Lord George Bentinck, there was none to dispute with him the leadership of the Conservative party in the House of Commons.

In the parliament of 1841 he was member for Shrewsbury. In 1847 he was returned for Buckinghamshire, and never again had occasion to change his constituency. Up to this time his old debts still embarrassed him, but now his private and political fortunes changed together. Froude reports that he "received a large sum from a private hand for his *Life of Lord George Bentinck*" (published in 1852), "while a Conservative millionaire took upon himself the debts to the usurers; the 3 per cent. with which he was content being exchanged for the 10 per cent. under which Disraeli had been staggering." In 1848 his father Isaac Disraeli died, leaving to his son Benjamin nearly the whole of his estate. This went to the purchase of Hughenden Manor—not, of course, a great property, but with so much of the pleasant and picturesque, of the dignified also, as quite to explain what it was to the affectionate fancy of its lord. About this time, too (1851), his acquaintance was sought by an old Mrs Brydges Willyams—born a Spanish Jewess and then the widow of a long-deceased Cornish squire—who in her distant home at Torquay had conceived a restless admiration for Benjamin Disraeli. She wrote to him again and again, pressing for an appointment to consult on an important matter of business: would meet him at the fountain of the Crystal Palace in Hyde Park. Her importunity succeeded, and the very small, oddly-dressed, strange-mannered old lady whom Disraeli met at the fountain became his adoring friend to the end of her life. Gratitude for her devotion brought him and his wife in constant intimacy with her. There were many visits to Torquay; he gratified her with gossiping letters about the great people with whom and the great affairs with which the man who did so much honour to her race was connected, that being the inspiration of her regard for him. She died in 1863, leaving him all her fortune, which was considerable; and, as she wished, was buried at Hughenden, close to the grave where Disraeli was to lie.

It is agreed that the first three years of Disraeli's leadership in Opposition were skilfully employed in reconstructing the shattered Tory party. In doing this he made it sufficiently clear that there could be no sudden return to Protectionist principles. At the same time, however, he insisted (as he did from first to last) on the enormous importance to the country, to the character of its people no less than to its material welfare, of agricultural contentment and prosperity; and he also obtained a more general recognition of the fact that "the land" had borne fiscal burdens under the old régime which were unfair and unendurable under the new. So far he did well; and when in 1852 he took office as chancellor of the exchequer in Lord Derby's first Administration, the prospect was a smiling one for a man who, striving against difficulties and prejudices almost too formidable for imagination in these days, had attained to a place where he could fancy them all giving way. That, however, they were not. New difficulties were to arise and old prejudices to revive in full force. His first budget was a quaint failure, and was thrown out by a coalition of Liberals and Peelites which he believed was formed against Mr Disraeli more than against the chancellor of the exchequer. It was on this occasion that he exclaimed, "England does not love coalitions." After a reign of ten months he was again in Opposition, and remained so for seven years. Of the Crimean war he had a better judgment than those whose weakness led them into it, and he could tell them the whole truth of the affair in twenty words: "You are going to war with an opponent who does not want to fight, and whom you are unwilling to encounter." Neither were they prepared; and the scandals and political disturbances that ensued revealed him as a party leader who could act on such occasions with a dignity, moderation, and sagacity that served his country well, maintained the honour of party government, and cost his friends nothing. The mismanagement of the war broke down the Aberdeen Government in 1855, and then Disraeli had the mortification of seeing a fortunate chance of return to office lost by the timidity and distrust of his chief, Lord Derby—the distrust too clearly including the undervaluation of Disraeli himself. Lord Derby wanted Lord Palmerston's help, Mr Gladstone's, Mr Sidney Herbert's. This arrangement could not be made; Lord Derby therefore gave up the attempt to form a ministry, and Lord Palmerston came in. The next chance was taken in less favouring times. The Government in which Disraeli was again financial minister lasted for less than eighteen months (1858-59), and then ensued another seven years in the cold and yet colder shade of Opposition. Both of these seven-year outings were bad, but the second by far the worse. Parliamentary reform had become a burning question and an embarrassing one for the Tory party. An enormous increase of business, consequent upon the use of steam machinery and free-trade openings to commerce, filled the land with prosperity, and discredited all statesmanship but that which steered by the star over Manchester. Mr Gladstone's budgets, made possible by this prosperity, were so many triumphs for Liberalism. Foreign questions arose which strongly excited English feeling—the arrangements of peace with Russia, Italian struggles for freedom, an American quarrel, the *Arrow* affair and the Chinese war, the affair of the French colonels, and the Conspiracy Bill; and as they arose Palmerston gathered into his own sails (except on the last occasion) every wind of popular favour. Amid all this the Tory fortunes sank rapidly, becoming nearly hopeless when Lord Palmerston, without appreciable loss of confidence on his own side, persuaded many Tories in and out of Parliament that Conservatism would suffer little while he was in power. Yet there was great despondency, of course, in the Conservative ranks; with despondency discontent; with discontent rancour. The prejudice against Disraeli as Jew, the revolt at his theatri-

As leader in the House of Commons.

calisms, the distrust of him as "mystery man," which up to this time had never died out even among men who were his nearest colleagues, were now more openly indulged. Out of doors he had a "bad press," in Parliament he had some steady, enthusiastic friends, but more that were cold. Sometimes he was seen on the front Opposition bench for hours quite alone. Little conspiracies were got up to displace him, and might have succeeded but for an unconquerable dread of the weapon that destroyed Peel. In this state of things he patiently held his ground, working for his party more carefully than it knew, and never seizing upon false or discrediting advantages. But it was an extremely bad time for Benjamin Disraeli.

Though Lord Palmerston stumbled over his Foreign Conspiracy Bill in 1858, his popularity was little damaged, and it was in no hopeful spirit that the Tories took office again in that year. They were perilously weak in the House of Commons, and affairs abroad, in which they had small practice and no prestige, were alarming. Yet the new Administration did very well till, after resettling the government of India, and recovering from a blunder committed by their Indian secretary, Lord Ellenborough, they must needs launch a Reform Bill to put that dangerous question out of controversial politics. The well-intended but fantastic measure brought in for the purpose was rejected. The country was appealed to, with good but insufficient results; and at the first meeting of the new parliament the Tories were turned out on a no-confidence vote moved by Lord Hartington. Foreign affairs supplied the motive: failure to preserve the peace of Europe at the time of the Italian war of independence. It is said that the Foreign Office had then in print a series of despatches which would have answered its accusers had they been presented when the debate began, as for some unexplained reason they were not. Lord Palmerston now returned to Downing Street, and while he lived Disraeli and his colleagues had to satisfy themselves with what was meant for useful criticism, though with small hope that it was so for their own service. A Polish insurrection, the Schleswig-Holstein question, a commercial treaty with France, the civil war in America, gave Disraeli occasions for speech that was always forcible and often wiser than all could see at the time. He never doubted that England should be strictly neutral in the American quarrel when there was a strong feeling in favour of the South. All the while he would have gladly welcomed any just means of taking an animated course, for these were dull, dark days for the Conservatives as a parliamentary party. Yet, unperceived, Conservatism was advancing. It was much more than a joke that Palmerston sheltered Conservative principles under the Liberal flag. The warmth of his popularity, to which Radical applause contributed nothing in his later days, created an atmosphere entirely favourable to the quiet growth of Conservatism. He died in 1865. Earl Russell succeeded him as prime minister, Mr Gladstone as leader of the House of Commons. The party most pleased with the change was the Radical; the party best served was Disraeli's. Another Reform Bill, memorable for driving certain good Liberals into a Cave of Adullam, broke up the new Government in a few months; Disraeli contributing to the result by the delivery of opinions not new to him and of lasting worth, though presently to be subordinated to arguments of an inferior order and much less characteristic. "At this rate," he said in 1866, "you will have a parliament that will entirely lose its command over the executive, and it will meet with less consideration and possess less influence." Look for declining statesmanship, inferior aptitude, genius dying off. "Instead of these you will have a horde of selfish and obscure mediocrities, incapable of anything but mischief, and that mischief devised and regulated by the raging demagogue of the hour." The Reform legislation which promised these results in 1866 was thrown out. Lord Derby's third Administration was then formed in the summer of the same year, and for the third time there was a Tory Government on sufferance. Its followers were still a minority in the House of Commons; an angry Reform agitation was going on; an ingenious resolution founded on the demand for an enlarged franchise serviceable to Liberals might extinguish the new Government almost immediately; and it is pretty evident that the Tory leaders took office meaning to seek a cure for this desperate weakness by wholesale extension of the suffrage. Their excuses and calculations are well known, but when all is said, Lord Derby's statement of its character, "a leap in the dark," and of its intention, "dishing the Whigs," cannot be bettered. Whether Lord Derby or Mr Disraeli originated this resolve has been much discussed, and it remains an unsettled question. It is known that Disraeli's private secretary, Mr Ralph Earle, quarrelled with him violently at about this time; and Sir William Fraser relates that, meeting Mr Earle, that gentleman said: "I know what your feelings must be about this Reform Bill, and I think it right to tell you that it was not Disraeli's Bill, but Lord Derby's. I know everything that occurred." Mr Earle gave the same assurances to the writer of these lines, and did so with hints and half-confidences (quite intelligible, however) as to the persuasions that wrought upon his chief. Mr Earle's listener on these occasions confesses that he heard with a doubting mind, and that belief in what he heard still keeps company with Mahomet's coffin. One thing, however, is clear. To suppose Disraeli satisfied with the excuses made for his adoption of the "dishing" process is forbidden by the whole tenor of his teaching and conduct. He could not have become suddenly blind to the fallacy of the expectations derived from such a course; and all his life it had been his distinction to look above the transient and trafficking expedients of the professional politician. However, the thing was done. After various remodellings, and amid much perturbation, secession, violent reproach, the Household Suffrage Bill passed in August 1867. Another memorable piece of work, the Confederation of Canada, had already been accomplished. A few days after Parliament met in the next year Lord Derby's failing health compelled him to resign, and Mr Disraeli became prime minister. Irish disaffection had long been astir; the Fenian menace looked formidable not only in Ireland but in England also. The reconstructed Government announced its intention of dealing with Irish grievances. Mr Gladstone approved, proposing the abolition of the Irish Church to begin with. A resolution to that effect was immediately carried against the strong opposition of the Government. Disraeli insisted that the question should be settled in the new parliament which the Franchise Act called for, and he seems to have had little doubt that the country would declare against Mr Gladstone's proposal. He was mistaken. It was the great question at the polls; and the first elections by the new constituencies went violently against the authors of their being.

Reform Bill of 1867.

Premier, 1868.

The history of the next five years is Mr Gladstone's. The Irish Church abolished, he set to work with passionate good intention on the Irish land laws. The while he did so sedition took courage and flourished exceedingly, so that to pacify Ireland the constable went hand in hand with the legislator. The abolition of the Irish Church was followed by a Coercion Act, and the Land Act by suspension of *Habeas Corpus*. Disraeli, who at

first preferred retirement and the writing of *Lothair*, came forward from time to time to point the moral and predict the end of Mr Gladstone's impulsive courses, which soon began to fret the confidence of his friends. Some unpleasant errors of conduct—the Collier case, the Ewelme rectory case, the grave and significant Odo Russell scandal (to help the Government out of a scrape the ambassador was wrongfully accused of exceeding his instructions)—told yet more. Above all, many humiliating proofs that England was losing her place among the nations came out in these days, the discovery being then new and unendurable. To be brief, in less than four years the Government had well-nigh worn out its own patience with its own errors, failures, and distractions, and would gladly have gone to pieces when it was defeated on an Irish University Bill. But Disraeli, having good constitutional reasons for declining office at the moment, could not allow this. Still gathering unpopularity, still offending, alarming, alienating, the Government went on till 1874, suddenly dissolved Parliament, and was signally beaten, the Liberal party breaking up. Like most of his political friends, Disraeli had no expectation of such a victory—little hope, indeed, of any distinct success. Yet when he went to Manchester on a brief political outing two years before, he was received with such acclaim as he had never known in his life. He was then sixty-eight years old, and this was his first full banquet of popularity. The elation and confidence drawn from the Manchester meetings were confirmed by every circumstance of the 1874 elections. But he was well aware of how much he owed to his opponents' errors, seeing at the same time how safely he could lay his future course by them. He had always rejected the political economy of his time, and it was breaking down. He had always refused to accept the economist's dictum without reference to other considerations than the turnover of trade; and even Manchester could pardon the refusal now. The national spirit, vaporized into a cosmopolitan mist, was fast condensing again under mortification and insult from abroad uncompensated by any appreciable percentage of cash profit. This was a changing England, and one that Disraeli could govern on terms of mutual satisfaction; but not if the reviving "spirit of the country" ran to extremes of self-assertion. At one of the great Manchester meetings he said, "Do not suppose, because I counsel firmness and decision at the right moment, that I am of that school of statesmen who are favourable to a turbulent and aggressive diplomacy. I have resisted it during a large part of my life."

But for the hubbub occasioned by the Public Worship Regulation Act, the first two years of the 1874 administration had no remarkable excitements till near the end of them. The Public Worship Act, introduced by the Archbishop of Canterbury, was meant to restrain ritualism. Disraeli, who from first to last held to the Reformed Church as capable of dispensing social good as no other organisation might, supported the Bill as "putting down ritualism"; spoke very vehemently; gave so much offence that at one time neither the Bill nor the Government seemed quite safe. For some time afterwards there was so little legislation of the kind called "enterprising" that even some friends of the Government began to think it too tame; but at the end of the second year an announcement was made which put that fear to rest. The news that the Khedive's Suez Canal shares had been bought by the Government was received with boundless applause. It was a courageous thing to do; but it was not a Disraelian conception, nor did it originate in any Government department. It was suggested from without at a moment when the possibility of ever acquiring the shares was passing away. On the morning of the 15th of November 1875, the then editor of the *Pall Mall Gazette* went to Lord Derby at the Foreign Office, informed him that the Khedive's shares were passing into the hands of a French syndicate, and urged arrest of the transaction by purchase for England. (The shares being private property their sale could not, of course, be forbidden.) Lord Derby thought there must be a mistake. He could not believe that bargaining of that kind could go on in Cairo without coming to the knowledge of the British Consul there. He was answered that nevertheless it was going on. The difficulties of purchase by England were then arrayed by Lord Derby. They were more than one or two, and of course they had a formidable look; but so also had the alternative and the lost opportunity. One difficulty had already come into existence, and had to be met at once. Lord Derby had either to make direct inquiry of the Khedive or to let the matter go. If he inquired, and there was no such negotiation, his question might be interpreted in a very troublesome way; moreover, we should put the idea of selling the shares into the Khedive's head, which would be unfortunate. "There's my position, and now what do you say?" The answer given, Lord Derby drafted a telegram to the British Consul-General at Cairo, and read it out. It instructed Colonel Stanton to go immediately to the Khedive and put the question point blank. Meanwhile the prime minister would be seen, and Lord Derby's visitor might call next day to hear the reply from Cairo. It is enough to add here that on receipt of the answer the purchase for England was taken up and went to a speedy conclusion.

Suez Canal Shares.

As if upon the impulse of this transaction, Disraeli opened the next session of Parliament with a Bill to confer upon the Queen the title of Empress of India—a measure which offended the instincts of many Englishmen, and, for the time, revived the prejudices against its author. More important was the revival of disturbances in European Turkey, which, in their outcome, were to fill the last chapter of Disraeli's career. But for this interruption it is likely that he would have given much of his attention to Ireland, not because it was an attractive employment for his few remaining years, but because he saw with alarm the gathering troubles in that country. And his mind was strongly drawn in another direction. In a remarkable speech delivered in 1872, he spoke with great warmth of the slighting of the colonies, saying that "no minister in this country will do his duty who neglects any opportunity of reconstructing as much as possible our colonial empire, and of responding to those distant sympathies which may become the source of incalculable strength and happiness to this island." However, nothing was done in fulfilment of this duty in the first two years from 1874, and early in the third the famous Andrassy note, the Berlin memorandum, the Bashi-Bazouk atrocities, and the accumulative excitement thereby created in England, reopened the Eastern question with a vengeance. The policy which Disraeli's Government now took up may be truly called the national policy. Springing from the natural suggestions of self defence against the march of a dangerous rivalry, it had the sanction of all British statesmanship for generations, backed by the consenting instinct of the people. It was quite unsentimental, being pro-Turkish or anti-Russian only as it became so in being pro-British. The statesmen by whom it was established and continued saw in Russia a Power which, unless firmly kept within bounds, would dominate Europe; more particularly, that it would undermine and supersede British authority in the East. And without nicely considering the desire of Russia to expand to the Mediterranean, the Pacific, or in any other

Eastern question.

direction, they thought it one of their first duties to maintain their own Eastern empire; or, to put it another way, to contrive that Great Britain should be subject to Russian ascendancy (if ever), at the remotest period allowed by destiny. Such were the ideas on which England's Russian policy was founded. In 1876 this policy revived as a matter of course in the Cabinet, and as spontaneously, though not upon a first provocation, became popular almost to fury. And furiously popular it remained. But a strong opposing current of feeling, equally passionate, set in against the Turks; war began and lasted long; and as the agitation at home and the conflict abroad went on, certain of Disraeli's colleagues, who were staunch enough at the beginning, gradually weakened. It is certainly true that Disraeli was prepared, in all senses of the word, to take strong measures against such an end to the war as the San Stefano treaty threatened. Rather than suffer that, he would have fought the Russians in alliance with the Turks, and had gone much farther in maturing a scheme of attack and defence than was known at the time or is commonly known now. That there was a master motive for this resolution may be taken for granted; and it is to be found in a belief that not to throw back the Russian advance then was to lose England's last chance of postponing to a far future the predominance of a great rival power in the East. How much or how little judgment shows in that calculation, when viewed in the light of later days, we do not discuss. What countenance it had from his colleagues dropped away. At the end their voices were strong enough to insist upon the diplomatic action which at no point falls back on the sword; Lord Derby (foreign minister) being among the first to make a stand on that resolution, though he was not the first seceder from the Government. Such diplomacy in such conditions is paralytic. It cannot speak thrice, with whatever affectation of boldness, without discovering its true character to trained ears; which should be remembered when Disraeli's successes at Berlin are measured. It should be remembered that what with the known timidity of his colleagues, and what with the strength and violence of the Russian party in England, his achievement at Berlin was like the reclamation of butter from a dog's mouth; as Prince Bismarck understood in acknowledging Disraeli's gifts of statesmanship. It should also be remembered, when his Eastern policy in 1876-78 is denounced as malign and a failure, that it was never carried out. Good or bad, ill or well calculated, effective existence was denied to it; and a man cannot be said to have failed in what he was never permitted to attempt. The nondescript course of action which began at the Constantinople Conference and ended at Berlin was not of his direction until its few last days. It only marked at various stages the thwarting and suppression of his policy by colleagues who were haunted night and day by memories of the Crimean war, and not least, probably, by the fate of the statesmen who suffered for its blunders and their own. Disraeli also looked back to those blunders, and he was by no means insensible to the fate of fallen ministers. But just as he maintained at the time of the conflict, and after, that there would have been no Crimean war had not the British Government convinced the Tsar that it was in the hands of the peace party, so now he believed that a bold policy would prevent or limit war, and at the worst put off grave consequences which otherwise would make a rapid advance.

As if aware of much of this, the country was well content with Disraeli's successes at Berlin, though sore on some points, he himself sharing the soreness. Yet there were great days for him after his return. At the Berlin Conference he had established a formidable reputation; the popularity he enjoyed at home was affectionately enthusiastic; no minister had ever stood in more cordial relations with his sovereign; and his honours in every kind were his own achievement against unending disadvantage. But he was soon to suffer irretrievable defeat. A confused and unsatisfactory war in Afghanistan, troubles yet more unsatisfactory in South Africa, conspired with two or three years of commercial distress to invigorate "the swing of the pendulum" when he dissolved parliament in 1880. Dissolution the year before would have been wiser, but a certain pride forbade. The elections went heavily against him. He took the blow with composure, and sank easily into a comparative retirement. Yet he still watched affairs as a great party leader should, and from time to time figured vigorously in debate. Meanwhile he had another novel to sit down to—the poor though highly characteristic *Endymion;* which, to his great surprise and equal pleasure, was replaced on his table by a cheque for ten thousand pounds. Yet even this satisfaction had its tang of disappointment; for though *Endymion* was not wholly written in his last days, it was in no respect the success that *Lothair* was. This also he could bear. His description of his grandfather recurs to us: "A man of ardent character, sanguine, courageous, and fortunate, with a temper which no disappointment could disturb."

As Earl of Beaconsfield (failing health had compelled him to take refuge in the House of Lords in 1876) Benjamin Disraeli died in his house in Curzon Street on the 19th of April 1881. The likelihood of his death was publicly known for some days before the event, and then the greatness of his popularity and its warmth were declared for the first time. No such demonstration of grief was expected even by those who grieved the most. He lies in Hughenden churchyard, in a rail-enclosed grave, with liberty for the turf to grow between him and the sky. Within the church is a marble tablet, placed there by his Queen, with a generous inscription to his memory. The anniversary of his death has since been honoured in an unprecedented manner, the 19th of April being celebrated as "Primrose Day"—the primrose, for reasons impossible accurately to define, being popularly supposed to have been Disraeli's favourite flower. Even among his friends in youth (Sir Edward Lytton Bulwer, for example), and not improbably among the City men who wagered their money in irrecoverable loans to him on the chance of his success, there may have been some who compassed the thought of Benjamin Disraeli as prime minister and peer; but at no time could any fancy have imagined him remembered so enduringly as Lord Beaconsfield has been. It is possible that Sarah Disraeli (the Myra of *Endymion*), or that "the most severe of critics but a perfect wife," may have had such dreams—hardly that they could have occurred to any mind but a devoted woman's. Disraeli's life was a succession of surprises, but none was so great as that he should be remembered after death more widely, lastingly, respectfully, affectionately, than any other statesman in the long reign of Queen Victoria. While he lived he did not seem at all cut out for that distinction even as an Imperialist. Significant as was the common grief when he died, no such consequence could be inferred from it, and certainly not from the elections of 1880. It stands, however, this high distinction, and with it the thought that it would have been denied to him altogether had the "adventurer" and "mystery man" of the 'sixties died at the age of threescore years and ten. We have said that never till 1872 did he look upon the full cup of popularity. It might have been said that even at that

Death and influence.

time intrigue to get rid of him had yet to cease in his own party; and but a few years before, a man growing old, he was still in the lowest deeps of his disappointments and humiliations. How, then, could it be imagined that with six years of power from his seventieth year, the Jew "adventurer," mysterious and theatrical to the last, should fill a greater space in the mind of England twenty years after death than Peel or Palmerston after five? Of course it can be explained; and when explained, we see that Disraeli's good fortune in this respect is not due entirely to his own merits. His last years of power might have been followed by as long a period of more acceptable government than his own, to the effacement of his own from memory; but that did not happen. What did follow was a time of universal turbulence and suspicion, in which the pride of the nation was wounded again and again. To say "Majuba" and "Gordon" recalls its deepest hurts, but not all of them; and it may be that a pained and angry people, looking back, saw in the man whom they lately displaced more than they had ever seen before. From that time, at any rate, Disraeli has been acknowledged as the regenerator and representative of the Imperial idea in England. He has also been accused on the same grounds; and if the giver of good wine may be blamed for the guest who gets drunk on it, there is justice in the accusation. It is but a statement of fact, however, that Disraeli retains his hold upon the popular mind on this account mainly. The rekindling of the Imperial idea is understood as a timely act of revolt and redemption: of revolt against continuous humiliations deeply felt, redemption from the fate of nations obviously weak and suspected of timidity. It has been called rescue-work—deliverance from the dangers of invited aggression and a philosophical neglect of the means of defence. And its first achievement for the country (this is again a mere statement of fact) was the restoration of a much-damaged self-respect and the creation of a great defensive fleet not a day too soon for safety. So much for "the great heart of the people." Meanwhile political students find to their satisfaction that he never courted popularity, and never practised the art of working for "quick returns" of sympathy or applause. As "adventurer" he should have done so; yet he neglected the cultivation of that paying art for the wisdom that looks to the long future, and bears its fruit, perchance, when no one cares to remember who sowed the seed. So it is that to read some of his books and many of his speeches is to draw more respect and admiration from their pages than could have been found there originally. The student of his life understands that Disraeli's claim to remembrance rests not only on the breadth of his views, his deep insight, his long foresight, but even more on the courage which allowed him to declare opinions supplied from those qualities when there was no visible likelihood of their justification by experience, and therefore when their natural fate was to be slighted. His judgments had to await the event before they were absolved from ridicule or delivered from neglect. The event arrives; he is in his grave; but his reputation loses nothing by that. It gains by regret that Death was beforehand with him.

"Adventurer," as applied to Disraeli, was a mere term of abuse. "Mystery-man" had much of the same intention, but in a blameless though not in a happy sense it was true of him to the end of his days. Even to his friends, and to many near him, he remained mysterious to the last. It is impossible to doubt that some two or three, four or five perchance, were at home in his mind, being freely admitted there; but of partial admissions to its inner places there seem to have been few or none. Men who were long associated with him in affairs, and had much of his stinted companionship, have confessed that with every wish to understand his character they never succeeded. Sometimes they fancied they had got within the topping walls of the maze, and might hope to gain the point whence survey could be made of the whole; but as often they found themselves, in a moment, where they stood at last and at first—outside. His speeches carry us but a little way beyond the mental range; his novels rather baffle than instruct. It is commonly believed that Disraeli looked in the glass while describing Sidonia in *Coningsby*. We group the following sentences from this description for a purpose that will be presently seen:—(1) "He was admired by women, idolized by artists, received in all circles with great distinction, and appreciated for his intellect by the very few to whom he at all opened himself." (2) "For, though affable and generous, it was impossible to penetrate him: though unreserved in his manners his frankness was limited to the surface. He observed everything, thought ever, but avoided serious discussion. If you pressed him for an opinion he took refuge in raillery, and threw out some paradox with which it was not easy to cope. The secret history of the world was Sidonia's pastime. His great pleasure was to contrast the hidden motive with the public pretext of transactions." (3) "He might have discovered a spring of happiness in susceptibilities of the heart; but this was a sealed fountain for Sidonia. In his organization there was a peculiar, perhaps a great deficiency; he was a man without affection. It would be hard to say that he had no heart, for he was susceptible of deep emotions; but not for individuals. Woman was to him a toy, man a machine." These sentences are separately grouped here for the sake of suggesting that they will more truly illustrate Disraeli's character if taken as follows:—The first as representing his most cherished social ambitions—in whatever degree achieved. The second group as faithfully and closely descriptive of himself: descriptive too of a character purposely cloaked. The third as much less simple; in part a mixture of truth with Byronic affectation, and for the rest (and more significantly), as intimating the resolute exercise of extraordinary powers of control over the promptings and passions by which so many capable ambitions have come to grief. So read, Sidonia and Benjamin Disraeli are brought into close resemblance by Disraeli himself; for what in this description is untrue to the suspected fundamentals of his character is true to his known foibles. But for a general interpretation of Lord Beaconsfield and his career none serves so well as that which Froude insists on most. He was thoroughly and unchangeably a Jew. At but one remove, by birth, from southern Europe and the East, he was an Englishman in nothing but his devotion to England and his solicitude for her honour and prosperity. It was not wholly by volition and design that his mind was strange to others and worked in absolute detachment. He had "none of the hereditary prepossessions of the native Englishman." No such prepossessions disturbed his vision when it was bent upon the rising problems of the time, or rested on the machinery of government and the kind of men who worked it and their ways of working. The advantages of Sidonia's intellect and temperament were largely his, in affairs, but not without their drawbacks. His pride in his knowledge of the English character was the pride of a student; and we may doubt if it ever occurred to him that there would have been less pride but more knowledge had he been an Englishman. It is certain that in shrouding his own character he checked the communication of others to himself, and so could continue to the end of his career the costly mistake of being theatrical in England. There

Character.

was a great deal too (though little to his blame) in Lord Malmesbury's observation that he was not only disliked in the House of Commons for his mysterious manner, but prejudiced by a pronounced foreign air and aspect. Lord Malmesbury does not put it quite as strongly as that, but he might have done so with truth. No Englishman could approach Disraeli without some immediate consciousness that he was in the presence of a foreigner.

Lord Beaconsfield has been praised for his integrity in money-matters: the praise could have been spared—it does not rise high enough. It is also said to his honour that he "never struck at a little man," and that was well; but it is explained as readily by pride and calculation as by magnanimity. A man of extraordinary coolness and self-control, his faults in every kind were faults of excess: it is the mark of them all. But whatever offence they gave, whatever mischief they did, was soon exhausted, and has long since been pardoned.

Lord Beaconsfield's Preface to 1849 edition of Isaac Disraeli's works.—*Correspondence with his Sister*, and *Home Letters*, edited by Ralph Disraeli.—Samuel Smiles. *Memoirs and Correspondence of John Murray.—Life of the Earl of Beaconsfield*, by F. Hitchman.—*Memoir* by T. E. Kebbel.—*Memoir* by J. A. Froude.—*Memoir* by Harold Gorst.—Sir William Fraser's *Disraeli and his Day.—The Speeches of Lord Beaconsfield*, edited by T. E. Kebbel.—T. P. O'Connor's *Life.—National Dictionary of Biography*. Personal knowledge. (F. G.)

Beaconsfield, a town of Cape Colony in Griqualand West, nearly 2 miles S.W. of Kimberley, after which it ranks as the most important place in the diamond fields. Although dating only from 1870, when it was founded near the famous Dutoit's Pan mine, and still figured on but few maps, it had a population in 1891 of 10,500, and in 1898 of over 13,000. In the same district are also the rich De Beer's and Bultfontein mines, for the collective output of which, see Kimberley.

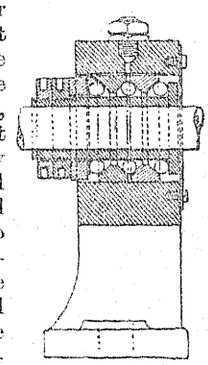
Beardsley, Aubrey Vincent (1872-1898), English artist in black and white, was born at Brighton, 24th August 1872. In 1883 his family settled in London, and in the following year he appeared in public as an "infant musical phenomenon," playing at several concerts with his sister. In 1888 he obtained a post in an architect's office, and afterwards one in the Guardian Life and Fire Insurance Company (1889). In 1891, under the advice of Sir Edward Burne-Jones and M. Puvis de Chavannes, he took up art as a profession. In 1892 he attended the classes at the Westminster School of Art, then under Professor Brown; and from 1893 until his death, at Mentone, 16th March 1898, his work came continually before the public, arousing a storm of criticism and much hostile feeling. Beardsley had an unswerving tendency towards the fantastic of the gloomier and "unwholesome" sort. His treatment of most subjects was revolutionary; he deliberately ignored proportion and perspective, and the "freedom from convention" which he displayed caused his work to be judged with harshness. In certain phases of technique he especially excelled; and his earlier methods of dealing with the single line in conjunction with masses of black are in their way unsurpassed, except in the art of Japan, the country which probably gave his ideas some assistance. He was always an ornamentist, rather than an illustrator; and his work must be judged from that point of view. His frontispiece to *Volpone* is held by some to be, from this purely technical standpoint, one of the best pen-drawings of the age. His posters for the Avenue Theatre and for Mr Fisher Unwin were among the first of the modern cult of that art.

The following are the chief works which are illustrated with drawings by Beardsley: the *Bon Mot* Library, *The Pall Mall Budget*, and *The Studio* (1893), Sir Thomas Malory's *Morte d'Arthur* (1893-94), *Salomé* (1894), *The Yellow Book* (1894-95), *The Savoy Magazine* (1896), *The Rape of the Lock* (1896).

See also J. Pennell. *The Studio*. 1893.—Symons. *Aubrey Beardsley*. 1898.—R. Ross. *Volpone*. 1898.—H. C. Marillier. *The Early Work of Aubrey Beardsley*. 1899.—Smithers. *Reproductions of Drawings by Aubrey Beardsley*.—John Lane. *The Later Works of Aubrey Beardsley*. 1901. (E. F. S.)

Beardstown, a city of Cass county, Illinois, U.S.A., situated in the western part of the state, on the east bank of Illinois river, at an altitude of 448 feet. It is entered by two railways, the Baltimore and Ohio South-Western, and the Chicago, Burlington, and Quincy. Population (1880), 3135; (1890), 4226; (1900), 4827.

Bearings, Ball and Roller.—There are two methods usually adopted for the transport of loads along roads, namely, by wheels or by rollers. The former consists of a disc or wheel, turning on a spindle or axle; in this case frictional resistance due to the load is exerted at the bearing surface of the wheel on the axle, and has to be met and overcome. The latter arrangement, in its primitive form, is usually adopted for the transport of heavy loads only. It possesses the advantage that, as there is no rubbing contact between the surface of the rollers and the load, purely frictional resistances do not exist. This argument is strictly only true when the rollers are hard and work on true hard surfaces. The ball bearing, which has done much to make the cycle carriage efficient, combines the adoption of the principle involved in the latter method described above, with its application to the former, so that the frictional resistances which would otherwise exist between wheel and axle are practically eliminated. In place of rollers, however, balls are generally used, especially for light loads, as they possess the obvious advantage that, being symmetrical about a centre, there is no need to constrain them, as in the case of rollers whose axes must be kept in correct relation to each other. It will be seen that in the case of a sphere placed between two plane surfaces actual contact is made at two points only, and the stresses at these points under a load are correspondingly severe. For this reason it is necessary to employ in a bearing a large number of balls in order to increase the points of support, and to make the balls themselves and the paths on which they run of the finest hardened steel, and perfectly true in form. Perfect rolling contact is only obtained when the balls and contact surfaces touch at points, and then only when the parts in contact are not constrained to move at different speeds in relation to each other. It is frequently the case that, in order to obtain more contact surface so as better to support a load, the paths on which the balls run are curved to fit the balls, but in such cases friction, due to rubbing contact in place of true rolling contact, must necessarily result. In light machines, such as bicycles, it is customary to have one circle of balls to each bearing, but for heavier bearings these are increased in number; and as the examination and separation of a bearing with a large number of balls would be exceedingly inconvenient, it is customary to carry the balls in cages or some similar device. Where heavy loads have to be carried it is customary to use rollers in a bearing in place of balls, with very satisfactory results. It is absolutely necessary, however, that the axes of the rollers should retain a symmetrical relation to each other, and that their peripheries should not touch, or friction will result.



Ball Bearing.

The circle of rollers is therefore carried either in a cage or some other contrivance. A well-designed bearing is shown in the figure. The balls and paths are capable of ready removal from the outer bracket support, and when removed the balls are prevented from falling by the ring paths. Very heavy loads, such as bridges, guns, and their mountings, &c., are commonly carried on a circle of rollers, forming in effect roller bearings, with such excellent results that the resistance to rotation is very small compared with the total load. (G. H. Ba.)

Beatrice, capital of Gage county, Nebraska, U.S.A., situated in the south-eastern part of the state, in the valley of Big Blue river, at an altitude of 1265 feet, in an agricultural region. It has three railways: the Burlington and Missouri River; the Chicago, Rock Island, and Pacific; and the Union Pacific. Population (1900), 7875.

Beaulieu, a French village in the arrondissement of Nice, department of Alpes Maritimes, 5 miles E. by N. of Nice and 1 mile S.E. of Villefranche, of which it may be regarded as an extension. Formerly a mere hamlet, it has become in recent years a frequented and fashionable winter resort, and has numerous handsome villas. In the vicinity are interesting grottoes. Population (1891), 184; (1896), 1031.

Beaumont, capital of Jefferson county, Texas, U.S.A., situated on Neches river, in the eastern part of the state, in a rich agricultural region, where cotton is the principal product. It is surrounded by dense forests of pine and cypress, and has extensive lumber manufactures. In 1901 wells were sunk at Beaumont, and petroleum was found in large quantities. It is at the intersection of four railways, affording communication in all directions. Population (1900), 9427.

Beaumont, Sir John (1583-1627), English poet, second son of the judge, Sir Francis Beaumont, was born at Grace-Dieu, in Leicestershire, in 1583. The deaths of his father (in 1598) and of his elder brother, Sir Henry Beaumont (in 1605), made the poet early the head of this brilliant family; the dramatist, Francis Beaumont, being a younger brother. John went to Oxford in 1596, and entered as a gentleman commoner in Broadgate's Hall, the present Pembroke College. It is said that he was intended for the law, but on the death of Henry he no doubt went down to Grace-Dieu to manage the family estates. He began to write verse early, and in 1602, at the age of nineteen, he published anonymously his *Metamorphosis of Tobacco*, written in very smooth couplets, in which he addressed Drayton as his "loving friend." He lived in Leicestershire for many years as a bachelor, being one "who never felt Love's dreadful arrow." But in process of time he became a tardy victim, and married a lady of the Fortescue family, who bore him four stout sons, the eldest of whom, another John, was accounted one of the most athletic men of his time. "He could leap 16 feet at one leap, and would commonly, at a stand-leap, jump over a high long table in the hall, light on a settle beyond the table, and raise himself straight up." This magnificent young man was not without literary taste; he edited his father's posthumous poems, and wrote an enthusiastic elegy on him; he was killed in 1644 at the siege of Gloucester. Another of Sir John Beaumont's sons, Gervaise, died in childhood, and the incidents of his death are recorded in one of his father's most touching poems. Sir John Beaumont concentrated his powers on a poem in eight books, entitled *The Crown of Thorns*, which was greatly admired in MS. by the earl of Southampton and others, but which is lost. After long retirement, Beaumont was persuaded by the duke of Buckingham to move in larger circles; he attended court, and in 1626 was made a baronet. This honour he did not long survive, for he died on the 19th of April 1627, and was buried in Westminster Abbey ten days later. The new Sir John, the strong man, published in 1629 a volume entitled *Bosworth Field; with a taste of the variety of other Poems left by Sir John Beaumont.* No more "tastes" were ever vouchsafed, so that it is by this volume and by the juvenile *Metamorphosis of Tobacco* that Beaumont's reputation has to stand. Of late years, the peculiarities of John Beaumont's prosody have drawn attention to his work. He wrote the heroic couplet, which was his favourite measure, with almost unprecedented evenness. Bosworth Field, the scene of the battle of which Beaumont's principal poem gives a vaguely epical narrative, lay close to the poet's house of Grace-Dieu. He writes on all occasions with a smoothness which was very remarkable in the first quarter of the 17th century, and which marks him, with Waller and Sandys, as one of the pioneers of the classic reformation of English verse. (E. G.)

Beauregard, Pierre Gustave Toutant (1818-1893), American soldier, was born near New Orleans, Louisiana, on 28th May 1818. At the United States military academy he graduated second in his class in July 1838, and was detailed as a lieutenant of engineers. In the Mexican war he distinguished himself in siege operations at Vera Cruz, and upon the advance to the Mexican capital was wounded and twice brevetted. As captain of engineers, in March 1853, he took charge of constructive defences in and about Louisiana and the Gulf coast (1853-60), and was superintendent at West Point in January 1861 for a few days. Resigning his United States commission on 20th February 1861, he became a brigadier-general of the new Southern Confederacy, and was sent to direct the operations at Charleston, South Carolina, which resulted in the capture of Fort Sumter and the outbreak of civil war. Ordered next to Virginia, he won, with General Joseph E. Johnston, the first battle of Bull Run (21st July), was promoted to general, and in the spring of 1862 went to Tennessee as second in command to General Albert S. Johnston. When that officer was killed during the battle of Shiloh on 6th April, Beauregard assumed command. Nearly routing his adversary the first day, he was compelled on the second to fall back to Corinth, Mississippi, which he evacuated in good order on 30th May, upon General Halleck's approach. His health now failing, he performed less conspicuous service; defending Charleston (September 1862-April 1864); reinforcing Lee near Petersburg (May 1864); and later in 1864 attempting with inadequate troops to resist General Sherman's march through Georgia and the Carolinas. With General Joseph E. Johnston he surrendered to Sherman in April 1865. After the war he engaged in railway management, became adjutant-general of his native state, and served the Louisiana lottery. He died in New Orleans, 20th February 1893.

Beauvais, chief town of department of Oise, France, 44 miles N.N.W. of Paris, with stations on the railway from Paris to Tréfort and other lines. Besides its other industries, Beauvais is a great centre of toy manufactures. Population (1881), 14,934; (1896), 16,371.

Beaverdam, a city of Dodge county, Wisconsin, U.S.A., situated in the south-eastern part of the state, in 45° 28′ N. lat., and 88° 52′ W. long., at an altitude of 873 feet. The Chicago, Milwaukee, and St Paul Railway passes through it. Its position on the shore of Beaverdam Lake makes it an attractive summer resort. It is the seat of Wayland University. Population (1900), 5128.

Beaver Falls, a borough of Beaver county,

Pennsylvania, U.S.A., situated in the western part of the state, on Beaver river, 30 miles north-west of Pittsburg, at an altitude of 784 feet, on the Pennsylvania and the Pittsburg and Lake Erie Railways. It is in the coal and natural gas region and has extensive manufactures. It is the seat of Geneva College. Population (1900), 10,054.

Beawar, a town of British India, the administrative headquarters of Merwara district in Rajputana, situated in 26° 9′ N. lat. and 74° 23′ E. long., 33 miles from Ajmer. Population, about 20,000. It is an important centre of trade, especially in raw cotton, and has four factories for ginning and pressing cotton, two of which are worked by hydraulic pressure.

Bebel, Ferdinand August (1840-——), German socialist, was born at Cologne on the 22nd of February 1840; he became a turner and worked at Leipzig. Here he took a prominent part in the workmen's movement and in the association of working men which had been founded under the influence of Schultz-Delitzsch; at first an opponent of socialism, he came under the influence of Liebknecht, and since 1865 he has been a confirmed advocate of socialism. With Liebknecht he belonged to the branch of the socialists which was in close correspondence with Karl Marx and the International, and refused to accept the leadership of Schweitzer, who had attempted to carry on the work after Lassalle's death. He was one of those who supported a vote of want of confidence in Schweitzer at the Eisenach conference in 1867, from which his party was generally known as "the Eisenacher." In this year he was elected a member of the North German Reichstag for a Saxon constituency, and, with the exception of the years 1881 to 1883, has been a member of the German Parliament ever since. His great organizing talent and oratorical power quickly made him one of the leaders of the socialists and their chief spokesman in parliament. In 1870 he and Liebknecht were the only members who did not vote the extraordinary subsidy required for the war with France; the followers of Lassalle, on the other hand, voted for the Government proposals. He was the only Socialist who was elected to the Reichstag in 1871, but he used his position to protest against the annexation of Alsace-Lorraine and to express his full sympathy with the Paris Commune. Bismarck afterwards said that this speech of Bebel's was a "ray of light," showing him that Socialism was an enemy to be fought against and crushed; and in 1872 Bebel was accused in Brunswick of preparation for high treason, and condemned to two years' imprisonment in a fortress, and, for insulting the German emperor, to nine months' ordinary imprisonment. After his release he helped to organize, at the Congress of Gotha, the united party of Social Democrats, which had been formed during his imprisonment. After the passing of the Socialist Law he continued to show great activity in the debates of the Reichstag, and was also elected a member of the Saxon Parliament; when the state of siege was proclaimed in Leipzig he was expelled from the city, and in 1886 condemned to nine months' imprisonment for taking part in a secret society. Although the rules of the Social Democratic party do not recognize a leader or president, Bebel has since been by far the most influential member of the party. In the party meetings of 1890 and 1891 his policy was severely attacked, first by the extremists, the "young" Socialists from Berlin, who wished to abandon parliamentary action; against these Bebel won a complete victory. On the other side he was involved in a quarrel with Volmar and his school, who desired to put aside from immediate consideration the complete attainment of the Socialist ideal, and proposed that the party should aim at bringing about, not a complete overthrow of society, but a gradual amelioration. The conflict of tendencies then begun has continued, and Bebel has come to be regarded as the chief exponent of the traditional views of the orthodox Marxist party. He has been exposed to some natural ridicule on the ground that the "Kladderadatsch," which he often spoke of as imminent, has not yet taken place. On the other hand, though a strong opponent of militarism, he has publicly stated that foreign nations attacking Germany must not expect the help or the neutrality of the Social Democrats. His book, *Die Frau und der Socialismus*, which has gone through many editions, and contains an attack on the institution of marriage, has identified him with the most extreme forms of Socialism.

MEHRING. *Geschichte der deutschen Social-Demokratie.* Stuttgart, 1898.—*Reports of the Annual Meetings of the Social Democratic Party.* Berlin Vorwärts Publishing Company, 1890-1900. —B. RUSSELL. *German Social-Democracy.* London, 1897.

(J. W. HE.)

Beccles, a municipal borough, market town, and railway station, in the Lowestoft parliamentary division of Suffolk, England, on the Waveney, 10 miles W. by S. of Lowestoft. The corporation is lord of the manor and principal landowner. There are now extensive printing works and a hospital. Area of borough (a parish), 2017 acres; population (1881), 5721; (1891), 6669; (1901), 6898.

Bechuanaland, a country of British South Africa, which occupies all the central part of the great inland plateau, stretching from the Orange River uninterruptedly northwards to the Zambezi, and merging gradually westwards in the Kalahari desert. It is thus coterminous on the east with Orange River Colony, Transvaal, and Rhodesia, and on the west with German South-West Africa, where the conventional boundaries, as laid down by the Anglo-German agreements of 1884 and 1890, coincide partly with 20° and partly with 21° E. Gr. This region, which enjoys almost complete ethnical unity, being mainly inhabited by various branches of the great Bechuana nation, is divided politically into two sections—*South Bechuanaland*, from the Orange to the Molopo river, forming since

Tribal Groups.	Territory.	Area in Square Miles.	Population.	Chief Kraals.
Batlaro and *Basaomaka* (totem, *Klu*, the Elephant); Chief, Mankoroane	From Griqualand West to Kuruman and Taungs	30,000	60,000	Kuruman
Batlapin, (totem, *Tlapi*, the Fish); chief, Mankoroane	Between Taungs and Vryburg	...	...	Taungs
Barolong (totem, *Mari*, the Buffalo); chief, Montsioa	Between Vryburg and Molopo river	20,000	30,000	Mafeking
TOTAL, SOUTH BECHUANALAND.		50,000	90,000	
Bawanketsi (totem, *Kwena*, the Crocodile); chief, Bathoen	From the Molopo to the Kanya district	50,000	100,000	Kanya
Bakwena (totem, *Kwena*); chief, Sebele	From Kanya to Tropic of Capricorn			Formerly Kolobeng, now Molepolole
Bamangwato and *Batwana* (totem *Puti*, the duiker Antelope); chiefs, Khama and Sechome	From Sebele's to the Zambezi and westwards to and beyond Lake Ngami	150,000	400,000	Formerly Shoshong, now Palapye
TOTAL, NORTH BECHUANALAND.		200,000	500,000	

1895 an integral part of Cape Colony; and *North Bechuanaland*, from the Molopo to the Zambezi, since 1885 a British protectorate. In both sections the natives retain their primitive tribal organization, with their hereditary chiefs, totems (tutelar deities), recognized territories, and head kraals (stations), as tabulated above.

Here the areas include extensive hunting grounds claimed by the several tribes in the Kalahari desert, and in the populations are comprised some thousands of the so-called Ba-Kalahari, *i.e.*, Bushman half-breeds, formerly slaves, now servants and farm assistants of their Bechuana masters. The emancipation of these debased Bushman groups was one of the most beneficent results of the extension of British rule over Bechuanaland. Khama, the central figure if not the recognized paramount chief of the Bechuana nation, has long administered his extensive territory and controlled his formerly lawless Bamangwato subjects with a vigour combined with kindness which would reflect credit on any European potentate. In this Christian prince are embodied all the higher qualities of which the Bantu race is capable, and he, with Moshesh, Chaka, and a few others, has been appealed to in proof of the mental superiority of the Negroid Bantus over the full-blood Sudanese negro. In the protectorate the three chiefs, Khama, Sebele, and Bathoen, continue to govern their own people under the protection of Great Britain, which is represented by a Resident Commissioner stationed at the administrative capital, Mafeking, and acting under the High Commissioner of South Africa. The natives pay a hut-tax, which is collected by the chiefs, and order is maintained by a force of mounted police. The people are occupied chiefly with stock-breeding, and in recent years have suffered greatly from drought and rinderpest. In consequence of these losses the expenditure has in some years greatly exceeded the revenue (in 1897, £88,450 and £47,510 respectively); but in normal times accounts are balanced, and the population appears to be increasing. Khama had always forbidden the importation of spirits in his territory, and at present no licenses are granted for their sale in any part of the protectorate. For the physical features, climate, and other geographical details, see SOUTH AFRICA.

J. D. HEPBURN. *Twenty Years in Khama's Country.* London, 1895.—SIR HARRY JOHNSTON. *The Colonization of Africa.* Cambridge, 1899.—A. H. KEANE. *Africa*, vol. ii. London, 1895.

(A. H. K.)

Recent History.—With the settlement of Dr Livingstone in the country in the early 'forties, the political history of Bechuanaland may be said to begin. In 1852 a trader named M'Cabe was stopped by the Boers whilst crossing the Kalahari. This satisfied Livingstone that the Boers were endeavouring to close the country to British colonization. "The Boers," he wrote, "resolved to shut up the interior, and I determined to open the country." At this time the Boers attacked Setylli, a tribal chief, and tried to induce Montsioa, chief of the Barolong, to assist them, but he refused to be drawn into the strife. At a later date they tried to raise taxes from the Barolong, but without success. This led to a protest from Montsioa, which he lodged with a landdrost at Potchefstroom in the Transvaal, threatening to submit the matter to the British High Commissioner if any further attempt at taxation were made on the part of the Boers. The Boers then resorted to cajolery, and invited the Barolong to join their territories with the Transvaal, in order to save them from becoming British. Montsioa's reply was short: "No one ever spanned in an ass with an ox in one yoke." These overtures of the freebooting parties of Boers having failed, the president of the Transvaal in 1872 endeavoured to replace Montsioa as chief of the Barolong by Moshette, whom he declared to be the rightful ruler and paramount chief of that people. The attacks of the Boers at length became so unbearable that Montsioa made a request to the British authorities to be taken under their protection. In formulating this appeal he declared that when the Boers were at war with Moselekatze, chief of the Matabele, he had aided them on the solemn undertaking that they were to respect his boundaries. This promise they had broken. Khama, chief of the Bamangwato in Northern Bechuanaland, wrote about the same time to Sir Henry Barkly making an appeal similar to that sent by the Barolong. The letter, which is a remarkable one, contained the following significant passages: "I write to you, Sir Henry, in order that your queen may preserve for me my country, it being in her hands. The Boers are coming into it, and I do not like them." "Their actions are cruel among us black people. We are like money, they sell us and our children." "I ask Her Majesty to defend me, as she defends all her people. There are three things which distress me very much—war, selling people, and drink. All these things I shall find in the Boers, and it is these things which destroy people to make an end of them in the country. The custom of the Boers has always been to cause people to be sold, and to-day they are still selling people." The statements of Khama in this letter do not appear to have been exaggerated. The testimony of Livingstone confirms them, and even a Dutch clergyman, writing in 1869, described the system of apprenticeship of natives which obtained among the Boers "as slavery in the fullest sense of the word." These representations on the part of the Barolong, and the Bamangwato under Khama, supported by the representations of Cape politicians, led in 1878 to the military occupation of Southern Bechuanaland by a British force under Colonel Warren. The imperial troops at Warren's disposal, with the Kimberley volunteers, were able to check the Boers in the district at that time. With regard, however, to the indignant protests that were made by missionaries and travellers on the subject of Boer cruelty towards the natives, it is only fair to say that at the outset, in a large number of instances, the Boers' aid was called in by one or other native chief, a party to the tribal strife continually raging among the Bantu. In fact what occurred in Bechuanaland occurred more or less throughout South Africa. A continual struggle for power was going on amongst petty Bantu chieftains, who did not hesitate to call in any allies they could obtain. Thus in 1881 Massow invited the aid of the Boers against Mankoroane, who claimed to be paramount chief of Bechuanaland. The Transvaal war of that date offered opportunities to the freebooting Boers of the west which were not to be lost. Once having entered upon the scene of internal native warfare, the Boers continued their interference until Montsioa himself became involved, the Boers professing to support the claims of Moshette.

At this time the British forces were too much occupied with the Boers themselves to be able to respond to native appeals for help. Consequently the Boers proceeded without let or hindrance with their conquest and annexation of territory. In 1882 they set up the republic of Stellaland, with Vryburg as its capital, and forthwith proceeded to set up the republic of Goshen, farther north, in spite of the protests of Montsioa, and established a small town called Rooi Grond as capital. They then summoned Montsioa to quit the territory. The efforts of the British authorities at this period (1882-83) to bring about a satisfactory settlement were feeble and futile, and fighting continued until peace was made entirely on Boer lines. The Transvaal Government was to have supreme power, and to be the final arbiter in case of future quarrels arising among

Stellaland and Goshen.

the native chiefs. This agreement, arrived at without any reference to the British Government, was a breach of the Pretoria Convention, and led to an intimation on the part of Great Britain that she could not recognize the new republics. In South Africa, as well as in England, strong feeling was aroused by this act of aggression. Unless steps were taken at once, the whole of Bechuanaland might be permanently lost, while German territory on the west might readily be extended to join with that of the Boers. In the London Convention of 1884, conceded by Lord Derby in response to the overtures of Boer delegates, the Transvaal boundaries were defined, but in spite of this convention the Boers remained in Bechuanaland, and at length the Rev. John Mackenzie, who had succeeded Livingstone, was sent to the country to arrange matters. He found very little difficulty in negotiating with the various Bechuana chiefs, but with the Boers he was not so successful. In Goshen the Boers defied his authority, while in Stellaland only a half-hearted acceptance of it was given. He was then recalled by Sir Hercules Robinson, and Mr Rhodes succeeded him as deputy commissioner of Bechuanaland.

Mr Rhodes's mission was attended with great difficulty. British prestige after the disastrous Boer war of 1881 was at a very low ebb, and he realized that he could not count on any active help from the imperial or colonial authorities. He adopted a tone of conciliation, and decided that the Stellaland republic should remain under a sort of British suzerainty. But in Goshen the Boers would let him do nothing. Joubert, after meeting him at Rooi Grond, entered the country and attacked Montsioa. Mr Rhodes then left under protest, declaring that the Boers were making war against Great Britain. The Boers now proclaimed the country Transvaal territory. This was a breach of the London Convention, and Mr Kruger explained that the steps had been taken in the "interests of humanity." Indignant protest in Cape Town and throughout South Africa, as well as England, led to the despatch in October 1884 of the Warren Expedition, which was sent out by the British Government to remove the filibusters, to bring about peace in the country, and to hold it until further measures were decided upon. Mr Kruger met Sir Charles Warren's force at the Modder river, and endeavoured to stop him from proceeding farther, saying that he would be responsible for keeping order in the country. Warren, however, proceeded with his mission, and broke up the republics of Stellaland and Goshen. Bechuanaland was formally taken under British protection, and the sphere of British influence was declared to extend to the 22nd parallel of latitude.

The natives cheerfully accepted this new departure in British policy, and from this time forward Khama's country was known as the British Protectorate of Bechuanaland. That portion lying to the south of the Molopo river was described as *British Bechuanaland*, and was constituted a crown colony. In 1890 the northern portion also passed under the control of the governor of British Bechuanaland, Sir Sidney Shippard, a protest being made at the time by the British South Africa Company, on the ground that it was included in the sphere of their charter. Under the able administration of Sir Sidney Shippard peace was maintained among the natives, who have shown great loyalty to British rule.

A review of the history of the country down to this date shows how much has been due to the efforts of men like Livingstone, Mackenzie, and Rhodes. It is quite clear that had they not represented the true state of affairs to the authorities the whole of this territory would have gradually been absorbed by the Boers, until they had effected a union with the Germans on the west. The great trade route to the north—the "Suez Canal of South Africa," as Mr Rhodes called it—would thus have been effectually shut against trade and British colonization. With regard to the precise effect of missionary influence upon the natives, opinion will always remain divided. But Livingstone, who was not only a missionary but also an enlightened traveller, stated that a considerable amount of benefit had been conferred upon the native races by missionary teaching. Livingstone was a great advocate of the prohibition of alcohol among the natives, and that policy has always been adhered to by Khama.

In 1891 the Customs Union was extended to British Bechuanaland, and in 1895 the country was annexed to Cape Colony. At the same time it was provisionally arranged that the Bechuanaland protectorate should pass under the administration of the British South Africa Company. On learning what was going on, Khama and two other Bechuana chiefs came to England and protested against this arrangement. The result was that their territories and those of other petty chiefs lying to the north of the Molopo were made native reserves, into which the importation of liquor was forbidden. A British resident officer was to be appointed to each of the reserves. A stipulation, however, was made with these chiefs that a strip of country sufficient for the purposes of the Matabeleland railway should be conceded to the Chartered Company. In December 1895, the occurrence of the Jameson Raid, an expedition which started from these territories, prevented the completion of negotiations, and the whole of Northern Bechuanaland still remains a British protectorate. The two chief towns in British Bechuanaland are Mafeking and Vryburg, Palapye being the chief town in the protectorate. The railway is now extended throughout the entire length of the country, and up to Bulawayo in Rhodesia. Material progress during the last few years in Bechuanaland has not been great, owing to disturbed political conditions, but there is little question that as a grazing country, and also possibly for agricultural and mineral purposes, the country has a promising future.

AUTHORITIES.—THEAL. *History of South Africa; South African History and Geography.*—LIVINGSTONE. *South Africa.*—Private correspondence; Sir David Tennant and Sir Henry Bulwer. —JOHN MACKENZIE. *Austral Africa, Losing it or Ruling it.*—*Statistical Register, Cape of Good Hope*, 1899.—PRATT. *Leading Points in South African History.*—VINDEX. *Cecil Rhodes, His Political Life and Speeches.* (A. P. H.)

Beckenham, a parish and urban district in the Sevenoaks parliamentary division of Kent, England, 10 miles S. of London by rail. Although one of the more remote outlying districts around London, it has found great favour as a place of residence among City business men, and has changed from a village to a rapidly-growing modern town. It still retains many of its rural characteristics, and has wide thoroughfares and many handsome residences standing in extensive grounds. It has adopted electric lighting and public baths. Population of urban district (area, 3881 acres) (1881), 13,045; (1891), 20,707; (1901), 26,330.

Beckx, Petrus Johannes (1795-1887), twenty-second General of the Jesuits, was born at Sichem, near Louvain in Belgium, on 5th February 1795, and was admitted to the Society of Jesus at Hildesheim in 1819. In 1826 the conversion of Duke Ferdinand and Duchess Julia of Anhalt-Köthen (daughter of Frederick William II. of Prussia) to the Roman Catholic faith produced a great sensation in Germany; and it was a proof of Father Beckx's reputation that he was recommended by the General of the Order as their confessor. On the death of the duke he accompanied the duchess to Vienna, where he acquired great influence over the highest persons of the state, and in particular over Metternich.

On the expulsion of the Jesuits in 1848 he became rector of the college of Louvain; but in 1852 was recalled to Austria, and became Superior for Hungary, to which office was soon added that of Provincial of Austria. It was greatly owing to his exertions that the Primate of Hungary, Cardinal Szcitowski, obtained the revocation of the edict of 1848, expelling the Jesuits from Hungary. In 1853 Father Beckx attended the General Assembly of the Jesuits at Rome, where on 2nd July he was elected General of the Order in succession to Father Roothaan, by twenty-seven votes against sixteen given for Father Pierling. In 1883, owing to his great age, he received the assistance of Father Anderledy, vicar-general, and in the following year resigned to him the office of General. During his long tenure of the post (only exceeded by one of his predecessors, Claudio Acquaviva), he had seen the Jesuits emerge triumphant from the disasters of 1848; and they had proved too strong even for so formidable a foe as Bismarck. This success was largely the work of Father Beckx, whose combination of energy and tact, as well as his personal piety, gave him a preponderant influence in the Church. Pius IX. in particular placed unbounded confidence in him. He died at Rome on 4th March 1887. His *Month of Mary*, published anonymously in 1838, ran through many editions, and was translated into most of the European languages (English edition, 1883). He was also joint-author of the *Köthen Prayer-Book*, another work that obtained the widest circulation. But his literary activity was chiefly confined to the Jesuit organ, *Civiltà Cattolica*, of which he was the founder and director. (H. Sy.)

Bedford, a municipal and parliamentary borough (co-extensive and returning one member), market town, and county town of Bedfordshire, England, on the Ouse, 50 miles N.N.W. of London by rail. New buildings at the Grammar School were erected in 1891 at a cost of £25,000. In 1900 a further separate building for younger boys was opened, and there have also been recently erected admirably-equipped carpentering, engineering, and other workshops. The chemical and physical laboratories, gymnasium, &c., have been fitted out with every modern convenience and appliance. The number of scholars at the end of 1900 was 876. The Harpur Trust also governs a modern school with (1900) 508 boys, a high school with 538 girls, a modern school with 213 girls, and elementary schools with 1975 children. This last figure was formerly much larger, but three board schools, providing accommodation for 2670 children (1901), have been opened in order to relieve the Trust. Technical classes under the control of the county council are also conducted in the town. The old grammar school buildings have been turned into a town hall, &c. Modern structures include the barracks (£50,000), the corn exchange, the shire hall (rebuilt at a cost of £20,000), a suspension bridge, a theatre, and the county hospital (£34,000). The Bedford rooms are now used as a library. There are statues of John Bunyan (1874) and of John Howard, the philanthropist (1894). Bunyan Meeting, a chapel on the site of that in which the former preached, has interesting memorials of its founder. The corporation owns the markets and the water supply, and provides electric light. The water supply from the present sources being insufficient to meet the growing demands of the town, a scheme was proposed in 1901 for bringing water from Henlow, 12 miles distant. A provisional order to construct and work tramways has been granted to the corporation. A public park of 61 acres was opened in 1888, and another of 23 acres in 1894. Large engineering works have also been erected. Pillow-lace making in the neighbourhood is almost extinct. Area, 2200 acres; population (1881), 19,532; (1891), 28,023; (1901), 35,144.

Bedford, a city of Indiana, U.S.A., capital of Lawrence county, in the southern part of the state, at the intersection of three railways. It has extensive stone quarries. Population (1900), 6115.

Bedfordshire, a south midland county of England, is bounded on the N. by Huntingdon, on the N.W. by Northampton, on the W. by Buckingham, on the S. by Hertford, and on the E. by Hertford and Cambridge.

Area and Population.—According to the census returns of 1891 the area of the ancient and administrative county was 298,494 acres, or 466 square miles, with a population in 1881 of 149,473, and in 1891 of 160,704, of whom 75,477 were males, and 85,227 females, the number of persons to a square mile being 345, and of acres to a person 1·86. Since 1891 the area of the administrative county has undergone various alterations. In 1896 the parish of Swineshead was transferred from Huntingdon to Bedford, and the parish of Tilbrook from Bedford to Huntingdon; and in 1897 a part of the parish of Caddington, and the parishes of Kensworth and Studham, were transferred from Hertford to Bedford, and the hamlet of Humbershoe, part of the parish of Houghton Regis, the parish of Holywell, and parts of the parish of Shillington, from Bedford to Hertford. The area of the registration county is 309,989 acres, with a population in 1891 of 165,999, of which 74,189 were urban, and 91,810 rural. Within this area the increase of population between 1881 and 1891 was 7·59 per cent. Between 1881 and 1891 the excess of births over deaths was 21,382, but the increase in the resident population was only 11,713. In 1901 the population was 171,699. The following table gives particulars as to births, deaths, and marriages in 1880, 1890, and 1899:—

Year.	Marriages.	Births.	Deaths.	Illegitimate births.	
				Males.	Females.
1880	975	5008	3064	191	189
1890	1052	4597	2667	139	125
1898	1298	4423	2697	113	107

In 1899 the number of marriages was 1213, of births 4328, and of deaths 2858.

The following table gives the marriage-, birth-, and death-rates per thousand of the population, with the percentage of illegitimate births, for a series of years:—

	1870-79.	1880.	1880-89.	1890.	1888-97.	1898.
Marriage-rate .	14·1	12·6	13·5	12·1	13·5	14·9
Birth-rate . .	33·7	32·4	31·2	27·8	27·3	25·4
Death-rate. .	19·6	19·8	17·7	16·2	16·0	15·5
Percentage of illegitimacy .	7·2	7·6	6·6	5·7	5·5	5·0

Both the birth-rate and the death-rate were below those of England. In 1891 there were in the county 658 natives of Scotland, 663 natives of Ireland, and 316 foreigners.

Constitution and Government.—The county is divided into two parliamentary divisions, and also includes the parliamentary borough of Bedford returning one member. There are three municipal boroughs: Bedford, Dunstable, and Luton. The urban districts are Ampthill, Biggleswade, Kempston, and Leighton-buzzard. The county is in the Midland circuit, and assizes are held at Bedford. The boroughs of Bedford, Dunstable, and Luton have separate commissions of the peace, and Bedford has in addition a separate court of quarter sessions. The ancient county, which forms an archdeanery in the diocese of Ely, contains 125 ecclesiastical parishes and districts, and parts of 6 others.

Education.—The number of elementary schools on 31st August 1899 was 156, of which 69 were board schools and 87 voluntary, the latter including 80 National Church of England schools, 3 Wesleyan, 1 Roman Catholic, and 3 "British and other." The average attendance at board schools was 13,315, and at voluntary schools 14,019. The total school board receipts for the year ending 29th September 1899 were over £47,247. The income under the Technical Instruction Act was over £8, and that under the Agricultural Rates Act was over £1550.

Agriculture.—About nine-tenths of the total area of the county is under cultivation. Of the corn crops, which still occupy an exceptionally large area, wheat is still the chief, although its area within the last 25 years has diminished more than a third. Potatoes and turnips occupy an almost equal area, but the area of

the former is gradually increasing. The following table gives the principal acreages at intervals of five years from 1880 :—

Year.	Area under crops.	Corn crops.	Green crops.	Clover.	Permanent pasture.	Fallow.
1880	260,375	109,878	31,810	20,696	81,090	16,901
1885	260,298	101,026	35,283	22,795	87,944	13,250
1890	259,396	99,350	29,932	21,028	96,703	12,203
1895	254,997	89,571	29,813	22,317	99,773	13,235
1900	257,346	88,043	31,752	26,471	102,794	7,954

The following table gives particulars regarding the live stock for the same years :—

Year.	Total horses.	Total cattle.	Cows or heifers in milk or in calf.	Sheep.	Pigs.
1880	12,082	31,552	10,751	152,084	28,526
1885	11,882	37,525	12,187	151,813	32,545
1890	11,665	33,467	12,233	121,994	33,958
1895	12,103	30,023	11,092	96,278	32,826
1900	11,991	34,833	11,876	104,759	25,280

Industries and Trade.—According to the report of the inspector of factories for 1898 (1900), there were no persons employed in textile factories, while 6383 were employed in non-textile factories, and 6788 in workshops. Between 1895 and 1896 there was an increase of 7·4 per cent. in the number of persons employed in non-textile factories, and between 1896 and 1897 an increase of 15·8. Of those employed in workshops no fewer than 5901 are in the "returns" stated to be employed in "clothing." This includes chiefly those employed in the point pillow lace manufacture, which is an extensive female industry, and in the straw plait manufacture carried on mainly at Luton and Dunstable. In the manufacture of machines, conveyances, tools, etc., nearly 2300 persons are employed, there being at Bedford extensive agricultural implement and engineering works. In 1899, 611,745 tons of chalk were raised, 166,829 tons of clay, and 78,420 tons of gravel and sand.

AUTHORITIES.—The more important works are: ABBOT. *Flora Bedfordiensis*, 1798.—FISHE. *Collections, Historical, Genealogical, and Topographical, for Bedfordshire.* London, 1812-16, and also 1812-36.—PARRY. *Select Illustrations of Bedfordshire*, London, 1827; *Bedfordshire Domesday Book*, Bedford, 1881; *Visitation of Bedford*, 1566, 1582, *and* 1634, in *Harleian Society's Publications*, vol. xiv., London, 1884; *Genealogica Bedfordiensis*, 1538, 1800, London, 1890; and *Illustrated Bedfordshire*, Nottingham, 1895). See also *Bedfordshire Notes and Queries*, ed. F. A. Blades, and *Transactions of the Bedfordshire Natural History and Field Club.*

Beecher, Henry Ward (1813-1887), American preacher and reformer, was born in Litchfield, Connecticut, 24th June 1813. He was the ninth child of Lyman and Roxana Foote Beecher, and brother of Harriet Beecher Stowe. Entering Amherst College in 1830, he gave more attention to his own courses of reading than to college studies, and was more popular with his fellows than with the faculty. With a patience foreign to his impulsive nature, he submitted to minute drill in elocution, and became a fluent extemporaneous speaker. Reared in a Puritan atmosphere, he has graphically described the mystical experience which, coming to him in his early youth, changed his whole conception of theology and determined his choice of the ministry. "I think," he says, "that when I stand in Zion and before God, the highest thing that I shall look back upon will be that blessed morning of May, when it pleased God to reveal to my wondering soul the idea that it was His nature to love a man in his sins for the sake of helping him out of them." In 1837 he graduated from Lane Theological Seminary in Ohio, of which his father was president, and entered upon his work as pastor of a missionary Presbyterian church at Lawrenceburg, a village on the Ohio, a few miles below Cincinnati. The membership numbered nineteen women and one man. Mr Beecher was sexton as well as preacher. Two years later he accepted a call to Indianapolis. His unconventional preaching shocked the more staid members of the flock, but filled the church to overflowing with people unaccustomed to churchgoing. He studied men rather than books; became acquainted with the vices in what was a pioneer town; and in his *Sermons to Young Men* treated these with genuine power of realistic description and with youthful and exuberant rhetoric. Eight years later (1847) he accepted a call to the pastorate of Plymouth church (Congregational), then newly organized in Brooklyn, New York. The situation of the church, within five minutes' walk of the chief ferry to New York, the stalwart character of the men who had organized it, and the peculiar eloquence of Mr Beecher, combined to make the pulpit a national platform. The audience-room of the church, capable of seating 2000 or 2500 people, frequently contained 500 or 1000 more.

Mr Beecher at once became a recognized leader. On the all-absorbing question of slavery he took a middle ground between the pro-slavery or peace party, and abolitionists like William Lloyd Garrison and Wendell Phillips, believing, with such statesmen as W. H. Seward, S. B. Chase, and Abraham Lincoln, that slavery was to be overthrown under the constitution and in the Union, by forbidding its growth and trusting to an awakened conscience, enforced by an enlightened self-interest. He was always an anti-slavery man, but never technically an abolitionist. In the earlier days of the agitation, he challenged the hostility which often mobbed the anti-slavery gatherings; in the later days he consulted with the political leaders, inspiring the patriotism of the North, and sedulously setting himself to create a public opinion which should confirm and ratify the emancipation proclamation whenever the President should issue it. When danger of foreign intervention cast its threatening shadow across the national path, he went to England, and by his famous addresses did what probably no other American could have done to strengthen the spirit in England favourable to the United States, and to convert the doubtful and the hostile. For a little while he acted as one of the editors of the *Independent*, then a Congregational newspaper; and his editorials, copied far and wide, produced a profound impression on the public mind by clarifying and defining the issue. Later, he founded and became editor-in-chief of the *Christian Union*, afterwards the *Outlook*, a weekly religious undenominational newspaper. His lectures and addresses had the spirit if not the form of his sermons, just as his sermons were singularly free from the homiletical tone. Yet his work as a reformer was subsidiary to his work as a preacher. He was not indeed a parish pastor; he inspired church activities which grew to large proportions, but trusted the organization of them to laymen of organizing abilities in the church; and for acquaintance with his people he depended on such social occasions as were furnished in the free atmosphere of this essentially New England church at the close of every service, but during his pastorate the church grew to be probably the largest in membership in the United States.

It was in the pulpit that Mr Beecher was seen at his best. His mastery of the English tongue, his dramatic power, his instinctive art of impersonation, which had become a second nature, his vivid imagination, his breadth of intellectual view, the catholicity of his sympathies, his passionate enthusiasm, which made for the moment his theme seem to him the one theme of transcendent importance, his quaint humour alternating with genuine pathos, and above all his simple and singularly unaffected devotional nature, made him as a preacher without a peer in his own time and country. His favourite theme was love; love to man was to him the fulfilment of all law; love of God was the essence of all Christianity. Retaining to the day of his death the forms and phrases of the New England theology in which he

had been reared, he poured into them a new meaning, and gave to them a new significance. He probably did more than any other one man in America to lead the Puritan churches from a faith which regarded God as a moral governor, the Bible as a book of laws, and religion as obedience to a conscience, to a faith which regards God as a Father, the Bible as a book of counsels, and religion as a life of liberty in love. The later years of his life were darkened by a scandal which Mr Beecher's personal, political, and theological enemies used for a time effectively to shadow a reputation previously above reproach. But in the midst of these accusations the largest and most representative Congregational council ever held in the United States, gave expression to a vote of confidence in him, which time has absolutely justified. It is safe to say that the verdict of history will class this scandal with the somewhat similar, but more excusable one, respecting John Wesley. Not a student of books nor a technical scholar in any department, Mr Beecher's knowledge was as wide as his interests were varied. He was early familiar with the works of Matthew Arnold, Charles Darwin, and Herbert Spencer; he preached his *Bible Studies* sermons in 1878, when the higher criticism was wholly unknown to most evangelical ministers or known only to be dreaded; and his sermons on *Evolution and Religion* in 1885, when many of the ministry were denouncing evolution as atheistic. He was stricken with apoplexy while still active in the ministry, and died at Brooklyn on Tuesday, 8th March 1887, in the seventy-fourth year of his age.

The principal books by Mr Beecher, besides his published sermons, are: *Seven Lectures to Young Men*, 1844. *Plymouth Collection of Hymns and Tunes*, 1855. *Star Papers, Experiences of Art and Nature*, 1855. *Life Thoughts*, 1858. *Views and Experiences of Religious Subjects*, 1858. *Plain and Pleasant Talks about Fruits, Flowers, and Farming*, 1859. *Speeches on the American Rebellion—Manchester, Glasgow, Edinburgh, Liverpool, and London*; London, 1864. *Prayers from Plymouth Pulpit*, 1867. *Norwood: A Tale of Village Life in New England*, 1867. *The Life of Jesus the Christ*, 2 vols., 1871. *Yale Lectures on Preaching*, 3 vols., 1872-74.

The principal lives of Mr Beecher are: *Henry Ward Beecher: A Sketch of His Career*. By Lyman Abbott and S. B. Halliday, 1883.—*Beecher: Christian Philosopher, Pulpit Orator, Patriot, and Philanthropist*. By T. W. Handford, 1887.—*Life of Henry Ward Beecher*. By Joseph Howard, Jr., 1887.—*A Biography of Henry Ward Beecher*. By William C. Beecher, Rev. Samuel Scoville, and Mrs H. W. Beecher.—*Henry Ward Beecher*. By John Henry Barrows, 1893.—*Henry Ward Beecher: a Study*. By John R. Howard, 1891.—*The Boyhood of Henry Ward Beecher*. By Frank S. Child (Pamphlet), 1897.—*The History of Plymouth Church*. By Noyes L. Thompson, 1847-72.—*The Life and Work of Henry Ward Beecher*. By Thomas W. Knox. (L. A.)

Beechworth, a beautifully situated town in the county of Bogong, Victoria, Australia, with a station 172 miles by rail N.E. of Melbourne. It is the chief town of the Ovens goldfields, on which over 5000 miners are employed. The town has several churches and various public buildings, including a good library and museum. Mean temperature for the year, 55·2° F.; for January, 69·7° F.; for July, 41·0° F. Mean rainfall (4 years), 29·29 inches. Population (1891), 2528; (1901), 7359.

Beer. See Brewing.

Beets, Nikolaas (1814-1903), Dutch poet, was born at Haarlem on the 13th of September 1814; constant references in his poems and sketches show how deeply the beauty of that town and its neighbourhood impressed his imagination. He studied theology in Leyden, but gave himself early to the cultivation of poetry. In his youth Beets was entirely carried away on the tide of Byronism which was then sweeping over Europe, and his early works—*Jose*, 1834; *Kuser*, 1835; and *Guy de Vlaming*, 1837—are gloomy romances of the most impassioned type. But at the very same time he was beginning in prose the composite work of humour and observation which has made him famous, and which certainly had nothing that was in the least Byronic about it. This was the celebrated *Camera Obscura* (1839), the most successful imaginative work which any Dutchman of this century has produced. This work, published under the pseudonym of "Hildebrand," goes back in its earliest inception to the year 1835, when Beets was only twenty-one. It consists of complete short stories, descriptive sketches, studies of peasant life—all instinct with humour and pathos, and written in a style of great charm; it has been reprinted in countless editions. Beets became a professor at the University of Leyden, and the pastor of a congregation in that city. In middle life he published further collections of verse—*Cornflowers*, 1853, and *New Poems*, 1857—in which the romantic melancholy was found to have disappeared, and to have left in its place a gentle sentiment and a depth of religious feeling. In 1873-75 Beets collected his works in three volumes. In April 1883 he visited Scotland, when the honorary degree of LL.D. was conferred upon him by the University of Edinburgh.

Begas, Reinhold (1831-——), German sculptor, the son of Karl Begas, a distinguished painter, was born at Berlin on 15th July 1831. He received his early education (1846-51) in the ateliers of Rauch and Wichmann. During a period of study in Italy, from 1856-1858, he was influenced by Böcklin and Lenbach in the direction of a naturalistic style in sculpture. This tendency was marked in the group "Borussia," executed for the façade of the Exchange in Berlin, which first brought him into general notice. In 1861 he was appointed professor at the Art School in Weimar, but retained the appointment only a few months. That he was chosen, after competition, to execute the statue of Schiller for the Gendarmen Markt in Berlin, was a high tribute to the fame he had already acquired; and the result, one of the finest statues in the German metropolis, entirely justified his selection. Since the year 1870, Begas has entirely dominated the plastic art in Prussia, but especially in Berlin. Among his chief works during this period are the colossal statue of Borussia for the Hall of Glory; the Neptune fountain in bronze on the Schlossplatz; the statue of Alexander von Humboldt, all in Berlin; the sarcophagus of the Emperor Frederick III. in the mausoleum of the Friedenskirche at Potsdam; and, lastly, the national monument to the Emperor William (see Berlin), the statue of Bismarck before the Reichstag Gebaüde, and several of the statues in the Siegesalle. He was also entrusted with the execution of the sarcophagus of the Empress Frederick.

Bègles, a suburban town in the department of Gironde, France, 3 miles S.S.E. of Bordeaux, on the railway from Bordeaux to Cette. The principal manufactured products are chemicals, artificial manure, soap, and candles; and fish-curing is an important industry. Population (1881), 7238; (1896), 10,372.

Behar, or Bihar, a town of British India, in the Patna district of Bengal, which gives its name to an old province, situated on the right bank of the river Panchana. Population (1881), 48,968; (1891), 47,723; (1901), 44,894. There are still some manufactures of silk and muslin, but trade has deserted Behar in favour of Patna, and other places more favourably situated on the river Ganges and the railway. The old province, stretching widely across the valley of the Ganges from the frontier of Nepal to the hills of Chota Nagpur, corresponds to the two administrative divisions of Patna and Bhagalpur, with a total area of 44,197 square miles, population of 23,127,104, and a land revenue of Rx.1,425,876, or nearly one million sterling. It is the most densely populated

tract in India, and, therefore, always liable to famine; but it is now well protected almost everywhere by railways. It is a country of large landholders, and also of indigo planters. The vernacular language is not Bengali, but a dialect of Hindi; and the people likewise resemble those of Upper India.

Beira, a region of Portugal, formerly divided between the provinces of Beira Alta and Beir Baixa, but now comprised within the districts of Vizeu (answering to the former), and Guarda and Castello Branco (corresponding to the latter).

Beira (town). See EAST AFRICA, PORTUGUESE.

Beirút, or BEYROUT. (1) A viláyet of Syria which stretches along the sea-coast from Jebel el-Akra, south of the Orontes, to the Nahr Zerka, south of Mount Carmel, and towards the south extends from the Mediterranean to the Jordan. (2) The chief town of the viláyet, ancient *Berytus*, the most important sea-port town in Syria, situated on the south side of St George's Bay, on rising ground at the foot of Lebanon. Since the pacification of the Lebanon after the massacre of the Christians in 1860, Beirút has greatly increased in extent, and has become the centre of the transit trade for all Syria. In 1894 a small harbour, constructed by a French company, was opened, but the dues are so high that trade is being driven away to Haifa and Tripoli. In 1895 a French company completed a railway across the Lebanon to Damascus, and connected it with a line from Damascus to Mezeiríb in the Haurán. In 1898 a portion of a railway from Beirút to Tripoli was opened. The town has been supplied with water, since 1875, by an English company, and with gas, since 1888, by a French company. There are many American and European institutions in the city: the American Presbyterian mission, with a girls' school and a printing office, which published the Arabic translation of the Bible, and now issues a weekly paper and standard works in Arabic; the Syrian Protestant college with its theological seminary, medical faculty, training college, and astronomical observatory; the Scottish mission, and St George's institute for Moslem and Druse girls; the British Syrian mission schools; the German Hospital, orphanage, and boarding school; the French hospital and schools, and the Jesuit "Université de St Joseph" with a printing office. The average value of the exports for the five years 1894-98 was £726,981, and of the imports £1,656,672. In 1898 the exports were £2600, and the imports £253,400 less than the average, the latter being £650,000 less than in 1894. Population, 120,000 (Moslems, 36,000; Christians, 77,000; Jews, 2500; Druses, 400; foreigners, 4100). (C. W. W.)

Beith, a market and manufacturing town of Ayrshire, Scotland, 18¼ miles W.S.W. of Glasgow, with which it has two railway connexions. Modern erections are a Free Church, court house, and a post office. Beith is the centre of the West of Scotland cabinet-making industry. There is a good secondary school. Population (1891), 7126; (1901), 7523. The parish contains coal and ironstone mines, and trap, sandstone, and limestone quarries.

Beja, a town and episcopal see of Portugal, capital of district of the same name, 87 miles south-east from Lisbon. Population, 8394. The district of BEJA has an area of 4196 square miles, and population 157,751, giving thirty-seven inhabitants to the square mile. Pig-breeding is the chief industry. Copper, iron, and manganese are mined.

Bela, or LAS BELA, situated in 26° 27′ 30″ N. lat., and 66° 45′ 0″ E. long., 350 feet above sea level, capital of a small independent state to the south of Kalat (Baluchistan), ruled by the Jam (or Cham), who occupies the position of a protected chief under the British Raj. To the east lies Sind, and to the west Makrán, and from time immemorial the great trading route between Sind and Persia has passed through Las Bela. The low-lying, alluvial, hot and malarial plains of Las Bela, occupying about 2000 square miles on the north-east corner of the Arabian Sea, are highly irrigated and fertile—two rivers from the north, the Poráli and the Kud, uniting to provide a plentiful water supply. The bay of Sonmiani once extended over most of these plains, where the Poráli delta is now growing with measurable strides. The hill ranges to the east parting the plains from Sind, generally known as Hala but, locally, as the Mor and the Kirthar, between which lies the long narrow line of the Hab valley, strike nearly north and south, diminishing in height as they approach the sea and allowing of a route skirting the coast between Karachi and Bela. To the west they are broken into an infinity of minor ridges massing themselves in parallel formation with a strike which curves from south to west till they form the coast barrier of Makrán. The Persian route, curving somewhat to the north, traverses this waste of barren ridges almost at right angles, but on dropping into the Kolwah valley its difficulty ceases. It then becomes an open road to Kej and Persia, with an easy gradient. This was undoubtedly one of the greatest trade routes of the mediæval days of Arab ascendancy in Sind, and it is to this route that Bela owes a place in history which its modern appearance and dimensions hardly seem to justify. Bela is itself rather prettily situated on a rocky site above the banks of the Poráli. About four miles to the south are the well-kept gardens which surround the tomb of Sir Robert Sandeman; which is probably destined to become a "ziarat," or place of pilgrimage, of even greater sanctity than that of General Jacob at Jacobabad. The population of the town numbers about 5000. The Jam's retinue consists of about 300 infantry, 50 cavalry, and 4 guns. Liability to assist on active service is the only acknowledgment of suzerainty which is paid by the Jam to the Khan of Kalat.

From very early times this remote corner of Baluchistan has held a distinct place in history. There are traces of ancient Arab (possibly Himyaritic) occupation to be found in certain stone ruins at Gondakeha on the Kud river, 10 miles to the north-west of Bela, whilst the Greek name "Arabis" for the Poráli is itself indicative of an early pre-historic connexion with races of Asiatic Ethiopians referred to by Herodotus. On the coast, near the village of Sonmiani (a station of the Indo-Persian telegraph line) may be traced the indentation which once formed the bay of Morontobara, noted in the voyage of Nearkos; and it was on the borders of Makrán that the Turanian town of Rhambakia was situated, which was once the centre of the trade in "bdellium." In the 7th century A.D. Las Bela was governed by a Buddhist priest, at which time all the province of Gandava was Buddhist, and Sind was ruled by the Brahman, Chach. Buddhist caves are to be found excavated in the conglomerate cliffs near Gondakeha, at a place called Gondráni, or Shahr-i-Rogan. With the influx of Arabs into Makrán, Bela, under the name of Armel (or Armabel), rose to importance as a link in the great chain of trading towns between Persia and Sind; and then there existed in the delta such places as Yusli (near the modern Uthal) and Kambali (which may possibly be recognized in the ruins at Khairokot), and many smaller towns, each of which possessed its citadel, its caravanserai and bazaar, which are not only recorded but actually mapped by one of the mediæval Arab geographers, Ibn Haukel. It is probable that Karia Pir, 1½ miles to the east of the modern city, represents the site of the Armabel which was destroyed by Mahommed Kasim in his victorious march to Sind in 710. There is another old site 5 miles to the west of the modern town. The ruins at Karia Pir, like those of Tijarra Pir and Khairokot, contain Arab pottery, seals, and other mediæval relics. The Lumris, or Lassis, who originate the name Las as a prefix to that of Bela, are the dominant tribe in the province. They are comparatively recent arrivals who displaced the earlier Tajik and Brahui occupants. It is probable that this influx of Rajput population was coincident with the displacement of the Arab dynasties in Sind by the Mahommedan Rajputs in the 11th century A.D. Some authorities connect the Lumris with the Sumras.

There are no published accounts of Bela, excepting those of the Indian Government reports and gazetteers. This article is compiled from unpublished notes by the author and by Mr Wainwright, of the Indian Survey Department. (T. H. H.*)

Bela, a town of British India, administrative headquarters of the Partabgarh district of Oudh; a railway station 80 miles from Benares. Population about 9000; municipal income (1897-98), Rs.9610. It adjoins the village of Partabgarh proper, and the civil station sometimes known as Andrewganj. It has a high school and three printing-presses, one of which issues a newspaper in English and the vernacular.

Belda. See NIGERIA.

Belfast, a maritime city, county and parliamentary borough, capital of the province of Ulster, Ireland, on the river Lagan, 101 miles N. of Dublin. It is the centre of an extensive railway system, which includes the Great Northern, the Belfast and Northern Counties, and the Belfast and County Down Railways. Population (1881), 208,122; (1891), 255,950, of whom 118,759 were males, and 137,191 females, divided as follows among the different religions—Presbyterians, 87,234; Protestant Episcopalians, 75,522; Roman Catholics, 67,378; Methodists, 13,747; and other denominations, 12,069. The following table shows the degree of education in 1891 :—

	Males.	Females.	Total.	Percentage.			
				Roman Cath.	Presbyterians.	Protes. Epis.	Methodists.
Read and write	87,673	95,407	183,080	72·8	86·8	79·5	87·3
Read only . .	8,019	15,111	23,130	12·8	8·3	11·2	7·8
Illiterate . .	7,968	11,630	19,598	14·4	4·9	9·3	4·9

In 1881 the percentage of illiterates among Roman Catholics was 20·8, among Presbyterians 6·3, among Protestant Episcopalians 11·8, and among Methodists 5·2. In 1891 there were 30 superior schools with 2327 pupils (Protestants 1769 and Roman Catholics 558), and 233 primary schools, with 36,123 pupils (Protestants 27,070 and Roman Catholics 9053). Under the powers of an Extension Act the area of the city was considerably enlarged in 1897, and the population in 1901 was 348,876.

Recent History.—On the 27th April 1613 Belfast, then a small town, was constituted a corporation by charter of James I., to consist of a chief magistrate and twelve burgesses and commonalty, with the right of sending two members to Parliament. This charter was annulled by James II., and a new one issued in 1688, but the original one was restored in 1690 by William III. In conformity with the passing of the Municipal Corporations Act of 1840 the constitution of the corporation was changed and made to consist of ten aldermen and thirty councillors, under the style and title of "The Mayor, Aldermen, and Burgesses of the Borough of Belfast." In 1888 the rank of a city was by Royal Charter conferred upon Belfast, with the incidental rank, liberties, privileges, and immunities. In 1892 Queen Victoria conferred upon the mayor of the city for the time being the title of "Lord Mayor," and upon the corporation the name and description of "The Lord Mayor, Aldermen, and Citizens of the city of Belfast." By the passing of the Belfast Corporation Act of 1896, the boundary of the city was extended, and the corporation made to consist of fifteen aldermen and forty-five councillors, and the number of wards was increased from five to fifteen. By virtue of the Local Government (Ireland) Act, 1898, Belfast became a county borough 1st April 1899. Letters patent issued 26th November 1866, granting a separate court of quarter sessions, comprising a court of record for the trial of civil actions; and by the Local Government (Ireland) Act, 1898, Belfast became for assize purposes "the county of the city of Belfast," with a high sheriff.

Public Buildings and Improvements.—Few cities in the United Kingdom have been more extensively improved. Squalid districts have been removed and new thoroughfares opened up. The finest of these—Royal Avenue—contains the new post office and the Free Public Library (opened in 1888, and comprising a collection of over 30,000 volumes, as well as an art gallery and museum of antiquities). The Albert Bridge over the Lagan having collapsed, a new bridge was opened for traffic in 1890. The Campbell College, in the suburb of Belmont, was founded in 1892, in accordance with the will of Mr H. J. Campbell, who left £200,000 for the building and endowment of a public school. In 1897 the citizens subscribed £100,000 to found a new hospital to commemorate the Diamond Jubilee. A new city hall, now being erected at a cost of £200,000, will occupy the site of the old Linen Hall. In September 1899 the foundation stone of a Protestant cathedral to accommodate 3000 people was laid in Donegall Street, towards the erection of which the late countess of Shaftesbury bequeathed £7000. Several churches belonging to different denominations have also been built during the last few years, and the city now contains 121 places of worship. Six public parks and two theatres have been opened since 1878. The corporation has under its control the gas and electric undertakings, four public bath establishments, free library and art gallery, a well-equipped fire organization, a model lodging-house for men, and a modern refuse destructor. The tramway system, about 30 miles, is horse traction, but on the expiry of the company's lease the corporation will install electric traction. A technical institution, estimated to cost £100,000, is in process of erection. An infectious diseases hospital to accommodate 150 patients, also in progress, is to cost £45,000. The water-supply is under the control of the City and District Water Commissioners, who were incorporated in 1840. Under the Main Drainage Act of 1887 a comprehensive system was carried out, at a cost of £300,000, for intercepting the sewage which formerly flowed into the Lagan, and at present bacterial purification beds are being formed. Under recently-obtained powers water is brought a distance of 40 miles from the Mourne Mountains to a service reservoir at Knockbreckan. The estimated cost of this undertaking is over £1,000,000. There are two other sources of supply.

Administration.—Belfast is divided into four parliamentary divisions, north, south, east, and west, the number of registered electors in 1901 being respectively 10,108, 8813, 14,903, 8230. The harbour and docks are managed by a board of Harbour Commissioners, elected by the ratepayers and the shipowners. The rateable value of the city in 1901 was £1,196,051, and the total revenue in 1900 was £429,000.

Commerce and Shipping.—By the Belfast Harbour Acts the commissioners were empowered to borrow more than £2,500,000, in order to carry out several new works and improvements in the port. Under the powers of these Acts a new channel, called the Victoria Channel, several miles in length, was cut, leading in a direct line from the quays to the sea. This channel now affords 20 feet of water at low tide, and 28 feet at full tide, the width of the channel being 300 feet. The Alexandra Dock, which is 852 feet long and 31 feet deep, was opened in 1889, and the extensive improvements (including the York Dock, where vessels carrying 10,000 tons can discharge in from four to six days) have been effected from time to time, making the harbour one of the most commodious in the United Kingdom. Since 1891 the foreign trade of

the port has increased by 72 per cent., which seems to prove that Belfast is fast becoming, like Liverpool, a great distributing port. The following table shows the number of vessels cleared from and registered at the port in various years:—

Year.	Cleared.		Registered.	
	Vessels.	Tonnage.	Vessels.	Tonnage.
1880	7965	1,616,908	399	76,386
1890	8050	1,840,666	293	125,632
1896	8737	2,207,965	250	146,710
1897	8763	2,298,868	235	137,386
1898	9049	2,369,908	229	128,283
1899	8454	2,358,705	219	139,074
1900	8318	2,325,936	210	147,575

In 1880 the harbour receipts were £101,537, and in 1899 the receipts were £158,772 and the expenditure £128,505. In 1880 the customs dues collected amounted to £1,492,875, in 1890 to £2,128,446, and in 1899 to £2,832,563, an increase of over 90 per cent. in twenty years. The following were the amounts of the chief exports in 1900—linen, 38,142 tons; whisky, 30,782 tons; aerated waters, 10,552 tons; iron ore, 50,155 tons; linen yarn, 9087 tons; and 125,239 head of cattle. The Harbour Commissioners have obtained parliamentary powers to construct a graving dock capable of accommodating the largest class of warships. The growth and development of the shipbuilding industry during recent years has been immense, the firm of Harland and Wolff being amongst the first in the trade. In 1895, 18 vessels were launched in Belfast of 101,816 tonnage; in 1896, 25 vessels of 119,756 tonnage; in 1897, 21 vessels of 108,863 tonnage; in 1898, 16 vessels of 121,380 tonnage; in 1899, 17 vessels of 127,652 tonnage; and in 1900, 16 vessels of 136,226 tonnage. Amongst the most notable of the recent vessels built by Messrs Harland and Wolff are the *Oceanic* (1899) and *Celtic* (1901), for the White Star Line, the two largest vessels constructed up to those dates.

Trade and Manufactures.—Belfast is the centre of the Irish linen industry; it contains within its boundaries about 480,000 spindles for spinning flax and 15,000 power-looms. It is also the headquarters and business place for the entire flax-spinning and weaving industry of the country. The machinery gives constant employment directly to about 40,000 workers, and for subsequent processes to prepare the cloth for the market it employs about 10,000 more. The linen yarns exported average 20,750,000 lb per annum, the value of which exceeds £1,000,000. The imported yarns average 8,800,000 lb a year, and cost upwards of £300,000. Distilling is extensively carried on, the largest firm paying over £1,500,000 annually in duty. Several firms are engaged in the manufacture of mineral waters, for which the water of the Cromac Springs is peculiarly adapted, and the volume of trade may be estimated from the fact that in 1899, 11,084 tons of aerated waters were exported. The city also contains two of the largest establishments of their kind in the world—ropeworks employing 3000 hands, and a tobacco factory. Belfast boasts the largest tobacco factory in the world, that of Messrs Gallaher, Limited, and the largest rope manufactory in the world, that of the Belfast Ropework Company, Limited. (W. H. Po.)

Belfast, capital of Waldo county, Maine, U.S.A., situated in the southern part of the state, at the head of West Penobscot Bay, nearly 30 miles south of Bangor. It has an excellent harbour, with some commerce and varied manufactures, and is on a branch of the Maine Central railway. It was settled in 1770, and chartered as a city in 1853. Population (1880), 5308; (1900), 4615.

Belfort.—The territory of Belfort is, by the Franco-German Treaty of 1871, all that is left to France of its former Department of Haut-Rhin, created in 1790 out of territories belonging to Alsace, then one of the provinces of France. A mere fragment of its former self, the territory has been decreed resumption of the title "Département du Haut-Rhin." It comprises 4 cantons and parts of 2 others out of the 30 cantons composing in 1870 the Department of Haut-Rhin, and contains 106 communes. It is bounded on the N.E. and E. by German Alsace, on the S.E. and S. by Switzerland, on the S.W. by the Department of Doubs, on the W. by that of Haute-Saône, on the N. by that of Vosges. Its greatest length from N. to S. is 28 miles, greatest breadth from W. to E., 13½ miles.

With an area of only 235 square miles, it is, next to that of the Seine, the smallest Department of France. The northern part is occupied by the southern offshoots of the Vosges, the southern part by the northern outposts of the Jura. Between these two highlands stretches the Depression of Belfort, 18½ miles broad, joining the basins of the Rhine and the Rhône, traversed by the Rhône canal and several railways. A part of the natural highway open from Frankfort to the Mediterranean, the Depression has from earliest times provided the route for the migration from N. to S., and is still of great commercial and strategical value. The northern part, occupied by the Vosges, rises to 4124 feet in Ballon d'Alsace, the northern termination and the culminating point of the Department; to 3773 feet in the Planche des Belles-Filles; to 3345 feet in Baerenkopf; and to numerous other lesser heights. South of the Trouée de Belfort, there rise near Delle limestone hills, in part wooded, on the frontiers of France, Alsace, and Switzerland, attaining 1680 feet in the Forêt de Florimont. The territory between Lachapelle-sous-Rougemont (in the N.E.), Belfort, and Delle, does not rise above 1300 feet. The line of lowest altitude follows the river St Nicolas and the Rhône canal. The chief rivers are the Savoureuse, 24 miles long, running straight S. from the Ballon d'Alsace, and emptying into the Allaine; the Allaine, from Switzerland, entering the territory a little to the south of Delle, and leaving it a little to the west of Morvillars; the St Nicolas, 24 miles long, from Baerenkopf, running southwards into the Rhône canal and then S.W. into the Allaine. The climate is divided between the "Vosges climate" to the north of the town of Belfort, marked by long and rigorous winters, sudden changes of temperature, and an annual rainfall of 80 centimetres to 1 metre (31 inches to 39 inches), intensified by an impervious subsoil, against an average of 177 centimetres (30 inches) for the whole of France; and the "Rhône climate," milder and more equable, with a rainfall of 60 to 80 centimetres (23 inches to 31 inches), quickly absorbed by the soil or evaporated by the sun. The higher levels of the mountains are clothed with forests of pine, oak, beech, and chestnut. At lower levels grow the elm, ash, poplar, linden, maple, and acacia. Of wild animals there are found the wolf, fox, wild cat, otter, and badger. The population, 74,244 in 1881, 79,758 in 1886, had increased to 91,763 in 1901. Births in 1899, 2188, of which 259 were illegitimate; deaths, 1550; marriages, 638. There were in 1896, 188 schools, with 14,000 pupils, less than 1 per cent. of the population being illiterate. The only town in the territory is Belfort, whose population, 22,181 in 1886, had increased to 32,112 in 1901. The area under cultivation in 1896 amounted to 140,790 acres, of which 46,930 acres were plough-land. The wheat crop of 1898 was valued at £54,510; rye, £17,090; oats, £16,100; potatoes, £131,760; mangold-wurzel, £15,890; natural pastures, £155,600. The live stock of 1899 included 3550 horses, 19,940 cattle, 3800 sheep, 9440 pigs, and 1750 goats. Though minerals are not abundant, mining has made some progress in the territory. Its real industry, however, is in calicoes and spinning, an industry which, owing to the large immigration of spinners from the territory annexed by Germany, has made rapid progress since the war.

Belfort, or Béfort, chief town of the Territory of Belfort, France, 275 miles E.S.E. of Paris, on the railways from Paris to Bâle and Lyons to Strasburg. Its fortifications have been greatly extended since the war of 1871. In front of the citadel is a colossal figure, *The Lion of Belfort*, by Bertholdi, 36 feet high and 72 feet long, erected to commemorate the brave defence of the town during the war, and opposite the Hôtel de Ville a bronze group in memory of Thiers and Denfert-Rochereau. A new railway station was erected in 1890, and a civil hospital in 1895. The town has important trade, especially in wine. Imports in 1899, £3,468,000; exports, £4,864,000. Population (1901), 32,112.

Belgaum, a town and district of British India, in the Carnatic or Canarese-speaking division of Bombay. The town is situated in 15° 51′ N. lat. and 74° 34′ E. long., nearly 2500 feet above sea-level; it is a station on the Southern Mahratta railway, 245 miles south of Poona. The population in 1881 was 32,697; in 1891 it was 40,737; and in 1901 it was 26,237. Belgaum contains a cantonment which is the headquarters of a military district, with a garrison of all arms. It is also a considerable centre of trade and of cotton weaving. There are two cotton mills, with a capital of Rs.3,20,000, working 52,000 spindles, and employing 2186 hands, of whom 909 are children.

The district of BELGAUM has an area of 4057 square miles. The population in 1891 was 1,013,261, being 217 persons per square mile. Classified according to religion, Hindus numbered 873,051; Mahommedans, 80,484; Jains, 52,048; Christians, 7617, of whom 1454 were Europeans; Parsees, 61. In 1901 the population was 994,209, showing a decrease of 2 per cent., compared with an increase of 17 per cent. in the preceding decade. The land revenue and rates were Rs.22,51,550, the incidence of assessment being about 15 annas per acre; the number of police was 877. Out of a total cultivated area in 1897-98 of 1,714,200 acres, 51,069 were irrigated, including 5479 from government canals. The principal crops are millet, rice, wheat, other food-grains, pulse, oil-seeds, cotton, sugar-cane, spices, and tobacco. There are considerable manufactures of cotton-cloth. The town of Gokak is known for its dyes, its paper, and its wooden and earthenware toys. The West Deccan line of the Southern Mahratta railway runs through the district from north to south. In 1897-98 there were 311 schools, with 18,168 pupils, showing one village with a school to every 17 square miles, and 1·9 pupils to every 100 of the population. Two high schools at Belgaum town are maintained by Government and by the London Mission; total pupils about 830. There are nine printing-presses, most of which issue a vernacular newspaper. In 1897-98 the municipalities had a total income of Rs.1,09,980, the incidence of taxation being 13 annas per head. The death-rate in 1897 was 42 per 1000.

BELGIUM.

GEOGRAPHY AND STATISTICS.

BELGIUM (French *Belgique*, Flemish *Belgie*, German *Belgien*), a kingdom of Europe, lying between 49° 31′ and 51° 30′ N. latitude and between 2° 36′ and 6° 3′ E. longitude. Its frontier touches the North Sea, Holland, Rhenish Prussia, the Grand Duchy of Luxembourg, and France. Gradually rising towards the S.E., Belgium lies very low in the provinces of Antwerp and Flanders; reaches over 300 feet in height a little to the S.E. of Brussels; 650 feet near the Sambre and the Meuse; 1640 feet on the plateaux of the province of Luxembourg; over 2000 feet on the E. frontier of the province of Liége. The land is traversed from S. to N. by the Scheldt and its affluent the Lys, and by the Meuse and its affluent the Sambre. To the S. of the Sambre and the Meuse the country is, in general, undulating. The valleys of the Meuse, the Ourthe, the Amblève, the Lesse, the Semois, &c., are highly picturesque; the natural grottos of Han on the Lesse being celebrated, and the grotto of Remouchamps and the prehistoric caverns of Furfooz being no less remarkable. The mean annual temperature is 49·1° F. in the central part, but sinks to 44·6° F. on the highest plateaux. The most frequent winds are S.W. and W., bringing with them the humidity of the Atlantic. The average annual precipitation in rain and in snow amounts at Brussels to 28·8 inches.

Area and Population.—The area comprises 2,945,589 hectares, or 29,456 kilometres, or 11,373 English square miles, and the total population at the end of 1899 numbered 6,744,000, an average of 593·11 per square mile. The nine provinces, their respective areas, populations, and densities at the end of 1899 were:—

Provinces.	Area in English square miles.	Population at end of 1899.	Population per sq. mile, 1899.
Antwerp	1093	825,000	754·8
Brabant	1268	1,281,000	1010·2
Flanders, West	1249	811,000	649·3
Flanders, East	1158	1,035,000	893·7
Hainault	1437	1,164,000	789·1
Liége	1117	843,000	754·7
Limbourg	931	242,000	259·9
Luxembourg	1706	221,000	129·5
Namur	1414	352,000	248·9
Total	11,373	6,744,000	593

From 1876 to 1880 the average annual increase of population was 46,000; from 1880 to 1890, 55,000; from 1890 to 1899, over 75,000. At the census of 1898, out of a total population of 6,669,732, 3,326,190 were males and 3,343,542 females. The births and deaths per 1000 inhabitants have since 1876 undergone a gradual diminution, the births however continuing in marked excess over the deaths, as shown in the following table:—

Year.	Average Yearly Births per 1000 Inhabitants.	Average Yearly Deaths per 1000 Inhabitants.
1877-1886	31·21	21·31
1887-1896	29·25	20·92
1898	28·62	17·61

For every 100 births the percentage of illegitimacy has since 1871 varied from 7·2 to 8·76. The annual immigration since 1871 has varied from 15,000 to 27,000, and, since that date, has been continuously greater than the emigration, which in 1898 reached its maximum of 22,860. Among the population of foreign birth in 1890, 64,800 were born in France; 47,459 in Holland; 38,367 in Germany; 9266 in the Grand Duchy of Luxembourg; and 4102 in England. Linguistically, Belgium is distributed into three parts: Flemish, to the N. of a line stretching from near Warneton on the Lys eastwards to Visé on the Meuse; French in the country of the Walloons, to the S. of that line; German, in the arrondissement of Arlon. At the census of 1890 there were 2,744,271 inhabitants, or 45·21 per cent. of the total population, speaking only Flemish; 2,485,072, or 40·94 per cent., speaking only French; 700,997 speaking both French and Flemish; and 32,206 speaking only German.

Constitution and Government.—The constitution, adopted in 1831, was revised in 1893 with a view to extension of the rights of suffrage. The form of government is a constitutional, representative, and hereditary monarchy. The constitution declares that all power emanates from the people, and establishes three authorities—legislative, executive, and judicial. The legislative power is the conjoint function of the chamber of representatives, the senate, and the king. The members of the chamber of representatives are elected for four years, the half of them retiring every two years. Their number must not exceed the proportion of 1 to every 40,000 inhabitants. To be elected a representative one must be a Belgian by birth or by naturalization, must have attained the age of twenty-five years, and be domiciled in Belgium. No other condition is required. Every member receives a yearly indemnity of 4000 francs (£160) for discharging his functions as representative. Before 1893 the electoral law was based solely on the census. The members of the chamber of representatives were elected by citizens paying in taxes a fixed amount (namely 42 francs, 32 centimes). After the revision of 1893 the constitution granted the right of suffrage to every citizen who had attained the age of twenty-five years and been domiciled for not less than one year in the same commune. A supplementary vote is allowed to every citizen fulfilling certain conditions in respect of age, family, and personal or property tax. Two supplementary votes are accorded to every citizen whose profession, or the possession of a diploma or a certificate, attests an average level of higher instruction. No person, however, can dispose of more than three votes. In 1892, before the revision, the number of electors was 36,775. In 1900, after the revision, it had risen to 1,432,232. Further, the law of 29th December

1899 introduced into the election of members of the legislative chambers the principle of proportional representation, a principle which in the case of an election divides the writs among the parties according to the number of votes they represent. The members of the senate are elected for eight years, one half being renewed every four years. Senators must be at least forty years of age, and must fulfil prescribed conditions of fortune, excepting in the case of a certain number elected by the provincial councils. They are chosen by so many of the electors who vote for the chamber of representatives as have attained the age of thirty years, amounting in 1900 to 1,227,720; and by the provincial councils, two, three, or four for each province, according to population. Sons of the king, or, failing these, Belgian princes of the reigning branch of the royal family, are, by right of law, senators at the age of eighteen, but till the age of twenty-five have no voice in the deliberations. The king takes part in the legislative power by his right of initiative to present projects of law, and by the assent he gives to the projects of law voted by the chambers. He is charged with the sole executive power, which he exercises through the intermediation of the ministers whom he appoints and removes, and who are held responsible for the acts of the government. There are eight ministries :—justice, foreign affairs, interior and public instruction, finance and public works, war, railways posts and telegraphs, agriculture, industry and labour. The country is divided into 26 judicial arrondissements and into 222 cantons of justices of peace.

Provinces and communes.—For purposes of civil administration, the country is divided into the nine provinces already specified, and the provinces, again, are divided into communes, at present numbering 2610. Each province is self-governed. In each there is a commissioner of the government, bearing the title of governor, and appointed by the king; and a council chosen for four years by the electors of the province. Since the revision of the constitution the electors to the provincial council are the same body as elect the senators. In 1893 the number of provincial electors was 425,451; in 1900, 1,227,720. The council must assemble each year in the month of July. The provinces are divided into administrative arrondissements, in each of which a *commissaire d'arrondissement* is appointed to watch over the administration of communes having less than 5000 inhabitants. Each commune is self-governed. In each there is a burgomaster nominated by the king and, saving in exceptional cases, chosen by the members of the communal council; also a number of aldermen chosen by the members of the council from among themselves; further, a communal council elected for eight years by the electors of the commune. To be an elector to the communal council, it is necessary, since the law of the 11th April 1895, (1) to be a Belgian by birth or by naturalization; (2) to fulfil the same conditions as are required for the right to elect senators; (3) to have been actually domiciled in the commune for at least three years. If the elector fulfil certain other conditions he may dispose of as many as four votes. In 1893 the number of communal voters was 547,559; in 1900, 1,136,010. The principle of proportional representation applies also to communal elections.

Religion.—The recognized religions are the Roman Catholic, the Protestant, the Anglican, and the Hebrew. The population is almost wholly Catholic. The Protestants number only about 15,000 and the Jews 3000. In the budget of 1898, 5,268,000 francs figures under the head of expenditure for the support of the Catholic religion, and 118,000 francs for the other creeds.

Education.—Free education has been recognized. There are accordingly schools of various grades established by private persons, by corporations and associations, and by the public authorities, national, provincial, and communal. There are three grades of general public education—elementary, middle-class, and higher. Elementary education comprised in 1898 more than 2000 infant schools with 195,000 pupils; 6700 elementary schools subject to government inspection, numbering altogether 775,000 pupils; 2300 adult schools with an attendance of 12,000; 19 normal schools for male teachers and 34 for female teachers, comprising altogether 3700 students. The expenditure on elementary education amounted in 1897 to 35,761,000 francs, in 1875 to 24,800,000 francs. The number of young men unable to read and write when called on to draw lots for the conscription was in 1870, 29·2 per cent.; in 1899, 12·8 per cent. Middle-class instruction, lower grade, was imparted in 1898 by 78 government schools for boys and 10 communal schools, having altogether 16,000 pupils; by 34 government schools for girls and 6 communal schools, with an attendance altogether of 7000 pupils; and by 2 male normal schools numbering, in 1899, 60 students, and 2 female normal schools numbering 100 students. Middle-class instruction, higher grade, was given in 1899 by 20 royal athenæum and 15 communal colleges, counting altogether 7500 scholars. The expenditure of the State, the provinces, and the communes on middle-class instruction, inclusive of the two grades, increases year by year, and amounted in 1897 to 4,600,000 francs. The higher learning is communicated in the two State universities of Liége and Ghent, in the two free universities of Louvain and Brussels, and in the "new" university founded at Brussels. To these universities are annexed schools of civil engineering, of mines, and of arts and manufactures. The students attending the universities numbered in 1899, in all, more than 5000. There is also a very large number of schools for special instruction. (1) For purposes of military instruction, there are at Brussels a military school, with an attendance of 300, designed for the training of officers of all arms, and a school of war (*école de guerre*) attended by officers desiring to obtain the brevet of *adjoint d'état major;* a riding school; regimental schools with an attendance of 3300; classes for illiterate soldiers. (2) To provide artistic education, there are the Royal Academy of Fine Arts at Antwerp, with 1300 students, and 84 other academies and schools of design, having altogether an attendance of 15,000; the Royal Conservatoire of Music at Brussels with 1600 students; another at Ghent with 1200 students; another at Liége with 1200 students; and 71 other schools of music having an attendance altogether of 12,000. (3) For industrial and commercial education there are special schools, with 1400 students, attached to the universities; the Hainault provincial school of mines (250 students); industrial or professional schools, communal or free, having an attendance altogether of 17,000; the Institut Supérieur of Commerce at Antwerp; schools to teach weaving, brewing, &c. (4) There are also schools of navigation at Antwerp and Ostend; a government agricultural institute at Gembloux; reform agricultural schools and prison schools; schools for the deaf and dumb; schools of domestic economy, &c. Public education is supported and encouraged by numerous scientific and literary institutions or associations, the principal of which are the Royal Academy of Sciences, Letters, and Fine Arts, at Brussels, founded in 1769; the Royal Flemish Academy, founded at Ghent in 1886; the Royal Academy of Medicine, established at Brussels in 1884; the observatory set up at Brussels in 1826 and now transferred to Uccle; the Royal Museum of Natural History and the government botanic gardens at Brussels; the zoological gardens at Antwerp, formed by a private society; and other bodies. The Government has instituted prizes, granted every three years, in French and Flemish dramatic literature; every five years in the history of Belgium, in social science, French and Flemish literature, mathematics, and natural and medical physics; and every ten years in philosophy and philology.

Crime and Pauperism.—In 1897 the number of criminals sentenced at the Assize courts was 105; and at the correctional tribunals 43,364. The average number of inmates of the various classes of prisons in 1897 was:—central prisons, 735; secondary prisons, 3833; reformatories, 222. The charitable institutions received in donations and legacies in 1898, 4,407,000 francs. In 1898 the total entries in the depots of mendicité for the reception of beggars and adult vagabonds were 3623, and the expenditure 1,224,213 francs.

Finance.—Every year the chambers settle the accounts and vote the budget. The total receipts and total expenditure of the State have to be entered in the budget and in the accounts. A special court called the Cour des Comptes is charged with the duty of examining and liquidating the accounts of the general administration and of presenting its observations thereon. The revenue and expenditure for the years specified were as follows:—

Year.	Revenue (Francs).	Expenditure (Francs).
1880 . . .	394,215,932	382,908,429
1885 . . .	393,085,424	351,251,439
1890 . . .	378,404,319	417,893,629
1895 . . .	395,730,445	410,383,402
1897 . . .	499,612,888	511,398,214

From 1880 to 1897 the revenue has increased 26 per cent., and the increase on the expenditure has been in that period 33 per cent. The taxation, amounting to 28 francs per head of population in 1880, had risen to 31 francs per head in 1897. The total amount of taxation shows an increase of 39 per cent. on the total sum of 1880. Among the items of expenditure for 1898, the most formidable one is that on account of the service of railways, posts, and telegraphs, figuring at 127,679,000 francs. The next in importance is on account of the interest on public debt, 123,303,850 francs. The public debt, consolidated and floating, was in 1880, 1,422,814,049 francs; in 1890, 2,018,043,774 francs; in 1899, 2,693,787,176 francs. In the budget for 1900 the revenue was estimated at 452,246,618 francs, and expenditure 450,929,726 francs. In each province the council settles every year the account of the revenue and expenditure of the preceding financial year, and votes the budget for the current year. In 1897 the provincial receipts amounted altogether to the sum of 17,501,567 francs. The sum total of the provincial debts amounted to 32,679,614 francs. In each commune the council prepares every year the budget of revenue and expenditure. In 1892 the sum total of the

communal receipts amounted to 178,020,761 francs, and that of its expenditure to 179,316,792 francs.

Defence.—The constitution establishes a permanent army, a gendarmerie, and a civil guard (*garde civique*). The army is recruited by voluntary engagement and by annual calls on the country, regulated by a drawing for conscription among the citizens who have reached twenty years of age. The contingent is fixed each year by enactment. Ordinarily it is about 13,000 men out of an average inscription of 63,000 men. The effective strength in pay on a peace footing is about 50,000 men; the complete war strength, including officers, 165,000. The strength of the gendarmerie, officers included, is 2865 men. In time of war the gendarmerie accompanies the army. The expenditure of the ministry of war for 1898 was 65,670,000 francs, five millions of which were on account of the gendarmerie. The expenditure on the war service in 1875 was 46,066,000 francs. The civic guard (*garde civique*) is composed of Belgians and foreigners who have been resident at least one year in Belgium, subject, however, in respect of the latter, to any provisions in international conventions. It is organized per commune or group of communes. It can only be mobilized by enactment. It is divided into the active and the inactive guard. The strength of the active guard is about 44,000 men. The yearly expenditure of the ministry of the interior for the civic guard is 139,000 francs. There are five fortified places in Belgium: Antwerp, capable of serving the army as a base of operations and as a refuge; it consists of a fortified *enceinte* and fourteen detached forts surrounding it at a distance of 3 to 7 kilometres (1·86 to 4·35 miles). The others are Dendermonde on the Scheldt, and Diest on the Demer, these two and Antwerp forming a triangle of defence; Liége, surrounded at a distance of 6 to 7 kilometres (3·73 to 4·35 miles), by fourteen detached forts; and Namur, surrounded by nine detached forts, which, with those of Liége, defend the valley of the Meuse. There is an exercise-camp at Beverloo in Limbourg, and a shooting artillery school at Brasschaet in the province of Antwerp.

Production and Industry.—The principal mineral production is coal, at present extracted from 115 mines actually in work, against 175 in 1875. These mines employ 120,000 workers; their annual production is about 22 million tons, of the value of 243 million francs. Notwithstanding the reduction in the number of working mines, the output has increased by 5 million tons since 1880. Black and red marble, building and paving stone, limestone and slate are extracted from 1500 quarries employing more than 35,000 workers, and yielding material to the value yearly of about 50 million francs. Iron, zinc, lead, and manganese are extracted by about 1600 miners, and the annual yield is valued at 2 million francs; since 1875, however, the production of these minerals has much declined, and it has been necessary to import them to the value, in 1898, of 90 million francs. The most important branches of industry are: agriculture, metallurgy, glass-works, and textiles. Agriculture employs the greatest number of labourers—19 per cent. of the general population. Cereals occupy 2,000,700 acres; fodder and orchards, 1,575,860 acres; potatoes, 456,950 acres; beetroot (sugar), 133,380 acres; and cattle number 1,420,000 head. The annual value of the agricultural products is estimated at about 1½ milliards of francs. Nevertheless, great quantities of food products are annually imported, amounting in 1898 to 480 million francs. The industry in metals, employing 32,000 workers and yielding a yearly value of 340 million francs, is represented by the manufacture of pig-iron, the construction of machinery and railway material; by the manufacture of arms, Liége producing annually one million of assayed pieces; by glass and crystal works employing altogether about 23,000 workers, and yielding in 1898 a value of 66 million francs. The manufacturing industry is represented more particularly by the fabrication of woollen yarn and woollen tissues, cloths, flannels, covers, &c., employing 30,000 workers. Wools are imported to the amount of 110,250,000 lb from La Plata, Australia, and the Cape. The manufacture, again, of cotton thread and tissues employs 18,000 operatives; and cotton is imported yearly to the amount of 99,225,000 lb, principally from the United States of America, East Indies, and England. The manufacture of linen thread and linen cloth employs 36,000 workers, the flax being in part grown, the rest imported to the amount of 143,325,000 lb from Russia, Holland, and France. Lace is also manufactured. The sea fisheries occupy about 400 vessels, and crews to the number of 2000 men.

Commerce.—The annual value of the commerce with foreign countries amounted in 1899 to 7 milliards of francs in the way of general commerce, and to over 4 milliards in the way of special commerce. The value of the commerce has since 1870 experienced a continuous increase, as shown, in millions of francs, in the table given below.

The average share of each inhabitant in the special imports, *i.e.*, imports for home consumption, amounted in 1870 to 183 francs, rising to 310 francs in 1898; in the special exports (*i.e.*, exports of Belgian produce), 136 francs in 1870 rising to 270 francs in 1889; in the transit trade, 165 francs in 1870, 187 francs in 1898. The countries with which Belgium did the greatest business in

	1870.	1880.	1890.	1898.
Imports, General Commerce	1760·2	2710·4	3189·2	3654·3
,, Special ,,	920·8	1680·9	1672·1	2260·2
Exports, General ,,	1521·8	2225·2	2948·1	3351·6
,, Special ,,	690·1	1216·7	1437·0	1949·3

1898 were: Germany, from which she received imports valued at 25·4 million francs, and to which she sent exports valued at 485·5 million francs; France, from which the imports were 385·7 million francs, and the exports to which 345·8; Great Britain exporting 312·0, and importing 360·7; Holland exporting 169·0 and importing 211·8; the United States exporting 280·1 and importing 69·4; Russia exporting 131·9 and importing 43·16. In the relative magnitude of the annual value of its special commerce, Belgium takes the sixth place among the nations of the world, following Great Britain, Germany, the United States, France, and Holland. The articles of greatest value imported were: cereals and their derivatives, 19 per cent. of the total import; raw textiles such as cotton, wool, silk, flax, hemp, and jute, 13 per cent.; mineral substances such as iron-ore, diamond, sulphur, copper, tin, lead; and timber. The exports of greatest value were textiles, wool, linen, oakum, hemp, 9 per cent.; cereals and their derivatives, 5 per cent.; coal, coke, briquette, glass, machinery and railway carriages, arms.

Shipping and Navigation.—Belgium has no navy for purposes of war. There is a daily service of steamers between Ostend and Dover, and between Antwerp and Harwich. The national merchant marine is not considerable, the number of vessels has little varied since 1870, amounting in 1898 to but 73, six of which were sailing vessels; the total tonnage being 108,537. The total number of vessels entering the ports of Belgium in 1899 was 8672, of 8,632,862 tons, and clearing 8581, of 8,521,331 tons. The ports are Antwerp, one of the most important in Europe, the ships entering which number annually more than 5200 (480 of them sailing vessels), with a united tonnage of 6,423,000; Ostend on the North Sea, with a yearly entrance of 1923 ships of 1,202,000 tons; Ghent, communicating with the sea by the Ghent canal to Terneuzen; Brussels, communicating with the Scheldt, by the canal of Willebroeck; Bruges, communicating by canal with Ostend; Nieuport on the North Sea; Selzaete on the Ghent-Terneuzen canal. Among the vessels arriving in 1898, the largest number came from Great Britain (4010); from Germany (986); Norway and Sweden (599). Antwerp has regular intercourse with all parts of the world.

Internal Communications.—Inland communication is highly developed, especially when compared with its extent of territory. The State and provincial roads, paved or macadamized, and the concrete roads have a total length of 5737 miles, against 5002 in 1875. The communal roads have likewise experienced a very large development. The total length of railway line open in Belgium in 1899 was 2867 miles (2069 belonging to the State, and 798 to companies), against 2175 in 1875. This gives an average of one mile of railway for every 4½ square miles of territory, and for every 2420 inhabitants. The gross receipts in 1898 amounted for the State to 183,950,458 francs, of which 60,185,764 francs were for passengers; and for the companies, 24,835,703 francs, of which 7,519,768 francs were for passengers. The number of passengers conveyed in 1898 was 126 millions. Since 1886 "vicinal" railways have been opened to the number of 96 lines, their total length of line in actual operation being, in 1898, 1094 miles. Horse and electric tramways have been laid down in the principal towns. The vicinal railways and tramways are constructed and worked by societies. Navigable waterways are formed of numerous canals, and canalized rivers such as the Upper Scheldt and its tributaries, the Lys, the Durme, the Dender, the Gnat and the Little Nèthe; the Meuse and its tributaries; the Sambre; and the Lower Ourthe. The total length of navigable waterways is 1360 miles.

Posts, Telegraphs, and Telephones are exclusively in the management of the State. The gross revenue of the post office in 1898 exceeded 22 million francs, and the expenditure was more than 12 millions. The total number of letters and post cards conveyed in 1898 was over 200 millions, of newspapers and printed matter, over 130 millions. In 1898 there were 1022 post offices in Belgium. The total receipts of the telegraph service in 1898 amounted to more than 7½ million francs, and to an ordinary expenditure of over 5,700,000 francs. The telegraph lines had in 1898 a combined length of 3964 miles; there were 1058 telegraph offices. The use of the telephone dates from 1884. All the lines constructed from the beginning, were taken up by the State in 1896. There were in 1898 local telephones of a total length of

19,620 miles. The same year there were over 100,000 international telephonic communications made.

Banks.—There are three very important financial institutions, established at the intervention of the state: the National Bank, the General Savings Bank under state guarantee, and the *Société du Crédit Communal*. The National Bank discounts bills, has its headquarters at Brussels, and branches in the provinces. It serves gratuitously as cashier of the state and of the Savings Bank. The following figures show the situation of the National Bank on the 31st December 1899:—

Active.	1000 Francs.	Passive.	1000 Francs.
Cash	112,663	Capital and reserve . .	77,464
Portfolio, Belgium . .	337,304	Notes in circulation . .	543,357
,, Foreign . .	112,861	Treasury accounts, current	34,161
Advances in public purse	49,913	Private ,, ,,	38,232
Property, Mutuals . .	89,477	Various	11,894

There are 54 joint-stock and private banks, also agricultural banks, credit unions, and popular banks. The sums discounted by the Bank in 1898 amounted to 3,026,959,163 francs. The Savings Bank under state guarantee receives deposits bearing interest, keeps cheque-books, and an insurance fund. There were in 1898, 899 offices, 1,377,643 depositors, and the amount of deposits at end of year was 532,081,819 francs.

The *Société du Crédit Communal* is designed to secure to the communes the means of contracting loans on favourable terms. A Crédit Agricole was officially organized in 1884 by a law authorizing the Savings Bank to devote part of its funds in loans to agriculturists. Among the great number of other financial institutions are savings banks under the patronage of communes, the society for the encouragement of national industry, &c.

Money.—The mintage of Belgian money is committed to a contractor, entitled Directeur de la fabrication, who works under the superintendence of the Government at a rate of charges fixed by royal decree. The value of all the coins minted since 1832 down to 1898 amounts to 1,172,516,348 francs. Since 1861 no coins have been minted, except the gold piece of 20 francs; silver pieces of 5, 2, and 1 francs, and of 50 centimes; nickel pieces of 10 and 5 centimes; and copper pieces of 2 and 1 centime.

For Belgium's relation with the CONGO FREE STATE, see that article, and also below (p. 203).

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RECENT HISTORY.

When Belgium was definitely established, in 1839, as an independent state, the political parties which had formed a coalition for the purpose of safeguarding and reorganizing the country again split up. In 1846 the first Catholic administration was formed under Malou, and was succeeded in the following year by the first Liberal administration of Rogier and Frère-Orban. This government preserved Belgium from the contagion of the revolutionary ideas of 1848, extended the electoral franchise, diminished the intensity of the industrial crisis in Flanders, restored the financial equilibrium, instituted the municipal guard and the National Bank, and introduced public middle-class education. After a short interval of the Catholic Ministry of de Decker (1855-57), the Liberals again returned to power, under Rogier (1857-58), and under Frère-Orban (1868-70). In 1860 the octroi of the towns was abolished, and next year Protection was introduced, savings banks were established, co-operative and friendly societies promoted, and trade unions declared legal. In 1865 the devolution of the crown from Leopold I. upon his son was satisfactorily effected. Between 1870 and 1878 two Catholic Cabinets were in power, d'Anethan's (1870-71), and Malou's (1871-78). The latter, composed of moderate Catholics, permitted the extreme Right, "the Ultramontanes," to take the lead. In this period came the struggle between the Pope and the Italian Government, and the German *Kulturkampf*. The Belgian Clericals declared in favour of the re-establishment of the temporal power, and congratulated the German priests whom Bismarck had dispossessed. M. Malou held the Government aloof from these manifestations, and in consequence of the representations of the German Chancellor was obliged even publicly to condemn them, but, notwithstanding the attitude of the Government, the Ultramontane agitation compassed its fall. The Liberals, who in Rogier's second Ministry had divided themselves into Doctrinaires (Moderates) and Progressists, again joined hands as a protest against Clerical intervention in politics and especially against the attitude of the Church in the elections. The Government was obliged to pass a law ensuring the secrecy of the ballot (1877), the provisions of which were framed on the English system, and this soon gave the Liberals a majority in the Chambers, which lasted from 1878 to 1884.

The Liberal party and the education question.

The new Cabinet devoted itself, under M. Frère-Orban, solely to the settlement of the educational question. The office of Minister of Public Education was created, and a new system of primary education introduced. In 1842 the popular schools were sectarian in character, and instruction by the clergy in the Catholic faith was obligatory; children belonging to other persuasions being dispensed from attendance. After 1846 the Liberal Congress, in framing the programme of the party, demanded the abolition of this system. The law of 1879 provided for the secularization of primary education; but by Article 4 the ministers of all confessions received permission to impart religious instruction in the schools to children whose parents desired it, at hours other than those set apart for regular education. Instruction in morals, until then entrusted to the clergy, was secularized and placed in the hands of the regular teachers. On the other side, the State extended its direction and control to the communal schools, subjecting them to a rigorous inspection. After the passing of this law, a struggle ensued between the Government and the Liberal party on the one side, and the Episcopate and the Catholic party on the other, the latter not being satisfied with the concessions made by Article 4. The bishops condemned the school law, and ordained that absolution should be refused to teachers in the Government schools, and to all parents who left their children in them; moreover, they implored their clergy to found schools everywhere in opposition to the schools "sans Dieu." This movement succeeded to a great extent. In 1884 the State primary schools numbered only 346,000 scholars, as against 500,000 in the Catholic schools. The Government was unable to prevail upon the Episcopate to end this "school campaign," the clergy being entirely independent of the State, although it vainly negotiated with the Pope for the issue of an ordinance to the bishops to abandon their opposition to the law. M. Frère-Orban was obliged to recall the Belgian Minister to the Vatican on the eve of the fêtes of the national jubilee, 1880, with which the clergy refused to associate themselves. The struggle was embittered by the report of a parliamentary committee appointed to inquire into the educational system, which not only showed conclusively the insufficiency of education as imparted in Catholic schools, but exposed the measures taken by the clergy to boycott the Government schools.

In order to meet the Catholics with any hope of success, Liberalism had need of all its strength; but at this very juncture it became so completely disintegrated that its

unity has never since been restored. The cause of this disintegration was the extension of the franchise.

Franchise reforms.

The Constitution of 1831 (Article 47) granted the Parliamentary franchise to citizens paying 100 florins Dutch currency (211 f. 60 c.) direct taxes in the large communes, gradually descending to 20 florins in the villages. The Liberal Congress of 1846 demanded the reduction of the electoral qualification to the last-named figure, and this reform was carried out in 1848. It was impossible to go farther without modifying the text of the Constitution, which required the consent of two-thirds of the Chambers, specially elected for the purpose. Nevertheless, the Liberal Progressists in November 1870 proposed in the Chamber the revision of Article 47. This motion was rejected by 73 Liberal and Catholic votes to 23 Progressist. But, in order to some extent to compensate the minority, the Ministry of M. d'Anethan lowered the qualification for the provincial and communal electorate, so far as it was possible to do so without violating the Constitution. There were from that date 350,000 communal electors (paying 10 f. in taxes), 200,000 provincial electors (paying 20 f.), and 100,000 general electors (paying 42 f. 32 c.). This reform enhanced the strength of the revisionist movement, for the communal and provincial electors evinced a natural desire to acquire full rights of suffrage. Relying on these tendencies, M. Janson, head of the Progressists, moved a second time, in 1883, the revision of Article 47. This motion was defeated by 116 Catholic and Ministerial votes to 11 (8 Progressist and 3 Catholic). But, as in 1870, the Progressists again obtained some compensation. The electoral body, communal and provincial, was enlarged by the grant of the franchise to qualified electors, *i.e.*, such as could show, either by certificates or by examination, that they had received a full primary education. One hundred and thirty thousand new voters were thus created. But the hostility of the Progressists to the Ministry was not assuaged by this concession, nor by the lodging of Bills making education obligatory upon all, and founding industrial schools for infants. Moreover, to political difficulties financial ones were added. Receipts into the Treasury had fallen off, as a consequence of the European economic crisis; expenses had increased owing to the extension of primary education; and the deficit had reached a total of 25,000,000 f. in 1883. The Government, in spite of the Catholics and Progressists, imposed a fresh tax upon tobacco, alcohol, &c. In the month of June 1884, the elections not only deprived the Liberal party of its majority, but also consigned it for an indefinite period to the cold shade of opposition. Its defeat was due to the Catholic agitation against the School Law, and to differences in regard to the franchise question. The Conservative electors, swaying from right to left, and alarmed by the demands of the Progressists and the anti-Clerical policy of the Government, gave their votes to the Catholics.

Catholic administrations.

The period since 1884 may be divided into two parts, that of the *bourgeois* régime, or the limited franchise (1884-94), and the beginning of the Democratic régime — universal suffrage (1894-1900). Six Ministries were in office, under Malou, Beernaert, de Burlet, de Smet de Naeyer, van den Peereboom, and de Smet de Naeyer (for the second time). In the Malou Ministry, which lasted from June to October 1884, the Premier's chief colleagues were MM. Woeste, Beernaert, and van den Peereboom. The portfolio of Public Education was abolished, and a new enactment replaced the School Law of 1859. The communes obtained the right to suppress their secular schools, and to adopt at their pleasure the Catholic schools established since 1879. They might retain at least one secular school, or adopt at least one Catholic school, where 25 fathers of families demanded it. The State subsidized all the communal schools, whether secular or sectarian. Secular instruction in morals disappeared from the programme, but religious instruction was not made obligatory. The passing of this Bill in October called forth violent protests. The Liberal mayors of the large cities went in a body to the king to entreat him to withhold his sanction; the measure none the less became law. In the same month the communal elections turned out unfavourably for the Catholics, and the king, grasping the situation, demanded the resignation of the Ministers who had been most vehemently attacked on account of their Clericalism, namely, MM. Woeste and Jacobs. M. Malou followed his colleagues, and M. Beernaert, who had been Minister of Public Works from 1873-78, and again from June 1884, became President of the Cabinet.

Further demands for revision.

M. Beernaert's Ministry, which held office during the period from October 1884 to March 1894, controlled affairs during the most troublous period through which Belgium had passed since 1839. The political agitation of 1884, confined to the *bourgeoisie*, gave place in 1886 to an agitation which was at once both political and social, and of which the mainspring lay in the working class. On the 18th of March 1886 a Socialist rising suddenly burst out at Liége, on the occasion of the anniversary of the Paris Commune. The movement rapidly spread in the industrial centres of Liége, Charleroi, and Mons. Thousands of working men went on strike, demanding better wages and the suffrage. On the 28th March a body of strikers set fire to a glass manufactory at Jumet, near Charleroi. The coalfields were put into a state of siege, and the military came on several occasions into armed conflict with the strikers. The vigour with which this outbreak was suppressed soon re-established public order, but these sad occurrences drew public attention sharply to the condition of the working classes. It was felt that political and social reforms were imperative. The Government opened a comprehensive inquiry, which served as the basis of numerous social laws. Simultaneously, the Liberal Progressists began a campaign for the extension of the franchise, and in this were supported by the Socialist labour party, formed in 1885.

The movement of 1886 must be regarded as one of the epoch-making events in modern Belgian history. By giving a fresh impulse to the demands of the revisionists, by calling forth the framing of laws for the protection of workers, and bringing the Socialist party upon the scene, it caused Belgium to pass rapidly from a middle-class to a democratic régime. In 1887 the third motion for revision was rejected in the Chamber by 83 votes (Right) to 35 (Left). The moderate Liberals, acting on the advice of M. Frère-Orban, voted on this occasion for the motion. Harmony did not reign among the partisans of revision: the Socialists demanded universal suffrage, while the Progressists, faithful to Liberal tradition, insisted upon granting the franchise only to such Belgian subjects as could read and write. But the unanimity of the parties composing the Left as to the necessity for revision, rendered the measure inevitable. The revisionist propaganda became intense. M. Janson was returned to the Chamber by the solid vote of the Liberals of the capital, and forthwith moved revision for the fourth time. The Socialist party threatened the Government that, in the event of M. Janson's motion being defeated, it would proclaim a general strike. The motion was eventually taken into consideration (November 1890) by the unanimous vote of the House, M. Beernaert having persuaded the Catholic majority to support the principle of revision. Between this vote and

the end of the Constitutional crisis three years elapsed, marked by long Parliamentary discussions, by demonstrations on the part of the revisionists, and by strikes of a political tendency. The length of the debates was due to the divergent views of the parties. The Government and almost all the Catholics declared in favour of the adoption of the "occupation and residence" qualifications (as in England). The moderate Liberals proposed to refuse the franchise to the illiterate, and to such as were in receipt of charitable relief, public or private. The Progressists rallied round the Socialist watchword, "universal suffrage." On the other side, the problem had become considerably enlarged. M. Janson had only demanded the modification of Articles 47 (right of suffrage) and 53 and 56 (organization of the Senate). M. Beernaert thought that the revision should extend farther, in order that the new Constitution should have the same equilibrium as that of 1830, urging that it was necessary to have a counterpoise to democracy. He declared himself in favour of a complete reconstruction of the Senate, the qualification for election to it being fixed at 2116 f. a year, the election being partly direct and partly indirect, the establishment of the obligatory vote, and proportional representation. Finally, he demanded that it should be recognized as the prerogative of the Crown to take the opinion of the electors on the laws passed in Parliament or on Bills submitted for its deliberation. In order to carry these reforms, the revision of Articles 54, 57, 58, 26, and 48 was imperatively required. The Senate and the Chamber declared, in May 1892, that the time was come to modify the articles indicated by M. Janson and M. Beernaert. As prescribed by the Constitution, the Chambers were immediately dissolved, and two new Chambers elected. The Catholics had a majority in both, but not sufficiently large to enable them to dispense with the assistance of the Liberals, the Constitution requiring for every revision a majority of two-thirds. At the beginning of the final debate, which lasted from February until April 1893, M. Beernaert appealed to the "patriotic consensus" of the parties, a consensus which was not, however, conspicuous until the last moment, when, after the close of the general discussion, votes were taken successively upon the various Bills for extending the franchise. These were all thrown out (11th and 12th April).

The Labour party and electoral revision.

In view of this rebuff to popular aspirations, the Council of the Labour party proclaimed a general strike. Fifty thousand workmen struck work; in Brussels, violent demonstrations took place in the streets, and collisions followed between the working-men and the constabulary. The like happened at Antwerp and Mons, where several strikers were killed by the *gardes civiques*. The agitation assumed a dangerous aspect, and the Government and the Liberal Progressist Opposition perceived that it was necessary to terminate it. Harmony was restored as the result of a compromise proposed by M. Nyssens, Catholic Deputy and professor at the University of Louvain, who had already mooted the idea in a pamphlet published in 1890, and on 18th April the Chamber adopted the new Article 47 by 119 votes to 14. The new article introduced an electoral system until then unknown—*le suffrage universel plural*. Every Belgian citizen became an elector on attaining the age of 25 years, and one or two supplementary votes were conferred upon him under certain conditions. Hereupon the General Council of working men, while keeping universal suffrage, pure and simple, still nailed to the mast, ordered a resumption of work. The revision of the other articles presented fewer difficulties. M. Beernaert withdrew his amendment giving the Crown the right to take the opinion of the constituencies, an innovation that seemed in the main contrary to the essence of a Parliamentary system, as well as dangerous to the Crown itself. But he obtained the obligatory vote, the possibility of introducing proportional representation, thanks to a redrafting of Article 48, and lastly some modifications in the organization of the Senate. The electoral age was to be 30 years, with a qualification of 1000 f., and twenty-six senators were to be elected by the provincial councils. The new articles were promulgated on 7th September.

Electoral laws.

The electoral laws had yet to be framed. M. Beernaert introduced the Bill for proportional representation, but, before it was set down for debate, it roused such violent opposition on the part of the Catholic majority that he resigned. The labours of the Ministry of M. de Burlet, which lasted from March 1894 to February 1896, were mainly directed towards the passing of electoral laws for the additions to the Senate and the Chamber (1894), to the Provincial Councils (1894), and the Communal Councils (1895). The general tendency of this legislation was to restrain the application of Article 4 as much as possible. The following conditions resulted from these laws. The citizen, in order to possess a vote for the election of representatives to the Chamber, was to be of a *minimum* age of 25 years, and of 30 years for the election of senators and provincial and communal councillors. A *minimum* of three years' domicile was required for the communal electorate, and of one only for each of the others. For the four categories of elections a supplementary vote was given to (*a*) citizens who, having attained the age of 35 years and being married or widowers with children, paid at least 5 f. income-tax, and (*b*) to citizens of the age of 25 years possessing real estate to the value of 2000 f., or Belgian State securities yielding an income of at least 100 f. Two supplementary votes were bestowed upon citizens having certificates of middle-class education or upon such as were fulfilling functions and professions requiring the possession of such educational certificates. Moreover, for the communal elections a third supplementary vote was given to those who were in possession of real estate yielding an annual income of at least 100 f. It was thus possible to have at most four votes for the communal elections and three for the rest. The composition of the three electoral bodies for the year 1894-95 was as follows:—For the Chamber of Representatives there were 1,354,891 electors with 2,085,605 votes, and 21 electors for each 100 inhabitants, giving 1·54 vote per elector. For the Senate and Provincial Councils there were 1,148,433 electors with 1,856,838 votes. Every 100 inhabitants had 18 electors, equal to 1·62 vote per elector. For the Communal Councils there were 1,124,276 electors with 1,926,681 votes, and 17·6 electors per 100 inhabitants, equal to 1·71 vote per elector. The communal law of 1895 introduced a system of partial proportional representation. Where none of the lists of candidates obtains half the votes, the seats are distributed among the lists that have obtained a certain number of votes (quorum). On the other hand, the laws of 1894 retained, in the case of the other assemblies, both the system of majorities and the *scrutin de liste* by arrondissement or by canton.

These legislative labours having been completed, all the elected assemblies were dissolved and reconstructed by universal suffrage. The Parliamentary elections of October 1894 sent to the Senate 71 Catholics, 29 Liberals, and 2 Socialists (in February 1900 the numbers were respectively 72, 29, and 1), and to the Chamber 104 Catholics, 28 Socialists, and 20 Liberal Progressists (in February 1900 the figures were respectively 112, 28, and 12). The main features of this election were the great strengthening of the Catholic majority, the advent of a compact body

of Socialists, and the defeat of the Liberals. But the strength of the parties was not proportionate to the number of seats gained; the strength of the Catholic vote being 900,000 as against 350,000 Socialists and 450,000 Liberals. The provincial elections in the same year gave the Liberals the administration of two provinces—namely Brabant and Hainault; the Radical Socialists secured Liége, and the Catholics the remaining six provinces. The communal elections held in October 1895 resulted, in many of the cities, in councils without a stable majority, a state of things due to the existence of the three parties and to proportional representation. In February 1896 M. de Burlet, being in bad health, transferred the direction of public affairs to the Minister of Finance, M. de Smet de Naeyer. The Liberal defeat and the Socialist successes had substituted a revolutionary for a constitutional Opposition in Parliament. The new Cabinet recognized all the dangers of the situation from the point of view of monarchical and Conservative interests. On the other hand, the Liberals demanded a reform calculated to make their numbers in the Chamber proportionate to their electoral strength. The faults of the existing system were so apparent that opinion among all parties soon veered round in favour of its abolition. Yet parties and Ministry alike were divided as to the nature of the reform required. Some, like M. Woeste, were for the system of the *scrutin uninominal*, others demanded with M. Beernaert complete proportional representation. The more the Opposition on the left insisted on these demands, the less harmony reigned in the majority and in the Government. Hence, in 1899, a Ministerial crisis occurred. MM. de Smet de Naeyer and Nyssens, being unable to persuade their colleagues to declare in favour of proportional representation, resigned office.

The new chief of the Cabinet was M. van den Peereboom, who had been Minister of Railways since 1884. He conceived that he could solve the difficulty by applying proportional representation to the large arrondissements, returning at least three senators and six representatives, the *scrutins* of the small arrondissements continuing to be held on the majority system. This proposal met with formidable opposition. It satisfied neither M. Woeste nor his friends, and was virulently attacked in Parliament, in the press, and on platforms, by Liberals and Socialists alike. As a matter of fact it tended to keep the Catholic party in power. It actually confirmed them in possession of the majority of the small arrondissements they already held, and brought them seats in the large arrondissements, where they had hitherto not held any, or where the possession of the seats they had previously held was precarious. In spite of all protests to the contrary, M. van den Peereboom insisted on pressing his Bill; the Socialist Deputies began a course of organized obstruction in the Chamber, and from Parliament the agitation passed to the street. On several evenings in succession during June bloody encounters took place between the demonstrators and the gendarmes guarding the Houses of Parliament, the palace of the king, and the houses of Ministers. As in 1893 the movement degenerated into riots. It extended to all the large cities of the province, and found support among the Liberal middle classes; even the *garde civique* declared its dissatisfaction. The Government, weakly supported by the Right, gave way, as in 1893, and withdrew the Bill. A month later, in August 1899, M. van den Peereboom, despairing of finding another solution of the problem, resigned, making way for the second ministry of M. de Smet de Naeyer. The new Cabinet at once introduced a Bill giving proportional representation (for Parliamentary elections) to all the arrondissements. After a long debate, the Bill was adopted by the Chamber, in November, by 67 votes to 60, and by the Senate, in December, by 62 votes to 26, in spite of the double opposition of the Catholics, who held to M. Woeste, and of the Socialists, who considered the passing of the Bill of less importance than the suppression of plural voting. In both Chambers motions for the revision of Article 47 with a view to the introduction of the principle of "one man one vote" were defended, but rejected by an overwhelming majority. The features of the law are proportional distribution of seats among all the lists *en présence*, irrespective of the number of votes polled; grouping of the smaller districts in larger arrondissements; determination by the clerks of the lists of the order of election of candidates; prohibition of electors from giving votes to candidates of two lists; and the appointment of deputy Senators and representatives. The first elections which took place under the operation of the new law in May 1900 resulted as follows: there were elected to the Senate 58 Catholics, 39 Liberals and Radicals, and 5 socialists; to the Chamber of Representatives 85 Catholics, 1 Christian Democrat, 33 Liberals and Radicals, 33 Socialists. The Catholic majority in the two Chambers sensibly diminished, the Socialists and especially the Liberals gaining seats. Experience has shown that the Belgian electoral system is very complicated, and its simplification is urgently demanded. The Socialists and a majority of the Liberals advocate universal suffrage pure and simple, *i.e.*, the suppression of plural voting. They also demand the system of proportional representation, and an active agitation has begun in favour of these reforms. We may conjecture that, despite the opposition of the Catholics and certain Liberals, complete political equality will be finally attained if the union of the Liberal *bourgeoisie* and the Socialists, which brought about the electoral reforms of 1893 and 1899, becomes consolidated.

Proportional representation.

There are three political parties in Belgium — the Catholics, the Liberals, and the Socialists. The Catholic party was formed after the publication of the Encyclical in 1832. In 1846 it came into power for the first time, and up till 1901 had held it for twenty-seven years. It published its programme for the first time at the Congress of Malines in 1863. True to the instructions of the Papacy, it has, since then, posed more and more as the defender of constitutional liberties, by means of an ingenious distinction drawn between thesis and hypothesis. Its fight with the Liberal party centres essentially in two points — the question of education (lay or sectarian), and the maintenance of the privileged position of the clergy, which is paid by, but is yet independent of, the State. Since 1894, in spite of Conservative tendencies, the Catholic party, adapting itself to new political exigencies, has added to its old programme social reforms which have partly become law. Its unity, however, was in 1901 jeopardized by the rivalry of MM. Beernaert and Woeste, its two chiefs since the death of Malou,—the first before all a "Conservative," and the latter before all a "Clerical." Certain Catholic elements have become organized in working men's associations grouped in a democratic federation distinct from the Catholic federation. In Flanders a Democratic Christian party has been formed under the lead of the Abbé Daens, an inhibited priest. Its demands are obligatory education and military service, a progressive tax levied upon income, and measures of agrarian socialism. On the whole, the Catholic party finds its support in the aristocracy, in one section of the *bourgeoisie*, but chiefly in the Flemish peasants.

Political Parties.

The Liberal party, as constituted by a congress in 1846,

had up to 1901 been in power for twenty-seven years. Towards 1860 there was formed within it a Progressist fraction demanding extension of the franchise and secular schools. How the party became divided in 1883 has been already shown. The Progressists have now formed themselves into a distinct party. The moderate Liberals favour personal military service, proportionate taxation of income, and liberty of labour in the case of adults. The demands of the Progressists are: a nation in arms, a progressive income tax, universal suffrage pure and simple, and all measures called "Socialisme d'état." Both fractions of Liberalism insist upon obligatory education and war upon Clericalism. Since 1894, a Liberal working men's party has been formed, to embrace all working men not belonging to the Socialist or Catholic groups. Its programme is that of the Progressists. But the Liberal party finds its recruits mainly among the middle class, and the financial and industrial world.

The Socialist party was formed on 6th April 1885, by certain co-operative groups. Its political action began after the troubles of 1886. It extended its influence to the workers in great industrial undertakings. We have seen what *rôle* it played in the revisionist crisis, and how it became an influential Parliamentary party. Its organization, a mixture of centralization and autonomy, is based upon the powerful trade unions of Ghent, Brussels, and other places, and upon numerous professional syndicates. Upon this substratum are built up (1) the district federations, uniting the socialist groups of each district; and (2) professional federations, uniting the workmen of the same branch of industry, wherever their domicile. Above these again comes the Congress, composed of delegates of each society, and at the pinnacle, the General Council, or the executive power, elected annually by the Congress. The political programme of the party may be summed up in a single word—"collectivism." The more immediate programme resembles that of the Progressists, who have often made electoral alliances with the Socialists, *i.e.*, universal suffrage, a nation in arms, regulation of labour, sliding-scale taxation, the monopoly of alcohol, and nationalization of mines and railways. The Socialist party naturally finds support among the industrial workers, and its considerable success is due to the numerical importance of this class in relation to the total population of the kingdom.

The Parliament.

Of late years Parliamentary tradition has been greatly modified. Since 1884 power had remained in the hands of the same party, with frequent ministerial changes, due to divisions in the majority. The constitutional opposition of the Liberals has given place to the revolutionary opposition of the Socialists. There has been a material decline both in the quality of the debates and in the amount of useful work done in the Chamber. The Senate plays a part which is every day becoming more and more subordinate. It confines its labours to voting, without modification, Bills submitted to it by the Chamber. The supporters of proportional representation hope, perchance wrongly, that this institution is destined to rectify the defective working of the Parliamentary system.

Legislation.

There remain to be noted the principal enactments since 1885. In social legislation the following are the more important:—Prohibition of the "truck system"; the institution in 1887 of industrial and labour councils, composed of employers and *employés*, and of a superior council, formed of officials, workmen, and employers; laws assisting the erection of workmen's dwellings and supervising the labour of women and children (1889); laws for ameliorating the system of Friendly Societies (1890); laws regulating workshops (1896); for the institution of miners' representatives (1897); conferring corporate rights upon trade unions (1898); guaranteeing the security and health of working men during the hours of labour (1899). In 1900 laws were passed regulating the contract of labour, placing the workman on a footing of complete equality with his employer, assuring the married woman free control of her savings, and organizing a system of old-age pensions. The fourth law of primary education (1895) made religious instruction obligatory, and extended State subsidies to all schools, communal, adopted, or free, that satisfied certain conditions. As a matter of fact, the Liberals, the Socialists, and the Christian Democrats placed in their programme "obligatory primary education." In 1899 there were in Belgium 6674 subsidized schools, having 775,000 scholars, out of a total of 950,000 children of school age. Only 68,000 did not receive religious instruction. A law affecting higher education, passed in 1890, enriched the University curriculum by giving it a more scientific character; and confirmed the privilege acquired in 1876 by the four Universities of Liége, Ghent, Brussels, and Louvain, of conferring upon their students diplomas giving access to the liberal professions.

Military system.

The neutrality of Belgium, guaranteed by the Great Powers, is guarded by an army raised by conscription, substitutes being allowed. The annual contingent is 13,300 men; the term of service being two or three years with the colours and ten years in the reserve (130,000 men in time of war). For a considerable time past, the General Staff has demanded obligatory military service, 180,000 men in time of war, and the abolition of the principle of substitution. Of the political parties, the Catholics object to obligatory service and to increase of the army, while cordially advocating an army of volunteers and a reduction of the numbers with the colours. The Liberals uphold obligatory service with a reduction of the years with the colours. The Radicals and Socialists demand an army on the model of the Swiss. In 1887 the entrenched camps of Liége and Namur were formed. Until that date Belgium only possessed one entrenched camp, that of Antwerp (1859), which has since then been frequently enlarged. In 1897, the *garde civique*, a kind of *garde nationale*, was reorganized, and the Government endeavoured to give it the character of a reserve force to assist the army in defending the fortresses. The Government, in July 1901, laid before the Chamber a military Bill, which had for its object a reduction of the time of active military service, a large extension of voluntary service, and an increase of the annual contingent of 13,300 men in case only the volunteers do not join in sufficient numbers. This Bill did not abolish the principle of substitution, a reform demanded by the Liberals and the Socialists, nor did it seriously increase the effective strength of the army in time of war, a measure which was considered indispensable by the Military Commission of 1900-1901. (See ARMIES.)

Commerce.

The system of commercial liberty and treaties of commerce, established by M. Frère-Orban in 1861, is still of practical value in its main features. It is of vital importance to Belgium, a country of great industrial production and of dense population. To this system, in fact, Belgium owes her material prosperity. Nevertheless, protectionist tendencies, which took their rise among the agriculturists, have recently gained ground. Since 1887 duties have been imposed upon imported live animals and dead meat; and since 1895 duties upon barley, oats, &c., have either been imposed or the old ones increased.

Of six millions of inhabitants, according to the census of 1890, two and a half millions spoke French, or one of

its dialects—namely, Walloon; and two and three-quarter millions, Flemish. The linguistic frontier runs from west to east (from Comines, lying to the north of Lille, to Visé, to the north of Liége). The sole official language of the country from the 15th century to within the last few years was French (with the exception of the Dutch period, 1814-30). But the Flemish have by degrees succeeded in obtaining for their language an equal footing with French for official business. The introduction of universal suffrage has enhanced the strength of the Flemish movement, because the Deputies of Northern Belgium are now elected by citizens, of whom four-fifths are ignorant of French; indeed, in 1900 there was one Deputy who did not even understand that language. Some of the principal laws on the subject are these—use of Flemish in the law courts (1873); in the documents of public administrations (1878); and in middle-class schools (1883); promulgation of laws in both languages (1898).

Language.

Belgium of the present day affords a picture of a rapid and general transformation. Politically, it is becoming a democracy; economically, thanks to the development of its industries within, and of its commerce and colonial enterprise without, it is one of the wealthiest and most energetic nations of Europe. Its economic progress has determined its political transformation. Situated at the meeting-point of three great civilizations, whose influences it at once feels and assimilates, Belgium is becoming more and more a microcosm of Europe, an active laboratory of political, economic, and social experiences.

The political relations subsisting between Belgium and the Congo State date from 1885, when Leopold II., president of the African International Association, received at the Berlin Congress the sovereignty of the African State. The Chambers at once and almost unanimously authorized the King to accept this mandate. In 1890 King Leopold communicated to Parliament a clause in his will by which, on his death, he devised his African possessions to Belgium. In 1895 the Government deposited a Bill in the Chamber making the Congo State a Belgian Colony. The introduction of this Bill had been preceded by the conclusion of two conventions; one between Belgium and the Independent State, and the other between Belgium and France by which the latter declared that she did not oppose the cession of the State to Belgium, reserving, however, to herself the right to pre-emption should, in the future, Belgium dispose of either the whole or part of her African colony. In view of the violent opposition of the Socialists and of certain Catholics, the Ministry withdrew the Bill. Various laws have associated Belgium in the task of governing the Congo. A law of 1887 authorized the Congo State to issue in Belgium a loan to the amount of 150,000,000 f. Subscriptions were in 1889-95 invited for shares in the railway from Matadi to Stanley Pool, which was opened in 1898. A loan of 25,000,000 f. to the Independent State (1891) was in 1895 increased by a second loan of 6,850,000 f. In return, Belgium obtained the right to elect, in 1900, whether these advances should be repaid or whether the Congo State should be annexed. The Belgian Government was not, however, obliged to come to a decision on the date fixed. In accordance with the Government of the Congo State, the Belgian Government, in July 1901, passed a convention through Parliament, by virtue of which the Congo State is dispensed from payment of its debt to Belgium until an indeterminate date. Belgium reserves its right to annex the Congo at a date equally indeterminate. The Government, moreover, promised to bring in a Bill regulating the relations between Belgium and the Congo, in the event of the annexation of the latter.

The Congo State.

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LITERATURE.

Belgian literature, as distinguished from French, has come about through a fusion of two elements, the Flemish and the Walloon, which make up what we call the Belgian race; and it is only somewhat recently that any attempt has been made in literature to fuse these two elements. The Walloon, which is related to the French, brings a nervous sensibility, a delicate mental energy, while the Flemish, which is related to the Dutch, brings a slow, profound faculty of meditation, an almost primitive simplicity, together with a gross animal fervour, deeply rooted in the earth. Belgium is the country of Ruysbroeck and of Rubens, of the most spiritually abstract of mystics, and of the most carnal of the painters of life. In Belgian literature, coming into existence under that twofold influence, one becomes conscious at once of the body and of the soul, each interpenetrating the other in a constantly realized communion with nature. Beginning unconsciously, and under definitely French influences, Baudelaire, Zola, for example, a group of Belgian writers began to detach themselves from the various schools of France; their first public proclamation of a new literature may be dated from the banquet given in 1883 to Camille Lemonnier. Lemonnier had already found out a way for himself, on definitely Flemish soil; Maeterlinck began to concern himself with the soul; Eekhoud with the strange passions of the body; Verhaeren with whatever was most coloured and violent in body and soul and the external world; Rodenbach with the aged quietude of the little dead cities of his country. It was as if a sluggish body had become possessed of an unexpectedly powerful life; as if restless nerves had come to awaken a stolid nature. It was thus a new quality of imagination which seemed to reveal itself, as the soul became conscious of the mystery of the universe, and the body shivered at new fears, apprehensions, the haunting of a forgotten spiritual sense. It was the soul coming into a literature of mind, and at once the literature of Belgium was distinguished from the literature of France.

Camille Lemonnier (born 24th March 1855), though he may have learned something of his method from Zola, is himself a personal force, and perhaps the first personal force to show itself in Belgium. Beginning as an art-critic, his first characteristic books are the *Contes Flamands et Wallons* and *Un Coin de Village* of 1879. Then came *Les Charniers*, 1881; *Un Mâle*, 1881; *Le Mort*, 1883; *Happe-Chair*, 1886; *La Faute de Madame Charvet*, 1895; *L'Ile Vierge*, 1896; *Adam et Eve*, 1896; *La Petite Femme de la Mer*, 1897, &c. His best novels, such as *Un Mâle*, are full of a great, healthy, animal life; the life of the earth, rudely yet subtly apprehended, as if by an instinct very close to nature. He knows the peasant, in all his simplicity, brutality, uncouth vigour.

He gives us the peasant as a human being, the most elemental of human beings. His descriptions are so admirable because they are so human. His men and women are admirable because they are seen as a part of the same substance as the woods and fields they move in, not as social items. They live, love, act, as they do, because a mysterious force, of which they are for the most part unconscious, is in them; the same mysterious force which germinates in the furrows which they turn. And so he has surprising naïvetés, can be gross, accepts no compromises, and yet is full of restraint, of a kind of dignity, the strong man's mastery over his own strength. His style is large, coloured, vividly sober, always firm and decisive, always the faithful interpreter of his thought or sensation.

Maurice Maeterlinck was born 29th August 1862. His first book was a collection of verses, *Serres Chaudes*, 1889; this was followed by *La Princesse Maleine*, 1889; *Les Aveugles*, 1890; *Les Sept Princesses*, 1891; *Pelléas et Mélisande*, 1892; *Alladine et Palomides*, 1894; *Le Trésor des Humbles*, 1896; *Aglavaine et Sélysette*, 1896; *La Sagesse et la Destinée*, 1898; *La Vie des Abeilles*, 1901. Maeterlinck, though he began with plays, and has only latterly written essays, is rather a philosopher who has turned dramatist than a dramatist who has turned philosopher. A brooding poet, a mystic, a contemplative spectator of the comedy of death: that is how he presents himself to us in his work, and the introduction which he has prefixed to his translation of *L'Ornement des Noces Spirituelles* of Ruysbroeck l'Admirable shows how deeply he has studied the mystical writers of all ages, and how much akin to theirs is his own temper. In his plays he is always concerned with spiritual issues, with action as it might be seen in dreams, with a world reflected in a chamber of mirrors, with disembodied passions and the tragedies of childish and ghostly souls. He has invented a whole theatre of marionettes, who are more mysteriously simple than human beings; he has made the stage at once more subjective and more pictorial than it ever was before. In his essays he is content to speak with his own voice, and his own voice is more beautiful, and has more beautiful and profound things to say, than the feigned voices of his characters. Speaking without intermediary, he speaks with a more absolute abandonment of every convention of human reserve, except the reserve of an extreme fastidiousness in the choice of words simple enough and sincere enough to convey exactly his meaning, more spontaneously, it would seem, than any writer since Emerson. His essays might well be the favourite reading of those to whom beauty must come with a certain dogmatism, if it is to be accepted for what it is.

The poetry of Emile Verhaeren (born 21st May 1855), more than that of any other modern poet, is made directly out of the complaining voices of the nerves. In his early books, *Les Flamandes*, 1883; *Les Moines*, 1886, he began by solid, heavily-coloured *genre* pictures in the Flemish style. But it is not until *Les Soirs*, 1887, that we find what was to be his really individual style developing itself. In *Les Débâcles*, a year later, this art of writing in coloured and audible metaphor, and on increasingly abstract and psychological subjects, the sensations externalized, has become more master of itself, and at the same time more immediately the servant of a more and more feverishly nervous organization. In *Les Flambeaux Noirs*, 1890, there is a self-analysis, a kind of self-torture, which conveys to one the sense of all that is most solitary, picturesque, and poignant in the transformation of an intensely active and keen-sighted reason into a thing of conflicting visionary moods. Gradually, in *Les Apparus dans mes Chemins*, 1891; in *Les Campagnes Hallucinées*, 1893; in *Les Villages Illusoires*, 1895; in *Les Villes Tentaculaires*, 1895, the hallucinations become entirely external; it is now the country, the village, the town, that is to say, the whole organized world, which agonizes among cloudy phantoms, and no longer a mere individual, abnormal brain. With *Les Heures Claires*, 1899, we see him, in these poems of fiery reverie, sending his soul into the universe, and becoming a vehement voice for all that he finds most passionate in it. It is, in its way, a dramatizing of emotion, but, if one may say so, an abstract dramatizing. In his two plays, *Les Aubes*, 1898, and *Le Cloître*, 1900, he tries to give a more lyrical form to the new subjective kind of drama which Maeterlinck has made possible, giving us, in his brief and fiery scenes, little broken bits of the savage forces of the world, working out their passionate issues in a conflict of cities, or under the quiet roofs of the cloister. His latest collection of poems is *Petites Légendes*, 1900. What he has so far achieved is a melodrama of the spirit; there is poetry in it, as there is in everything written by the only contemporary writer of French verse who has a really vivid energy, but there is rhetoric as well as poetry.

Georges Eekhoud (born in 1854) is in some ways the most passionately Flemish of the Belgian group, partial and imperfect as he is. In his *Kermesses*, 1883; *Nouvelles Kermesses*, 1887; *Le Cycle Patibulaire*, 1892; *Mes Communions*, 1895; *Escal-Vigor*, 1899; *La Faneuse d'Amour*, 1900, he has evoked, in a prose more feverish than the verse of Verhaeren, the image of all that is most excessive, outcast, extravagant, in the life of his country. He writes the tragedies of those whom their own natures, or the misery of circumstance, have brought into conflict with society. He writes with a kind of fury of sympathy, a sort of perverse ecstasy, as if he delighted in the sorrows for which he has so revolutionary a pity. Every story is a little violent episode, full of cruelty and compassion. The life of the people comes into his pages with all its exuberance, colour, disorder, its pell-mell of noble and abominable sentiments, its gross joys and sordid disasters; life so vehemently realized that it seems, in these pages, to overflow all bounds. He is impatient with words, as with acts; his words seem to reel under some airy intoxication; he writes always at full speed. All his work is a kind of confession, in which he seems to unburden himself of a heart-load of hates and sympathies, dramatizing his own emotions into incidents of an only too vigorous externality.

In Georges Rodenbach (born 16th July 1855, died 25th December 1898) we find the sleepy spirit of Bruges, that other side of what is typically Flemish, and the titles of his books are themselves significant of the aspect under which he saw his corner of the world: *Le Règne du Silence*, 1891; *Bruges-la-Morte*, 1892; *Les Vies Encloses*, 1896; *Le Carillonneur*, 1897; *Le Miroir du Ciel Natal*, 1898. His best known book, *Bruges-la-Morte*, is an attempt to study the soul of a town, which he evokes with an almost feminine delicacy of perception. His prose and verse are pallid, elegant, monotonous with a kind of sweet monotony; they are sincere to a certain aspect of Belgian life, and to a personal way of receiving sensation, but they have none of the energy of a temperament able to dream strongly. They have charm, but it is a drowsy charm, a little conscious of the effectiveness of its languor; they are like faint pictures, not faded by time, but painted with timid colours.

By the side of these writers, or preceding them, as with Charles de Coster, Octave Pirmez, Théodore Hannon, are many writers whom space forbids to do more than mention; but an account of Belgian literature would not be complete without at least mention of the names of Edmond Picard, Eugène Demolder, Charles van Lerberghe,

Max Elskamp, Albert Giraud, Fernand Severin, and Albert Mockel. (A. Sy.)

Belgrade (Servian, *Beograd, i.e., White Castle*), the capital of Servia, situated in 44° 47′ N., and 20° 28′ E. Belgrade in 1895 contained 59,790 inhabitants, of whom 11,471 were foreigners, mostly Austro-Hungarian and Turkish subjects. The number of houses in 1895 was 5317, of which 156 were governmental and 67 municipal buildings. It is the most important commercial town in Servia, and one of the more important of the whole Balkan peninsula. It is situated at the confluence of two great rivers, the Save and the Danube, on a triangular ridge of which the southern base, having in its centre the pyramid of the Avala hill, leans on the northern slopes of the mountains of Central Servia (called Shumadiya). The north-western side of the triangle slopes towards the Save, while the north-eastern side descends slowly to the right bank of the Danube. The northern end of the ridge is formed by a cliff of Tertiary chalk, about 200 feet high, on which the citadel (*grad*) is built. The western side of the cliff is washed by the Save, which, coming from the west, there falls into the Danube. This latter, coming from the north, turns at the foot of the citadel in an easterly direction. Just opposite the citadel, in a north-westerly direction, half-an-hour by steamer across the Danube, lies the Hungarian town Zimony (Serv. *Zemun;* Germ. *Semlin*), which in many respects may be considered as a suburb of Belgrade. The position of Belgrade has been always considered as of great strategical, political, and commercial importance. The city was considered to be the key of Hungary, and its possession was believed to secure possession of Servia, besides giving command of the traffic between the Upper and the Lower Danube. It has, in consequence, seen more battles under its walls than most fortresses in Europe. The Turks used to call it "*Darol-i-Djehad*," "the home of wars for faith." As the royal residence, the seat of the government, and the centre of the import trade, Belgrade is being rapidly transformed into a modern European town, with wide streets, electric tramways, and electric lighting. The glacis of the citadel has been converted into a beautiful park, from which there are lovely views. Another popular resort is the park of *Topchider*, with an old Turkish kiosk of Prince Milosh situated in beautifully-laid-out grounds. In the adjoining forest of lime-trees, called *Koshutnyak* (Parc-aux-Cerfs), Prince Michael was assassinated in 1868. The highest educational establishments are to be found in Belgrade: the "Velika Shkola" (a small university with three faculties), the military academy, the theological seminary, the high school for girls, a commercial academy, and several schools for secondary education on German models. A commercial tribunal, a court of appeal, and the Court of Cassation are also in Belgrade. There is a fine monument to Prince Michael, who succeeded in removing the Turkish garrison from the Belgrade citadel and obtaining other Turkish fortresses in Servia by skilful diplomacy. There are no monumental buildings in the town, still there are several fine architectural structures, the New Palace, the High School, the National Bank, and the National Theatre. There is also an interesting national museum, with Roman antiquities and numismatic collections, a national library with some 40,000 volumes, with a wealth of old Servian MSS., and a botanical garden, rich in specimens of the Balkan flora. To promote commerce there is a stock and produce exchange (*Berza*), a national bank, privileged to issue notes, and several banking establishments. The insurance work is done by foreign companies, amongst which the Gresham and the North British occupy foremost places. For a town of nearly 60,000 inhabitants and of such political and commercial importance, which is also the seat of the Metropolitan of Servia, Belgrade has very few churches, and these are of a somewhat modest type. There are four Servian Orthodox churches, one Roman Catholic chapel, one evangelical chapel (German), one synagogue, and one mosque. This last is kept up entirely at the expense of the Servian Government.

The first fortification of the rock, at the confluence of the Save and the Danube, was made by the Celts in the 3rd century B.C. They gave it the name of *Singidunum*, by which Belgrade was known until the 7th century A.D. The Romans took it from the Celts, and replaced their fort by a regular Roman castrum, placing in it a strong garrison. Roman bricks, dug up in the fortress, bear the inscription, *Legio IV. Flavia Felix*. From the 4th to the beginning of the 6th century A.D. it often changed its masters (Huns, Sarmatians, Goths, Gepids); then the emperor Justinian brought it once more under Roman, or rather Byzantine, rule, and fortified and embellished it. Towards the end of the 8th century it was taken by the Franks of Charlemagne. In the 9th century it was captured by the Bulgarians, and held by them until the beginning of the 11th century, when the Byzantine emperor Basilius II. reconquered it for the Greek empire. The Hungarians, under king Stephen, took it from the Greeks in 1124. From that time it was constantly changing hands—Greeks, Bulgarians, Hungarians, replacing each other in turn. During the 14th century it was in the hands of the Servian kings. The Servian prince George Brankovich ceded it to the Hungarians in 1427. The Turkish forces unsuccessfully besieged the city in 1444 and 1456, on which last occasion a glorious victory was obtained by the Christian garrison, led by the famous John Hunyady and the enthusiastic monk John Capistran. In 1521 Sultan Suleyman took it from the Hungarians, and from that year it remained in Turkish possession until the year 1687, when the Austrians captured it, only to lose it again in 1690. In 1717 Prince Eugene of Savoy conquered it for Austria, which kept it until 1739, improving the fortifications and giving great impulse to the commercial development of the town. From 1739 to 1789 the Turks were again its masters, when, in that last year, the Austrians under General Laudon carried it by assault, only to lose it again in 1792. In 1807 the Servians, having risen for their independence, forced the Turkish garrison to capitulate, and became masters of Belgrade, which they kept until the end of September 1813, when they abandoned it to the Turks. Up to the year 1862 not only was the fortress of Belgrade garrisoned by Turkish troops, but the Danubian slope of the town was inhabited by Turks, living under a special Turkish administration, while the modern part of the town (the plateau of the ridge and the western slope) was inhabited by Servians living under their own authorities. This dual government was a constant cause of friction between the Servians and the Turks, and on the occasion of one conflict between the two parties the Turkish commander of the fortress bombarded the Servian part of the town (14th June 1862). The indirect consequence of this incident was that in 1866, on the categoric demand of Prince Michael of Servia, and under the diplomatic pressure of the Great Powers, the Sultan withdrew the Turkish garrison from the citadel and delivered it to the Servians. (C. Mi.)

Belize. See Honduras, British.

Bell, Alexander Graham (1847-——), inventor and physicist, son of Alexander Melville Bell (*q.v.*), was born in Edinburgh on 3rd March 1847. He was educated at the University of Edinburgh and the University of London, and removed with his father to Canada in 1870. In 1872 he removed to Boston, and became professor of vocal physiology in Boston University. In 1876 he exhibited an apparatus embodying the results of his studies in the transmission of sound by electricity, and his invention, with improvements and modifications, constitutes the modern commercial telephone (see *Ency. Brit.* vol. xxiii. p. 128). He is the inventor also of the photophone (see vol. xxiii. p. 130), an instrument for transmitting sound by variations in a beam of light.

Bell, Alexander Melville (1819-——), teacher and phonetist, was born at Edinburgh on 1st March 1819. Between 1843 and 1865 he was a lecturer at the University and New College of his native city. He was subsequently a lecturer at University College, London, and professor of philology and linguistics in Queen's University, Kingston,

In 1881 he removed to Washington, D.C. He is best known as the inventor of "visible speech" (see *Ency. Brit.* vol. xxii. p. 385), a system of indicating by alphabetical characters the utterances and modes of action of the human organs of speech. Among his writings are *Visible Speech, Principles of Phonetics*, and several books on elocution.

Bellagio, a town in the province of Como, Lombardy, Italy. It is beautifully situated at the tip of the peninsula which separates the two southern arms of Lake Como, and on this account is a favourite tourist resort. Its picturesque surroundings are studded with handsome villas (*e.g.*, Serbelloni, Melzi, &c.), and parks and gardens. The people are employed in turnery, and in the manufacture of silk, woollens, and cement. Population, about 3500.

Bellaire, a city of Belmont county, Ohio, U.S.A., situated in the eastern part of the state, on Ohio river, 5 miles south of Wheeling, at an altitude of 654 feet. It is entered by the Baltimore and Ohio, the Bellaire, Zanesville and Chicago, the Cleveland, Lorain, and Wheeling, and the Pennsylvania railways. Population (1900), 9912.

Bellamy, Edward (1850-1898), American author and social reformer, was born at Chicopee Falls, Massachusetts, 25th March 1850. He studied for a time at Union College and in Germany; was admitted to the bar in 1871; but soon afterwards entered upon journalistic work in Springfield, Massachusetts, and New York. After publishing three novelettes, pleasantly written, and showing some inventiveness in situation, but attracting no special notice, in 1888 he caught the public attention with *Looking Backward*, 2000-1887, in which he set forth ideas of co-operative or semi-socialistic life in village or city communities. The book was at first judged merely as a romance, but was soon accepted as a statement of the deliberate wishes and methods of its author, who devoted the remainder of his life, as editor, author, lecturer, and politician, to the spread of what he called "nationalism," his ideal being, in the opinion of M. Emile de Laveleye, "pure communism." Bellamy died at Chicopee Falls on the 22nd of May 1898. *Looking Backward* was widely circulated in America and Europe, and translated into several foreign languages.

Bellary (Ballari), a city and district of British India, in the Madras Presidency. The city is 305 miles by rail from Madras. Population (1881), 53,460; (1891), 59,467; (1901), 57,700. The municipal income in 1897-98 was Rs.1,00,050. Bellary is an important cantonment, and the headquarters of a military division. There is considerable trade in cotton, with two large steam presses, and some manufacture of cotton cloth. There is also a cotton mill, with 110 looms and 17,800 spindles, employing 456 hands. There are a missionary college, three high schools for boys, with 725 pupils, nine printing-presses, which issue three vernacular periodicals, and several reading-rooms and literary institutions. In 1901 Bellary was chosen as one of the places of detention in India for Boer prisoners of war.

The district of Bellary has an area of 5975 square miles. The population in 1891 was 900,126, being 151 persons per square mile. Classified according to religion, Hindus numbered 807,597; Mahommedans, 85,770; Christians, 5283, of whom 1124 were Europeans; Jains, 1463; "others," 13. In 1901 the population was 947,329, showing an increase of 8 per cent. The total amount of the land revenue and rates was Rs.19,64,992, the incidence of assessment being nearly 14 annas per acre; the number of police was 701. In 1897-98, out of a total cultivated area of 2,146,624 acres, 68,595 were irrigated, including 23,280 from Government canals. The principal crops are millet, other food-grains, pulse, oil-seeds, and cotton. There are considerable manufactures of cotton and woollen goods, and cotton is largely exported. The district is traversed by the Madras and Southern Mahratta railways, meeting on the eastern border at Guntakal junction, where another line branches off to Bezwada. In 1896-97 the number of schools was 1035, attended by 24,186 pupils, being one pupil to every 37 of the population. In spread of education Bellary ranks third among the rural districts of the province. The death-rate in 1897 was 31·2 per 1000.

Bellefontaine, a city of Ohio, U.S.A., capital of Logan county, north-west of the centre of the state, at the intersection of three railways. Population (1900), 6649.

Belleville, capital of St Clair county, Illinois, U.S.A., situated in the south-western part of the state, in 38° 29′ N. lat., and 89° 58′ W. long., at an altitude of 527 feet. It has four railways—the Illinois Central; the Louisville and Nashville; the Louisville, Evansville, and St Louis; and the St Louis, Belleville, and Southern; affording connexions in all directions. It is in the Southern Illinois coal-field, and has a large commerce in coal. It also has copper-refining works. Population (1880), 10,683; (1890), 15,361; (1900), 17,484.

Belleville, a city and port of entry of Ontario, Canada, and capital of Hastings county, 106 miles E.N.E. of Toronto, on Bay of Quinté and the Grand Trunk railway. Communication is maintained with Lake Ontario and St Lawrence ports by several lines of steamers. It is the commercial centre of a fine agricultural district, and has a large export trade in cheese and farm produce. There are several educational institutions, including Albert College, Ontario Business College, a convent, and an institute for the deaf and dumb, supported by the Government. The principal industries are cabinet and sewing-machine factories, grist and saw-mills, and distilleries. The exports for 1899-1900 were $1,691,935, and the imports were $460,326. Incorporated as a city in 1878, the population in 1881 was 9516, and in 1901 was 9117.

Belleville boilers. See Boilers.

Bellevue, a city of Campbell county, Kentucky, U.S.A., on the south bank of the Ohio river, in the northern part of the state, near Cincinnati, Ohio, and adjoining Newport, Kentucky. Population (1900), 6332.

Belley, chief town of arrondissement in department of Ain, France, 47 miles S.E. of Bourg, on railway from St André-le-Gay to Virren-le-Grand, pleasantly situated between vine-covered hills about 3 miles from the right bank of the Rhone. Indian cottons and muslin are manufactured, and there is trade in cattle, fowls, and truffles. The best lithographic stone is found in the vicinity. The town is of Roman origin, and in the 5th century became an episcopal see, and the capital of the province of Bugey. In 1385 it was almost entirely destroyed by an act of incendiarism, but was subsequently rebuilt by Duke Amadeus VIII. of Savoy. A stone with a curious inscription commemorating its destruction was buried in the foundation of the bishop's palace. Population (1876), 3499; (1896), 3753, comm., 4687; (1901), 6467.

Bellinzona, now the sole political capital of the Swiss canton of Tessin or Ticino. It is on the St Gothard railway, 95½ miles from Lucerne, while a branch line of 13¾ miles leads from Bellinzona to Locarno. Bellinzona is a picturesque and thoroughly Italian little town. Population (1888), 3290; (1901), 5047.

Belluno, a town and episcopal see and capital of the province of Belluno, Venetia, Italy, on the river Piave, 72 miles by rail N. from Venice. It has a museum with numismatical, mineralogical, and other collections, and a technical school (1879). There are also mineral springs and a hydropathic (1483 ft.). Population (1881) 15,660, (1901) 18,649; of province (1891) 174,140, (1901) 191,400.

Beloit, a city of Rock county, Wisconsin, U.S.A., situated in 42° 30′ N. lat., and 89° 11′ W. long., in the southern part of the state, on Rock river, at an altitude of 744 feet. It has two railways, the Chicago and North-Western, and the Chicago, Milwaukee, and St Paul. Beloit College, a Presbyterian institution, was founded in 1846. It has a faculty of 20 professors and about 400 students. Beloit was settled in 1835, and received a city charter in 1856. Population (1880), 4790; (1890), 6315; (1900), 10,436.

Belper, a market town and railway station, in the Mid parliamentary division of Derbyshire, England, on the Derwent, 7 miles N. of Derby. The church of St Peter has been restored, and an Anglican convent, a mission church, and a public hall erected. The nail trade has declined, but there are now large cotton mills, hosiery works, foundries, and engineering works. Area of township (an urban district), 3183 acres; population (1881), 9875; (1901), 10,934.

Belvidere, a city of Illinois, U.S.A., capital of Boone county, on the Kishwaukee river and at the intersection of two lines of the Chicago and North-Western railway, in the northern part of the state. Population (1890), 3867; (1900), 6937.

Benares, or VARANASI, a famous city of British India, in the North-West Provinces, which gives its name to an administrative district and a division. The city is situated in 25° 18′ N. lat., and 83° 3′ E. long., 421 miles N.W. from Calcutta, on the left bank of the Ganges. The area (exclusive of cantonments) is 3448 acres. The population in 1881 was 214,758; in 1891 it was 219,467; and in 1901 it was 203,095. The municipality consists of 25 members, of whom 18 are elected, with the district magistrate as *ex officio* chairman. The municipal income in 1897-98 was Rs.4,93,238, of which just half was derived from octroi; the incidence of taxation was R.1:12:1 per head. A considerable debt has been incurred for waterworks and drainage. In 1897-98 the total quantity of water pumped into the mains was 695,000,000 gallons; and the average daily consumption was 9 gallons per head. The death-rate in 1897 was 58·63 per 1000, comparing with a mean of 46·64 for the previous five years. In the early months of 1901 the city was visited by an outbreak of plague. The modern temples number 1454. The most conspicuous buildings are the mosque of Aurangzeb and the observatory of Raja Jai Singh. The European quarter of Benares lies to the west of the native town, on both sides of the river Barna. Here is the cantonment of Sikraul, no longer of much military importance; and the suburb of Sigra, the seat of the chief missionary institutions. Among recent buildings are the town hall, of red stone, erected at the sole cost of the Maharaja of Vizianagram, to commemorate the visit of Prince Alfred in 1870; the Carmichael Library, built mainly by the same nobleman in 1874; and the Prince of Wales Hospital, erected by public subscription to commemorate the visit of the prince in 1876. Benares conducts a flourishing trade by rail and river with the surrounding country. It is the junction between the Oudh and Rohilkhand and East Indian railways, the Ganges being crossed by a steel girder bridge of seven spans each 350 feet long. The chief manufactures are silk brocades, gold and silver thread, gold filigree work, jewellery, embossed brass vessels, and lacquered toys. The Queen's College was attended in 1896-97 by 157 students. In addition, the Sanskrit College, founded by Warren Hastings, had 370 students. This institution is active in the publication of Sanskrit texts. There are also many efficient schools, some of which are supported by missionary and native bodies. The number of printing presses is about 50, publishing 5 newspapers. There are about 15 literary societies, of which the Carmichael Library receives a grant of Rs.300 from the municipality.

The district of BENARES, which extends over both sides of the Ganges, has an area of 1099 square miles. The population in 1891 was 921,943, being 912 persons per square mile. Classified according to religion, Hindus numbered 831,782; Mahommedans, 88,401; Christians, 1364, of whom 727 were Europeans; "others," 396. In 1901 the population was 882,972, showing a decrease of 4 per cent. The land revenue and rates were Rs.10,05,822, the incidence of assessment being R.1:6:1 per acre; the number of police was 2450. The district is under permanent settlement. In 1896-97, out of a total cultivated area of 396,466 acres, 136,647 were irrigated from wells, &c. There are no Government canals. The principal crops are barley, rice, wheat, other food-grains, pulse, sugar-cane, and opium. The main line of the East Indian railway runs through the southern portion of the district, with two stations and a branch to Benares city; the Oudh and Rohilkhand railway through the northern portion, starting from the city, with three stations.

The division of BENARES has an area of 10,414 square miles. The total population in 1891 was 5,368,774, being an average of 515 persons per square mile. In 1901 the population was 5,032,699, showing a decrease of 6 per cent. The aggregate land revenue, which is permanently assessed, amounts to Rs.44,38,308, the average incidence being Rs.0:14:4 per head of population, and Rs.0:14:10 per acre of total area.

Bencoolen (Dutch *Benkoelen*), a Dutch residency on the south-west coast of Sumatra extending from 2° 30′ S. lat. to 5° 8′ S., and separated by the Barisan mountains from Palembang and Lampong. Its area is 9426 square miles. The bays of the coast are but slight indentations and the rivers small. The chief products are rice, pepper, tobacco, cotton, and *gambier*. There is considerable fishing. Since the abolition of forced labour (1878) and the substitution of taxation, the residency has made progress. Bencoolen, the capital, is on the coast near the island of Pulu Tiku (or Rat Island). The population of the town is about 5000, of the residency 158,767, including 146 Europeans, 659 Chinese, and 43 Arabs and other Asiatic foreigners.

Bendigo, the official name of SANDHURST, a city of Victoria, Australia, in the county of Bendigo, on the main line of railway between Melbourne and Echuca, 101 miles by rail N.N.W. from Melbourne. It is the centre of a large gold-mining district, which is also noted for its wines and agricultural produce. The deepest shaft in the colony is the Lazarus, which is 3424 feet in depth, and is still being sunk. There are several handsome public buildings, including the government offices, law courts, and town hall, and various industries, the manufacture of Epsom pottery being specially noteworthy. The output of gold in the district, in 1899, was 235,596 ozs. Bendigo was proclaimed a municipality in 1855, a borough in

1863, and a city in 1871. Its water supply is excellent, and the street mains have a total length of 100 miles. Altitude, 758 feet. Mean temperature for the year, 58·7° F.; for January, 72·3°; for July, 46·1°; rainfall (16 years), 23·85 inches. Population (1881), 28,153; (1891), 26,774; (1901), 31,020.

Benedek, Ludwig (1804-1881), Austrian general, was born at Odenburg in Hungary on 14th July 1804, his father being a medical man. He received his commission in the army as ensign in 1822. In 1846 he was engaged in suppressing the rising of Polish peasants in Galicia; he fought with great distinction during the Italian campaigns of 1848-49; was advanced to the rank of major-general, and took a leading part in the campaign of 1849 in Hungary, during which he was wounded. In the war of 1859 he commanded the eighth army corps, and in the battle of Solferino, where he held the right of the Austrian position, he succeeded in repulsing the attack of the Piedmontese. This success had little effect on the general course of the battle, but it confirmed his reputation as a fighting general and won him great popularity, which, owing to the prevailing discontent with the reactionary and clerical government of previous years, was increased by the fact that he was a Protestant and not of noble birth. He was made *Feldzeugmeister* and commander-in-chief of the Austrian army in Venetia. When war with Prussia was imminent he was with general approbation appointed to command the northern army which was to be concentrated in Bohemia. It was a post he did not himself desire, as he had no intimate knowledge of the country, and did not feel confidence in his capacity to direct operations on so large a scale. Though an admirable leader in battle, he had no scientific military education. It was, however, impossible for him to refuse the personal commands of the emperor and the requests of the Archduke Albrecht. The Austrian concentration was, however, not completed when war broke out, and during the first few days, instead of using the advantage which otherwise they might have secured by the possession of the inner lines, the Austrian armies were defeated in detail in a number of engagements fought between 24th June and 1st July; at Münchengrätz, Gitschin, Nachod, Trautenau, and Kalitz. Benedek, therefore, telegraphed to the emperor advising him to make peace; the emperor refused on the ground that no decisive battle had been fought; Benedek, thereupon, instead of retreating across the Elbe, determined to bring on a decisive engagement, and took up a position with the whole of his forces (210,000 men) near Königgrätz with the Elbe in his rear. Here he was completely defeated by the Prussians on 3rd July, but he succeeded in effecting his retreat on the evening of the battle across the river. He was at once suspended from his command and a court-martial ordered; the emperor, however, in December determined that the inquiry should be suspended. Benedek from this time lived in absolute retirement, and in obedience to the emperor's orders made no attempt to defend himself. While the indecision which he showed during the first few days of the war to a great extent caused him to lose the confidence of the army and prepared the way for the catastrophe of 3rd July, he was undoubtedly much impeded by the defects of the Austrian organization, as well as by the reluctance with which the representatives of the greatest Austrian families saw themselves placed under the command of a man who belonged to the middle class. The official account of the campaign, *Oesterreich's Kämpfe* 1867 (French translation *Les luttes d'Autriche*), probably for this reason leaves much to be explained as to the conduct of the war. The fullest account of Benedek's life and of the campaign of 1866 will be found in FRIEDJUNG, *Der Kampf um die Vorherrschaft in Deutschland*, Stuttgart, 1897. (J. W. HE.)

Benedetti, Vincent, COUNT (1817-1900), French diplomatist, was born at Bastia, in the island of Corsica, on 29th April 1817. In the year 1840 he entered the service of the French Foreign Office, and was appointed to a post under the marquis de la Valette, who was consul-general at Cairo. He spent eight years in Egypt, being appointed consul in 1845; in 1848 he was made consul at Palermo, and in 1851 he accompanied the marquis, who had been appointed ambassador at Constantinople, as first secretary. For fifteen months during the progress of the Crimean war he acted as chargé d'affaires. In the second volume of his essays he gives some recollections of his experiences in the East, including an account of Mehemet Ali, and a (not very friendly) sketch of Lord Stratford de Redcliffe. In 1855, after refusing the post of minister at Teheran, he was employed in the Foreign Office at Paris, and acted as secretary to the Congress at Paris (1855-56). During the next few years he was chiefly occupied with Italian affairs, in which he was much interested, and Cavour said of him he was an Italian at heart. He was chosen in 1861 to be the first envoy of France to the king of Italy, but he resigned his post next year on the retirement of Thouvenel, who had been his patron, when the anti-Italian party began to gain the ascendancy at Paris. In 1864 he was appointed ambassador at the court of Prussia.

Benedetti remained in Berlin till the outbreak of war in 1870, and during these years he played an important part in the diplomatic history of Europe. His position was a difficult one, for Napoleon did not keep him fully informed as to the course of French policy. In 1866, during the critical weeks which followed the attempt of Napoleon to intervene between Prussia and Austria, he accompanied the Prussian headquarters in the advance on Vienna, and during a visit to Vienna he helped to arrange the preliminaries of the armistice signed at Nikolsburg. It was after this that he was instructed to present to Bismarck French demands for "compensation," and in August, after his return to Berlin, as a result of his discussions with Bismarck a draft treaty was drawn up, in which Prussia promised France her support in the annexation of Belgium. This treaty was never concluded, but the draft, which was in Benedetti's handwriting, was kept by Bismarck and published in 1870. During 1867 he was much occupied with the affair of Luxemburg. In July 1870, when the candidature of the prince of Hohenzollern for the throne of Spain became known, Benedetti was instructed by the duc de Gramont to present to the king of Prussia, who was then at Ems, the French demands, that the king should order the prince to withdraw, and afterwards that the king should promise that the candidature would never be renewed. This last demand Benedetti submitted to the king in an informal meeting on the promenade at Ems, and the misleading reports of the conversation which were circulated were the immediate cause of the war which followed, for the Germans were led to believe that Benedetti had insulted the king, and the French that the king had insulted the ambassador. Benedetti was severely attacked in his own country for his conduct as ambassador, and the duc de Gramont attempted to throw upon him the blame for the failures of French diplomacy. He answered the charges brought against him in a book, *Ma Mission en Prusse*, Paris, 1871, which still remains one of the most valuable authorities for the study of Bismarck's diplomacy. In this Benedetti successfully defends himself, and shows that he had kept his Government well informed; he had even

warned them a year before as to the proposed Hohenzollern candidature. Even if he had been outwitted by Bismarck in the matter of the treaty of 1866, the policy of the treaty was not his, but was that of Drouyn de Lhuys. The idea of the annexation of part of Belgium to France had been suggested to him first by Bismarck; and the use to which Bismarck put the draft was not one which he could be expected to anticipate, for he had carried on the negotiations in good faith. After the fall of the empire he retired to Corsica. He lived to see his defence confirmed by later publications, which threw more light on the secret history of the times. He published in 1895 a volume of *Essais Diplomatiques*, containing a full account of his mission to Ems, written in 1873; and in 1897 a second series dealing with the Eastern Question. He died 28th March 1900, while on a visit to Paris. He received the title of Count from Napoleon.

ROTHAN. *La politique française en 1866*, Paris, 1879; and *L'affaire de Luxembourg*, Paris, 1881.—SOREL. *Histoire diplomatique*. Paris, 1875.—SYBEL. *Die Begrundung des deutschen Reiches*, Munich, 1889, &c. (J. W. HE.)

Benedict, Sir Julius (1804-1885), musical composer, was born in Stuttgart on 27th November 1804. He was the son of a Jewish banker, and learnt composition from Hummel at Weimar and Weber at Dresden; with the latter he enjoyed for three years an intimacy like that of a son. He was appointed Capellmeister of the Kärnthnerthor Theatre at Vienna in 1823, and of the San Carlo Theatre at Naples in 1825. Here his first opera, *Giacinta ed Ernesto*, was brought out in 1829, and another, written for his native city, *I Portoghesi in Goa*, was given there in 1830; neither of these was a great success, and in 1835 he went to Paris, leaving it, at the suggestion of Malibran, in the same year, for London, where he spent the remainder of his life. In 1836 he was given the conductorship of an operatic enterprise at the Lyceum Theatre, and brought out a short opera, *Un anno ed un giorno*, previously given in Naples. In 1838 he became conductor of the English Opera at Drury Lane, under the famous Bunn management, during the period of Balfe's great popularity; his own operas, produced there, were *The Gipsy's Warning* (1838), *The Bride of Venice* (1843), and *The Crusaders* (1846). In 1848 he conducted Mendelssohn's *Elijah* at Exeter Hall, for the first appearance of Jenny Lind in oratorio, and in 1850 he went to America as the accompanist on that singer's tour. On his return in 1852 he became conductor under Mapleson's management, and wrote recitatives for Weber's *Oberon*, producing his best known opera, *The Lily of Killarney*, at Covent Garden, under the Pyne and Harrison Company, in 1862. At the same theatre his last work, originally intended for the stage, *The Bride of Song*, was brought out in 1864. From the beginning of the Monday Popular Concerts he acted as regular accompanist, and he conducted the Norwich Festivals from 1845 to 1878 inclusive. His cantatas *Undine* (1860) and *Richard Cœur de Lion* (1863), and his oratorio *St Cecilia* (1866) were brought out at these festivals, and his *St Peter* at the Birmingham Festival of 1870. The cantata *Graziella* was brought out at the Birmingham Festival of 1882, and in the following year was produced at the Crystal Palace as an opera. A symphony from Benedict's pen was given at the Crystal Palace in 1873, and he contributed an interesting life of Weber to the series of biographies of "Great Musicians." For many years he officiated as "conductor" at the most fashionable concerts in London, whether public or private, and was knighted in 1871. He died in London on the 5th of June 1885. Benedict was one of the last, but at the same time one of the most capable, of those numerous German musicians who from the time of Handel onwards have found fortune by yielding to the less highly developed tastes of the English public, without making any very serious attempt to elevate the standard of their appreciation. (J. A. F. M.)

Benefice.—Under the modern statute law the term benefice means an ecclesiastical preferment with cure of souls, the right to confer which is called an advowson. An advowson is either presentative, in which case the patron presents a clerk to the bishop with a petition that he may be instituted to the vacant benefice, and if the clerk be canonically qualified the bishop admits and institutes him; or collative, where the bishop is the patron in right of his see. Donative benefices no longer exist, the Benefices Act 1898 making all donations with cure of souls presentative in accordance with the recommendation of a committee of the House of Commons in 1884.

The spiritual side of the right of advowson was also emphasized by the same Act. Under the previously existing law simony or "the corrupt presentation of any person to an ecclesiastical benefice for gift, money, or reward" renders the presentation void, and subjects the persons privy or party to it to penalties; a presentation to a vacant benefice cannot be sold, and no clerk in holy orders can purchase for himself a next presentation. An advowson may, however, be sold during a vacancy, though that will not give the right to present to that vacancy; and a clerk may buy an advowson even though it be only an estate for life, and present himself on the next vacancy. Under the Benefices Act, advowsons may not be sold by public auction except in conjunction with landed property adjacent to the benefice; transfers of patronage must be registered in the registry of the diocese, and no such transfers can be made within twelve months after the last admission or institution to the benefice. Restrictions had also been imposed on the transfer of patronage of churches built under the Church Building Acts and New Parishes Acts, and on that of benefices in the gift of the Lord Chancellor, and sold by him in order to augment others; but agreements may be made as to the patronage of such churches in favour of persons who have contributed to their building or enlargement without being void for simony.

The right of presentation may be exercised by its owner whether he be an infant, executors, trustees, coparceners (who, if they cannot agree, present in turn in order of age), or mortgagee (who must present the nominee of the mortgagor), or a bankrupt (who, although the advowson belongs to his creditors, yet has the right to present to a vacancy). Certain owners of advowsons are temporarily or permanently disabled from exercising the right which devolves upon other persons; and the Crown as patron paramount of all benefices can fill all churches not regularly filled by other patrons. It thus presents to all vacancies caused by simoniacal presentations, or by the incumbent having been presented to a bishopric or in benefices belonging to a bishopric when the see is vacant by the bishop's death, translation, or deprivation. Where a presentation belongs to a lunatic, the Lord Chancellor presents for him. Where it belongs to a Roman Catholic the right is exercised in his behalf by the University of Oxford if the benefice be situate south of the river Trent, and by that of Cambridge if it be north of that river.

Besides the qualifications required of a presentee by canon law, such as being of the canonical age, and in priest's orders before admission, sufficient learning and proper orthodoxy or morals, the Benefices Act now requires that a year shall have elapsed since a transfer of the right of patronage, unless it can be shown that such transfer was not made in view of a probable vacancy; that the

presentee has been a deacon for three years; and that he is not unfit for the discharge of his duties by reason of physical or mental infirmity or incapacity, grave pecuniary embarrassment, grave misconduct or neglect of duty in an ecclesiastical office, evil life, or conduct causing grave scandal concerning his moral character since his ordination, or being party to an illegal agreement with regard to the presentation; that notice of the presentation has been given to the parish of the benefice. Except by leave of the bishop or sequestrator, the incumbent of a sequestered benefice cannot be presented. The Act also gives to both patron and presentee an alternative mode of appeal against a bishop's refusal to institute or admit, except on a ground of doctrine or ritual, to a court composed of an archbishop of the province and a judge of the High Court nominated for that purpose by the Lord Chancellor, a course which, however, bars resort being had to the ordinary suits of *duplex querela* or action of *quare impedit*. In case of refusal of one presentee, a lay patron may present another, and a clerical patron may do so after an unsuccessful appeal against the refusal.

Upon institution the church is full against everybody except the Crown, and after six months' peaceable possession the clerk is secured in possession of the benefice, even though he may have been presented by a person who is not the proper patron. The true patron can, however, exercise his right to present at the next vacancy, and can reserve the advowson from an usurper at any time within three successive incumbencies so created adversely to his right, or within sixty years. Collation which otherwise corresponds to institution does not make the church full, and the true patron can dispossess the clerk at any time, unless he is a patron who collates. Possession of the benefice is completed by induction, which makes the church full against anyone, including the Crown. If the proper patron fails to exercise his right within six calendar months from the vacancy, the right devolves or lapses to the next superior patron, *e.g.*, from an ordinary patron to the bishop, and if he makes similar default to the archbishop, and from him on similar default to the Crown. If a bishopric becomes vacant after a lapse has accrued to it, it goes to the metropolitan; but in case of a vacancy of a benefice during the vacancy of the see the Crown presents. Until the right of presentation so accruing to a bishop or archbishop is exercised, the patron can still effectually present, but not if lapse has gone to the Crown. All benefices except those under the clear annual value of £50 pay their first fruits (one year's profits) and tenths (of yearly profits) to Queen Anne's Bounty for the augmentation for the maintenance of the poorer clergy. Their profits during vacation belong to the next incumbent. Tithe rent charge attached to a benefice is relieved from payment of one-half of the agricultural rates assessed thereon. Benefices may be exchanged by agreement between incumbents with the consent of the ordinary, and they may, with the consent of the patron and ordinary, be united or dissolved after being united. They may also be charged with the repayment of money laid out for their permanent advantage, and be augmented wholly by the medium of Queen Anne's Bounty.

Recent legislation has also affected the vacation of benefices by plurality, resignation, and deprivation. As regards plurality, by dispensation from the archbishop of Canterbury, two benefices may be held together, the churches of which are within four miles of each other, and the annual value of one of which does not exceed £200 (1885). As regards resignation, incumbents of seven years' standing, incapacitated by permanent mental or bodily infirmity from due performance of their duties, can resign their benefices and receive a pension not exceeding one-third of the net income (1871-81). As regards deprivation under the Clergy Discipline Act 1892, an incumbent who has been convicted of offences against the law of bastardy, or against whom judgment has been given in a divorce or matrimonial cause, is deprived, and on being found guilty in the consistory court of immorality or ecclesiastical offences (not in respect of doctrine or ritual), he may be deprived or suspended or declared incapable of preferment.

AUTHORITIES.—PHILLIMORE. *Eccles. Law*, 2nd edit. London, 1895.—CRIPPS. *Law of Church and Clergy*, 6th edit. London, 1886. For statistics of Benefices see ENGLAND, CHURCH OF.

(G. G. P.*)

Benevento, a town and archiepiscopal see and capital of the province of Benevento, Campania, Italy, situated amid the South Apennines, 78 miles by rail N.E. from Naples. There is a new suite of provincial offices. Brick-making, lime-burning, and rope-making are also carried on. Population of town (1881) 21,631, (1901) 24,650; of province (1881) 238,425, (1901) 257,101.

Benfey, Theodor (1809-1881), German philologist, son of a Jewish trader at Nörten, near Göttingen, was born on the 28th January 1809. His taste for philology was awakened in his youth by the careful instruction in Hebrew which he received from his father, and although originally designed for the medical profession, he resolved upon a literary career. After brilliant studies at Göttingen he spent a year at Munich, where he was greatly impressed by the lectures of Schelling and Thiersch, and afterwards settled as a teacher in Frankfort. His pursuits were at first chiefly classical, and his attention was diverted to Sanskrit by an accidental wager that he would learn enough of the language in a few weeks to be able to review a new book upon it. This feat he accomplished, and rivalled in later years when he learned Russian in order to translate Wasilieff's work on Buddhism. For the time, however, his labours were chiefly in classical and Semitic philology. At Göttingen, whither he had returned as privat-docent, he wrote a little work on the names of the Hebrew months, proving that they were derived from the Persian, prepared the great article on India in Ersch and Grüber's *Encyclopaedia*, and published from 1839 to 1842 the *Lexicon of Greek Roots* which gained him the Volney prize of the Institute of France. From this time his attention was principally given to Sanskrit. He published in 1848 his edition of the *Sama Veda;* in 1852-54 his *Manual of Sanskrit*, comprising a grammar and chrestomathy; in 1858 his practical Sanskrit Grammar, afterwards translated into English; and in 1859 his edition of the *Pantscha Tantra*, with an extensive dissertation on the fables and mythologies of primitive nations. All these works had been produced under the pressure of poverty, the Government, whether from parsimony or from prejudice against his Jewish extraction, refusing to make any substantial addition to his miserable salary as extra-professor at the University. At length, in 1862, the growing appreciation of foreign scholars shamed it into making him an ordinary professor, and in 1866 Benfey published the laborious work by which he is, on the whole, best known, his great *Sanskrit-English Dictionary*. In 1869 he wrote a history of German philological research, especially Oriental, during the 19th century. In 1878 his jubilee as doctor was celebrated by the publication of a volume of philological essays dedicated to him, and written by the first scholars in Germany. He had designed to close his literary labours by a grammar of Vedic Sanskrit, and was actively preparing it when he was interrupted by a fatal illness, which terminated in his death at

Göttingen on 26th June 1881. A collection of his various writings was published in 1890, prefaced by a memoir by his son. (R. G.)

Bengal, a province of British India, under the administration of a lieutenant-governor, situated in the north-east of the peninsula, occupying the lower valley of the Ganges. The total area (including native states) comprises 187,377 square miles. In 1891 the population was 74,643,366, and in 1901 it was 78,448,735. The capital is Calcutta, which is also the capital of the Indian empire. The word "Bengal" is sometimes used in a narrower sense for the geographical area of Bengal proper, excluding Behar and Orissa. This use has its justification in the fact that here alone is the Bengali language spoken.

Population.—The following table gives the area and population of the several districts and native states of Bengal, according to the census of 1891:—

Area and Population of Bengal (1891).

Divisions.	Districts.	Area in Square Miles.	Number of Towns and Villages.	Population, Census of 1891.			Density of Population to Square Mile.
				Males.	Females.	Total.	
Presidency	24 Parganás	2,108	5,765	989,278	902,755	1,892,033	898
	Calcutta and Suburbs	20	1	446,716	234,844	681,560	37,057
	Nadiya	2,128	5,766	1,436,024	1,137,569	2,573,593	1,209
	Jessore	2,794	2,982	802,147	841,961	1,644,108	588
	Khulna	2,925	4,851	941,334	947,493	1,888,827	646
	Murshidabad	2,077	3,209	617,981	559,671	1,177,652	567
		2,144	3,627	605,665	645,281	1,250,946	583
		12,068	20,435	4,403,151	4,131,975	8,535,126	707
Dacca	Dacca	2,797	6,813	1,200,583	1,220,073	2,420,656	865
	Faridpur	2,267	4,403	893,091	904,229	1,797,320	792
	Backergunje	3,649	4,703	1,104,443	1,049,522	2,153,965	590
	Maimansingh	6,332	7,959	1,788,616	1,683,570	3,472,186	548
		15,045	23,883	4,986,733	4,857,394	9,844,127	654
Chittagong	Chittagong	2,563	1,234	615,868	674,299	1,290,167	503
	Noakhali	1,645	2,625	508,727	500,966	1,009,693	614
	Tippera	2,491	6,318	911,799	871,136	1,782,935	716
	Hill Tracts	5,419	1,029	59,566	47,720	107,286	20
		12,118	11,206	2,095,960	2,094,121	4,190,081	345
Rajshahi	Dinajpur	4,118	7,676	812,047	743,788	1,555,835	378
	Rajshahi	2,330	5,219	654,338	658,998	1,313,336	564
	Rangpur	3,486	3,537	1,061,812	1,003,652	2,065,464	592
	Bogra	1,452	4,223	418,916	398,578	817,494	563
	Pabna	1,839	3,592	677,911	684,481	1,362,392	741
	Darjiling	1,164	1,319	123,046	100,268	223,314	192
	Jalpaiguri	2,962	3,331	364,659	316,693	681,352	230
		17,351	29,197	4,112,729	3,906,458	8,019,187	456
Bhagalpur	Monghyr	3,921	3,867	987,072	1,048,949	2,036,021	519
	Bhagalpur	4,226	5,067	1,004,865	1,027,831	2,032,696	481
	Purnea	4,993	5,994	993,496	951,162	1,944,658	389
	Malda	1,902	3,248	399,917	415,002	814,919	428
	Sonthal Parganás	5,469	11,266	870,567	883,629	1,754,196	321
		20,511	29,442	4,255,917	4,326,573	8,582,490	418
Patna	Patna	2,076	4,663	865,732	903,272	1,769,004	852
	Gaya	4,712	10,095	1,045,011	1,093,320	2,138,331	454
	Shahabad	4,365	4,883	990,799	1,072,538	2,063,337	473
	Muzaffarpur	3,003	4,104	1,305,374	1,406,071	2,711,445	903
	Darbhanga	3,335	3,890	1,370,985	1,430,970	2,801,955	840
	Saran	2,653	4,296	1,133,926	1,333,551	2,467,477	930
	Champaran	3,531	5,117	936,135	923,330	1,859,465	527
		23,675	37,048	7,647,962	8,163,052	15,811,014	667
Burdwan	Burdwan	2,697	3,560	682,872	709,008	1,391,880	516
	Bankura	2,621	5,497	525,941	543,727	1,069,668	408
	Birbhum	1,753	3,193	389,639	408,194	797,833	455
	Midnapur	5,186	14,934	1,308,100	1,323,416	2,631,516	507
	Hooghly	1,223	2,582	529,139	547,571	1,076,710	880
	Howrah	476	1,335	364,890	356,321	721,211	1,515
		13,956	31,101	3,800,581	3,888,237	7,688,818	550
Chota Nagpur	Hazaribagh	7,021	8,087	566,964	597,357	1,164,321	166
	Lohardaga	7,140	3,578	551,873	577,012	1,128,885	155
	Singbhum	3,753	2,877	271,417	274,071	545,488	145
	Manbhum	4,147	8,317	593,199	600,129	1,193,328	288
	Palamau	4,905	3,901	294,320	302,450	596,770	122
		26,966	26,760	2,277,773	2,351,019	4,628,792	172

Area and Population of Bengal (1891)—*continued.*

Divisions.	Districts.	Area in Square Miles.	Number of Towns and Villages.	Population, Census of 1891.			Density of Population to Square Mile.
				Males.	Females.	Total.	
Orissa . .	Cuttack . . .	3,633	5,429	940,557	997,114	1,937,671	533
	Puri	2,473	5,000	474,530	470,468	944,998	382
	Balasore . . .	2,066	6,311	481,638	512,987	994,625	481
	Angul and Kondmals .	1,681	1,443	85,768	84,290	170,058	101
		9,853	18,183	1,982,493	2,064,859	4,047,352	411
Total British Territory . .		151,543[1]	227,255	35,563,299	35,783,688	71,346,987	471

[1] Exclusive of the Sundarbans, about 5500 square miles.

Area and Population of Native States of Bengal (1891).

Divisions.	Area in Square Miles.	Number of Towns and Villages.	Population, Census of 1891.			Density of Population to Square Mile.
			Males.	Females.	Total.	
Cooch Behar	1,307	1,154	302,457	276,411	578,868	443
Hill Tippera	4,086	...	71,596	65,846	137,442	34
Tributary States: Orissa . . .	14,387	11,385	849,450	847,260	1,696,710	118
,, ,, Chota Nagpur .	16,054	4,678	449,683	433,676	883,359	55
Total Native States . .	35,834	17,217	1,673,186	1,623,193	3,296,379	93
Grand Total . . .	187,377	244,472	37,236,485	37,406,881	74,643,366	398

Since 1881 the population increased by nearly 7 per cent., which was below the rate of increase for India generally. But this increase of population was unequally distributed. In some of the central and northern districts there was an actual decrease, attributed to the prevalence of malarial fever. In eastern Bengal, where the population is already very dense, the rate of increase was as high as 11 per cent. In the hilly country of Chota Nagpur, where some emigration prevails, the increase was 10 per cent. The extremely high rate of increase for native states (19 per cent., despite an actual decrease in Cooch Behar) may be ascribed to more accurate enumeration. Excluding the metropolitan districts of the Twenty-four Parganás and Hooghly, the greatest density of population is to be found in the Patna division, or Behar proper. Here two purely agricultural districts (Saran and Muzaffarpur) each support more than 900 persons on every square mile, being the highest density for all India. In Chota Nagpur the average density falls to 172 persons per square mile. Classified according to religion, and excluding native states, Hindus numbered 45,220,124, or 63·4 per cent. of the total population, as compared with 64·8 per cent. in 1881, showing that they increased less rapidly than other religions. Mahommedans numbered 23,437,591, or 32·85 per cent., being specially numerous in eastern Bengal, where in some districts they form more than two-thirds of the inhabitants. The fact that they have increased more than the Hindus is explained partly by conversion and partly by their healthier mode of life. They eat more meat, and marry later. The Christians numbered 190,829, or ·27 per cent. Of these, 23,301 were Europeans, and 15,006 Eurasians, leaving 152,522 for native converts, who are most numerous in the Lohardaga district of Chota Nagpur. Buddhists and Jains together numbered 196,164, or ·27 per cent. The Buddhists proper are almost confined to the half-Tibetan district of Darjiling and the half-Burmese district of Chittagong. The few Jains are traders residing chiefly in Calcutta and Murshidabad. Aboriginal tribes numbered 2,294,506, or 2·4 per cent. They are found chiefly in Chota Nagpur, the Sonthal Parganás, and the border districts of the Burdwan division. In the native states of Bengal the proportion of aboriginal tribes rises as high as 14 per cent. Jews numbered 1447; Sikhs, 412; and Parsis, 179; leaving 5735 for "others."

According to the preliminary returns of the census of 1901, the total population of Bengal amounted to 74,713,020 for British territory alone, showing an increase of nearly 5 per cent. In eastern Bengal the rate of increase was maintained; but there is an actual decrease in the thickly populated tracts of Behar. In the native states, which for the first time include Sikkim, the total population amounted to 3,735,715, showing an apparent increase of 13 per cent.

Crops.—Excluding Orissa, almost the entire area of Bengal was brought under the permanent settlement of Lord Cornwallis in 1793. Consequently, no agricultural statistics are available, as for the rest of India. The following figures are little better than conjectural. The total cultivated area is estimated at 55 million acres, of which 10 millions are cropped more than once. The staple crop almost everywhere is rice, grown on 40 million acres, while other food grains cover 15 million acres; oil-seeds, 4 million acres; jute, 2 million; sugar-cane, 1 million; tobacco, 648,000; indigo, 555,000; opium, 235,000; cotton, 167,000; tea, 128,000. The two crops grown under European supervision are indigo and tea. Indigo-planting has decreased in Bengal proper, but is still an important industry in northern Behar. The crop is a very fluctuating one, the total out-turn having been 58,000 *maunds* in 1896-97, compared with 94,000 *maunds* in the next year. The following table gives the chief statistics of the tea industry for 1897, according to districts:—

District.	Number of Gardens.	Area of Gardens.	Area under Mature Plant.	Area under Immature Plant.	Out-turn of Manufactured Leaf.
		Acres.	Acres.	Acres.	lb.
Darjiling .	186	55,822	48,588	7,234	11,597,256
Jalpaiguri .	285	65,072	46,905	18,167	24,232,316
Chittagong	23	4,024	3,596	428	2,126,028
Chittagong Hill Tracts	1	100	100	...	27,120
Hazaribagh	4	611	586	25	36,200
Lohardaga	21	2,438	2,429	9	931,695
Total .	520	128,067	102,204	25,863	38,950,615

The tea industry is almost confined to the hills of Darjiling, and the submontane tract of the Dwars (or Dooars) in Jalpaiguri. It is in the latter tract that most of the later extensions have taken place. The larger out-turn is apparently due to the leaf being sent here from Darjiling to be manufactured. The returns show 75,143 persons permanently employed, and a daily average of 52,444 persons temporarily employed. Cinchona is grown on Government plantations in the neighbourhood of Darjiling, and there manufactured into quinine. The total number of cinchona trees is about 2½ millions. In 1897-98 the crop amounted to 318,715 lb of dry bark. The output of the factory was 10,149 lb of sulphate of quinine and 4075 lb of cinchona febrifuge. The gross receipts amounted to Rs.1,76,798, a net profit of Rs.11,632.

Industries.—The chief coalfields of Bengal are near Raniganj in the Burdwan district, and at Karharbari and Giridih in Hazaribagh. The industry has progressed rapidly, not only supplying fuel to the local railways and factories, but also exporting it by sea. In 1898 the aggregate output of all the Bengal collieries was 3,622,090 tons, valued at Rs.96,87,250. The total number of persons employed was 48,604, of whom 14,709 were women and 2090 children. The following table gives the output for 1893-99, and also for earlier quinquennial periods:—

Year.	Output of Coal in Bengal. Tons.	Year.	Output of Coal in Bengal. Tons.
1878 . .	957,243	1895 . .	2,716,155
1883 . .	1,200,957	1896 . .	3,037,920
1888 . .	1,380,594	1897 . .	3,142,497
1893 . .	1,902,866	1898 . .	3,622,090
1894 . .	2,035,944	1899 . .	3,883,000

The only important ironworks are those of the Barrakur Company

near Raniganj, where iron ore and coal are found together. In 1898, the total output of pig-iron was 19,719 tons, of which 15,779 tons were sold and 8515 tons were consumed in the foundries.

Jute is grown throughout the marshes of Eastern Bengal. Apart from the quantity exported and the quantity made up by hand, it supports a prosperous mill industry, chiefly in the neighbourhood of Calcutta and Howrah. Jute presses, mostly worked by steam or hydraulic power, employ nearly 30,000 persons. The following table gives the chief statistics of jute mills in Bengal for 1895-98:—

	No. of Mills.	No. of Looms.	No. of Spindles.	Persons Employed.				
				Men.	Women.	Young Persons.	Children.	Total.
1895-96	27	10,406	4,000,875	50,973	15,640	4082	6,923	77,618
1896-97	30	12,611	4,366,225	59,339	17,092	5649	9,174	91,254
1897-98	33	13,444	4,567,500	61,343	16,995	6023	10,405	94,766

In 1898, the number of cotton mills, all in the same neighbourhood, was ten, with 200 looms and 379,082 spindles, employing 11,739 hands. The total out-turn was nearly 45 million lb of yarn, chiefly of counts between 10 and 20, and 63,266 lb of woven goods, chiefly *dhutis*, *chadars*, and shirtings. There were also four paper mills, employing 3222 hands, with an out-turn of 33 million lb of paper, valued at Rs. 49,72,850. The materials used are rags, jute, grasses, old gunny bags, &c., and paper of good quality is produced. The number of flour mills, large and small, was 25; of oil mills, 83; and of rice mills, 1.

Railways.—Bengal is well supplied with railways, which naturally have the seaport of Calcutta as the centre of the system. South of the Ganges, the East Indian follows the river from the North-Western Provinces, with its terminus at Howrah on the Hooghly, opposite Calcutta. A chord line passes by the coalfield of Raniganj, which enables this great railway to be worked more economically than any other in India. The Bengal-Nagpur, from the Central Provinces, also has its terminus at Howrah, and the section of this railway through Midnapur carries the East Coast line from Madras. North of the Ganges the Eastern Bengal runs north to Darjiling, and maintains a service of river steamers on the Brahmaputra. The Bengal Central serves the lower Gangetic delta. Both of these have their termini at Sealdah, an eastern suburb of Calcutta. Northern Behar is traversed by the Bengal and North-Western, with an extension eastwards through Tirhut to join the Eastern Bengal. The Assam-Bengal railway will connect the Brahmaputra valley with the Bengal port of Chittagong. In addition there are a few light lines and steam tramways.

Canals and Rivers.—Rivers and other waterways still carry a large part of the traffic of Bengal, especially in the delta and along the Brahmaputra. The Government maintains two channels through the Sundarbans, known as the Calcutta and Eastern canals, and likewise does its best to keep open the Nadiya rivers, which form the communication between the main stream of the Ganges and the Hooghly. There is further a route by water between Calcutta and Midnapur. The most important canals, those in Orissa and on the Sone river in Southern Behar, have been constructed primarily for irrigation, though they are also used for navigation. The following table gives the financial results of the four chief irrigation schemes, classified as "major works," for 1897-98:—

	Capital Outlay.	Revenue Receipts.	Working Expenses.	Simple Interest.	Excess Expenditure.	Loss per cent.
	Rs.	Rs.	Rs.	Rs.	Rs.	
Orissa Project	2,63,02,141	5,54,757	5,42,752	10,27,516	10,15,511	3·83
Midnapur Canal	84,65,427	2,75,636	2,41,831	3,31,130	2,97,325	3·51
Hijili Tidal Canal	26,15,242	92,210	40,167	1,02,063	50,020	1·93
Sone Project	2,67,91,549	12,66,974	6,30,326	10,37,108	4,00,460	1·49
Total	6,41,74,359	21,89,577	14,55,076	24,97,817	17,63,316	2·11

Various other "minor works," against which no interest is charged, show an excess revenue of Rs. 2,20,720, being 1·78 per cent. on a capital outlay of Rs. 1,23,81,671. Except as a protection against famine, expenditure on irrigation cannot be considered remunerative in Bengal.

Commerce.—The seaborne trade of Bengal is almost entirely concentrated at Calcutta, which serves also as the port of Assam and the North-Western Provinces. A small share is conducted at Chittagong and the Orissa ports. The following table gives the value of the total seaborne trade of the province, foreign and coasting, but exclusive of Government transactions, for the two years 1893-94 and 1897-98:—

	1893-94. Rs.	1897-98. Rs.
Imports—		
Foreign	31,03,61,126	31,30,17,449
Coasting	6,23,26,924	8,66,26,161
Total	37,26,88,050	39,96,43,610
Exports—		
Foreign	42,26,18,585	46,31,20,317
Coasting	6,42,39,959	9,31,17,535
Total	48,68,58,544	55,62,37,852
Grand total	85,95,46,594	95,58,81,462

It will be observed that the foreign imports show hardly any change, while the foreign exports have improved by 9·5 per cent. The considerable increase in both branches of coasting trade is due mainly to the importation of rice from Burma on account of famine, and to the growing exportation of coal and jute manufactures. In foreign trade the rate of increase during a period of twenty years is 52 per cent. for imports, and 45 per cent. for exports. The principal imports are cotton piece goods, railway materials, metals and machinery, oils, sugar, cotton twist, salt. The principal exports are jute, tea, hides, opium, rice, oil-seeds, indigo, lac.

Internal trade.—The interprovincial trade of Bengal is carried on mostly with the North-Western and Central Provinces and with Assam. In 1897-98, the total imports by rail were valued at Rs. 14,08,97,894, of which 66 per cent. came from the North-Western and 14 per cent. from the Central Provinces. The principal articles were opium, hides, raw cotton, wheat, shell-lac, and oil-seeds. The exports by rail were valued at Rs. 12,26,27,407, of which 71 per cent. went to the North-Western and 13 per cent. to the Central Provinces. The principal articles were cotton piece goods (more than one-fourth of the total), rice, coal, gunny bags, iron and steel, unrefined sugar, kerosene oil, cotton twist, gram and pulse, tobacco, manufactured silk, raw silk, and salt. In 1897-98, the imports from Assam by river steamer were valued at Rs. 5,05,74,823, almost entirely tea, with some oil-seeds and jute. The exports to Assam by river steamer were valued at Rs. 2,95,84,768, chiefly cotton piece goods (nearly one-third of the total), rice, gram and pulse, salt, cotton twist, sugar, tobacco, and gunny bags. The imports from Assam by country boat were valued at Rs. 1,27,10,294, chiefly rice (one-third of the total), oil-seeds, timber, limestone, hides, jute, mats, oranges, raw cotton, and dried fish. The exports into Assam by country boat were valued at Rs. 88,50,073, chiefly sugar, spices, kerosene oil, tobacco, salt, gram and pulse, rice, provisions, dried fruit and nuts, and Indian piece goods. The frontier trade of Bengal is registered with Nepal, Sikkim and Tibet, and Bhutan, but, except with Nepal, the amount is insignificant. In 1897-98 the imports from Nepal were valued at Rs. 1,45,97,183, chiefly rice (more than one-third), other food grains, oil-seeds, cattle, hides, tobacco, *ghee*, and timber. The exports into Nepal were valued at Rs. 1,46,54,634, chiefly silver (more than one-fifth), cotton piece goods, salt, tobacco, spices, brass and copper, provisions, sugar, betel-nuts, and iron.

Administration.—The administration of Bengal is conducted by a lieutenant-governor, with a chief secretary, two secretaries, and three under-secretaries. There is no executive council, as in Madras and Bombay; but there is a board of revenue, consisting of two members. For legislative purposes the lieutenant-governor has a council of twenty members, of whom not more than ten may be officials. Of the remaining members seven are nominated on the recommendation of the Calcutta corporation, groups of municipalities, groups of district boards, selected public associations, and the senate of Calcutta university. The number of divisions or commissionerships is 9, of which Chota Nagpur ranks as "non-regulation." The number of districts is 44, excluding the cities of Calcutta and Howrah. The total number of civil and revenue judges is 380, and of magistrates of all kinds, 2739. In 1898 the sanctioned strength of the district police was 23,788 of all ranks. In addition, the railway police numbered 654, and the military police 300. These numbers give a proportion of one policeman to every 2880 of the population, a much lower proportion than for India generally. The village police, or *chaukidars*, number about 160,000.

Army.—Since the reorganization of the Indian army in 1895, the Bengal command, under a lieutenant-general, comprises all Northern India, except the Punjab. It consists of two first-class and six second-class districts, of which only one—the Presidency district—lies wholly within the province of Bengal. Apart from Fort William and Barrackpur, near Calcutta, the only other important military station is Dinapur, near Patna, which is included in the Allahabad district. In 1898 the strength of the Bengal command was 23,252 European and 31,822 native troops—total 55,074. In addition there were 13,085 enrolled volunteers.

Local Government.—Excluding Calcutta the number of municipalities in Bengal is 151. The number of persons within municipal

limits is 2,722,000, or less than 4 per cent. of the total population. The number of electors is 469,000, or about one in six of the inhabitants. The municipalities vary in size, from Patna with 168,000 persons to Nalchiti with only 1675; the majority, however, have between 5000 and 15,000. The rule is that two-thirds of the municipal commissioners shall be elected by the ratepayers. But in a few cases (27 in all) the Government exercises the right of nomination. Out of a total of 2183 commissioners, 1172 are elected and 1011 nominated; 349 are officials and 1834 non-officials; 1949 are Indians and 234 Europeans. The classes most numerously represented are lawyers, landholders, merchants, doctors, and schoolmasters. In 1897-98, the aggregate municipal income was Rs. 33,00,000, of which Rs. 26,79,000 was derived from taxation, the average incidence of taxation being nearly R. 1 per head. The aggregate expenditure was Rs. 36,00,000, of which Rs. 10,68,000 was devoted to conservancy, Rs. 5,04,000 to buildings and roads, Rs. 3,76,000 to water-supply and drainage, Rs. 3,62,000 to hospitals and vaccination, Rs. 2,82,000 to police, lighting, and fire prevention, and Rs. 1,32,000 to education.

The number of district boards is 38, and of local boards 104. These bodies possess no power of taxation, but administer certain funds made over to them for expenditure on roads and bridges, education, hospitals, &c. On the district boards the number of members is 794, of whom 328 are elected by the local boards. On the local boards the number of members is 1253, of whom 413 are elected. Of the total number of both (2047), 1635 are non-officials, and 1761 are Indians. In 1897-98, the total income of the boards was Rs. 65,80,000, of which Rs. 39,20,000 was derived from road cess, Rs. 12,20,000 from tolls at ferries, &c., Rs. 4,70,000 from fees at cattle pounds, &c., and Rs. 5,40,000 from a Government grant. The total expenditure was Rs. 69,10,000, of which Rs. 37,90,000 was devoted to roads, bridges, &c., Rs. 12,00,000 to education, Rs. 3,00,000 to hospitals, and Rs. 2,60,000 to sanitation and water-supply.

Revenue and Expenditure.—The net revenue of Bengal for 1897-98 (in tens of rupees), was Rx. 14,340,376, classified thus: Imperial, Rx. 10,051,972; provincial, Rx. 3,783,460; local, Rx. 504,944. The net expenditure for the same period was Rx. 4,375,988: Imperial, Rx. 87,584; provincial, Rx. 3,670,721; local, Rx. 617,683. Of the total revenue, Rx. 3,945,951 was derived from land, Rx. 2,443,364 from salt, Rx. 1,759,285 from stamps, Rx. 1,444,919 from customs, and Rx. 1,273,766 from excise.

Education.—The following table gives the chief statistics of education in Bengal for the three quinquennial years, 1886-87, 1891-92, and 1896-97:—

	1886-87.		1891-92.		1896-97.	
	Schools.	Pupils.	Schools.	Pupils.	Schools.	Pupils.
Colleges . .	39	4,611	48	6,287	56	8,273
Secondary Schools	2,235	184,319	2,369	202,684	2,532	224,094
Primary Schools	50,667	1,122,286	51,269	1,175,962	52,854	1,307,867
Special Schools	180	5,378	270	7,438	198	8,359
Private Institutions	4,221	45,508	13,863	129,594	12,207	126,182
Total . .	57,342	1,362,102	67,824	1,531,965	67,847	1,674,775

These figures show fair progress, particularly in colleges, secondary, and primary schools. The general rate of increase in pupils was 12 per cent. during the first quinquennium, and 9 per cent. during the second, which is in both cases somewhat below the rate of increase for India generally. If we compare the number of pupils with the estimated population of school-going age (15 per cent. of the total population), the increase in ten years has been from 13·3 to 15·2 per cent. Taking girls alone, the number at school increased from 88,731 in 1891-92 to 105,919 in 1896-97, or by 19 per cent., while the proportion to the female population of school-going age rose from 1·61 to 1·93 per cent. Expenditure on education increased from Rs. 78,87,383 in 1886-87 to Rs. 1,09,68,635 in 1896-97. The total expenditure has increased faster than the total number of pupils, the rate of increase being 19 per cent. in the first quinquennium, and 17 per cent. in the second. But by far the larger share of this increase has come from fees and "other sources," chiefly missionary contributions and subscriptions. Altogether, the proportion of the total expenditure borne by public funds fell in ten years from 40·8 to 36·1 per cent. In secondary schools alone public funds contribute less than one-fifth.

Public Calamities.—Bengal has been fortunate in escaping to a great extent the two calamities of famine and plague which recently afflicted Central and Western India. The drought of 1896-97 did indeed extend to Bengal, but not to such an extent as to cause actual famine. The distress was most acute in the densely populated districts of Northern Behar, and in the remote hills of Chota Nagpur. Reducing the persons relieved to terms of one day, the net result of the operations from first to last shows that in the fifteen affected districts 61,018,611 individuals were employed on works for one day, and 70,783,120 were fed gratuitously. The total expenditure on famine relief amounted to Rs. 1,08,03,758, of which Rs. 63,00,000 were spent on wages and Rs. 32,00,000 on food. Plague first appeared at Calcutta in a sporadic form in April 1898, but down to April of the following year the total number of deaths ascribed to plague throughout the province was less than 1000, compared with 191,000 for Bombay. At the beginning of 1900, however, there was a serious recrudescence of plague at Calcutta, and a very malignant outbreak in the district of Patna, which caused 1000 deaths a week. In the early months of 1901, plague again appeared in the same regions. During 1900 the total number of deaths from plague in Bengal was 37,265, and during the first three months of 1901 as many as 52,402 deaths had occurred. The earthquake of 12th June 1897, which had its centre of disturbance in Assam, was felt throughout eastern and northern Bengal. In all the large towns the masonry buildings were severely damaged or totally wrecked. The permanent way of the railways also suffered. The total cost of repairs to Government buildings alone was estimated at Rs. 13,00,000, while the losses to private individuals may have amounted to a crore of rupees (say, £666,000). The total number of deaths returned was only 135. Far more destructive to life was the cyclone and storm-wave that broke over Chittagong district on the night of 24th October 1897. Apart from damage to shipping and buildings, the low-lying lands along the coast were completely submerged, and in many villages half the inhabitants were drowned. The loss of human lives was reported to be about 14,000, and the number of cattle drowned about 15,000. As usual in such cases, a severe outbreak of cholera followed in the track of the storm-wave. Another natural calamity on a large scale occurred at Darjiling in October 1899. Torrential rains caused a series of landslips, carrying away houses and breaking up the hill railway. The loss of life was returned at 300, including several English school children, and the value of property destroyed at Rs. 25,00,000. (J. S. Co.)

Benghazi. See TRIPOLI.

Benguella, or SÃO FILIPE DE BENGUELLA, a town of Portuguese West Africa, capital of district Benguella, stands on a bay of the same name, and is connected with its emporium, Catumbella, by a railway. Population, 2500. The district of Benguella exports spirits, cotton, india-rubber, wax, cocoanuts, hides, gums, ivory, salt, &c. —the principal being india-rubber (£358,200 in 1896). The total trade increased from £186,900 in 1886 to £669,100 in 1896, and £534,666 in 1899.

Beni, a department of Bolivia. Occupying the N.E. part of the republic and extending to the Rio Beni which is its west boundary, it borders on the department of La Paz and the territory of Madre de Dios. The river Guaporé forms its boundary to the east where it touches Brazil. To the south its limits are the departments of Cochabamba and Santa Cruz. Its area is 100,580 square miles. The population in 1893 numbered 25,760, and in 1898, 18,640, mostly Indians. The capital, Trinidad (5000), is situated on the Mamore. The department is divided into three provinces. In 1898 there were 24 schools with 700 pupils.

Benin.—The old kingdom of Benin has been incorporated in Southern Nigeria. Few Europeans visited Benin city in the period 1875 to 1891. Consul Annesley saw the king in 1890 with the hopes of making a treaty, but failed in his object. In March 1892 Captain Vice-Consul Gallwey (now Lieut.-Colonel H. L. Gallwey, C.M.G., D.S.O.) succeeded in concluding a treaty with the king Overami. The treaty, however, proved of no avail, and the king kept as aloof as of old from any outside interference. In January 1897, the Acting Consul-General J. R. Phillips and eight Europeans were brutally massacred on the road from Gwato to Benin city whilst on a mission to the king. A punitive expedition (see below) was organized under the command of Admiral Sir Harry Rawson, K.C.B., and the city was assaulted and captured on 18th February 1897. The king and chiefs responsible for the massacre having been placed on their trial by Sir Ralph Moor, K.C.M.G., the king was deposed, and deported to

Old Calabar, and the chiefs, six in all, were executed. The chief offender was not brought to justice until a second punitive expedition in 1899 completed the pacification of the country. After the removal of the king in September 1897, a council of chiefs was appointed. This council carries on the government of the whole Beni country, and is presided over by the Resident. Up to 1897 the only trade product allowed by the king was palm oil. Now an extensive trade is done in oil, kernels, timber, ivory, rubber, &c. In the rubber and timber industries great strides have been made. The rubber forests can only be worked under license and regulations protecting the trees and vines from damage and destruction, and a close season of six months in every year is enforced. To the considerable advantage of native owners Europeans take out timber concessions, the maximum extent of a concession being 9 square miles. A commodious Residency, built of bricks and timber procured on the spot, has been erected in the city, and a military post and prison were established there in 1897. Great attention is paid to the sanitary condition of the town. The chiefs and people are rebuilding their houses, and are generally contented with the new order of things. The roads round about are kept in good condition; rubber nurseries have been started; and Government reservations for elephants will be arranged for. The population of the city of Benin is about 5000. (H. L. G.)

The British Expedition of 1897.—This expedition was a remarkable example of good organization hastily improvised. The news of the massacre of Mr Phillips's party reached Rear-Admiral Rawson, the commander-in-chief on the Cape station, on 4th January 1897. The flagship *St. George* was at Simons Town. The small craft were dispersed. The *Theseus* and *Forte* at Malta had been ordered to join the Cape command. The *Malacca* transport was chartered in the Thames for the purposes of the expedition. In twenty-nine days a force of 1200 men, coming from three places between 3000 and 4500 miles from the Benin river, was landed, organized, equipped, and provided with transport. Five days later the city of Benin was taken, and in twelve days more the men were reembarked, and the ships coaled and ready for any further service. This feat is probably unique. The plan of operations was to move upon Benin in a single column from Warrigi, making demonstrations at Gwato and Sapobar in order to distract the attention of the Beni from the main advance. Four companies of Hausas from the force of the Niger Company Protectorate preceded the naval expedition, and were employed in making a road 7 miles long between Warrigi and Ceri on Ologbo Creek. Fifty native scouts were raised at Lagos and rendered useful service. About 800 carriers were obtained from the tribes in the neighbourhood of New Benin. On 11th February the admiral with the bluejackets and marines landed at Warrigi, and marched to Ceri. On the following day an advanced party of bluejackets and Hausas with two Maxim guns proceeded up the creek, and landing at Ologbo were soon afterwards fired on from the thick bush. On the 14th the advance guard under Lieutenant-Colonel Hamilton moved 5 miles in the direction of Benin, being constantly under fire. Agagi, 4 miles farther, was reached on the 15th after further fighting. Here the expected water supply was not found, and as it was necessary to carry at least three days' supply, together with five days' rations, the expedition had to be reorganized, and to leave behind every man not absolutely necessary. On the 16th a fresh start was made, the Beni constantly firing from the bush and being dislodged by volleys and the Maxims. On the 17th Benin was occupied after further fighting. Some rockets fired at random in the supposed direction of the town fell in the Juju compound and created a panic, which caused the place to be abandoned. On the following day the much-needed water was obtained. The town, which was found to be reeking of human sacrifices, was partly burned, and on the 22nd the expedition started on its return, leaving the Hausas in possession. Meanwhile the *Philomel*, *Barrosa*, and *Widgeon* anchored off the entrance to Gwato Creek on the 8th, and on the 9th an advance in boats was made under Captain O'Callaghan, R.N. Gwato was found deserted on the 10th, and was burned after an hour's engagement with the Beni. The *Phœbe*, *Alecto*, and *Magpie* supplied a force under Captain M'Gill, R.N., which occupied Sapobar on the 9th, and was attacked on the 20th. The total losses of the expedition were 10 killed, including 2 officers (Lieut.-Commander Pritchard and Surgeon Fyffe), and 32 wounded, including 5 officers. Staff-Surgeon Way died of sunstroke at Warrigi. The operations, though brief, threw a heavy and continuous strain upon the forces. Their marked success was due to the excellent organization devised by the naval officers and to the great care bestowed upon details. King Duboar of Benin was subsequently captured, and the country has quietly passed under British administration. The reign of wholesale murder has ended, and trade is developing in what was once the worst human shambles of Africa. (G. S. C.)

Benjamin, Judah Philip (1811-1884), Anglo-American lawyer, of Jewish descent, was born a British subject at St Croix in the West Indies on the 11th of August 1811, and was successively an American lawyer, a leading Confederate politician, and a distinguished English barrister. He eventually died in Paris a domiciled Frenchman. After 1815 his parents lived in Wilmington, North Carolina, and he went to Yale in 1825 for his education, but left without taking a degree, and entered an attorney's office in New Orleans. He was admitted to the New Orleans bar in 1832. He compiled with his friend Slidell a valuable digest of decisions of the Supreme Courts of New Orleans and Louisiana; and as a partner in the firm of Slidell, Benjamin, and Conrad, he enjoyed a good practice. In 1848 he was admitted a councillor of the Supreme Court, and in 1852 he was elected a senator for Louisiana, from which date he took an active part in politics, declining to accept a judgeship of the Supreme Court. In 1861 he withdrew from the Senate, left Washington, and actively espoused the Confederate cause. He joined Jefferson Davis's provisional government as attorney-general, becoming afterwards his secretary for war (1861-62), and chief secretary of state (1862-65). Although at times subject to fierce criticism with regard to matters of administration and finance, he was recognized as one of the ablest men on the Confederate side, and he remained with Jefferson Davis to the last, sharing his flight after the surrender at Appomattox, and only leaving him shortly before his capture, because Benjamin found himself unable to go farther on horseback. He escaped from the coast of Florida in an open boat, and after many vicissitudes reached Liverpool, England, an exile. Shortly afterwards his remaining property was lost in the failure of Overend and Gurney.

In London Benjamin was able to earn a little money by journalism, and on the 13th of January 1866 he entered Lincoln's Inn. He received a hospitable welcome from the English legal profession. The influence of English judges who knew his abilities and his circumstances enabled him to be called to the bar on the 6th of June 1866, dispensing with the usual three years of studentship, and he acquired his first knowledge of the practice and methods of English courts as the pupil of Mr C. E. Pollock (after-

wards Baron Pollock). Mr Pollock fully recognized his abilities and they became firm friends during their joint lives. Benjamin was naturally an apt and useful pupil; for instance, an opinion of Mr Pollock, which for long guided the London police in the exercise of their right to search prisoners, is mentioned by him as having been really composed by Benjamin during his pupillage. Benjamin joined the Northern Circuit, and a large proportion of his early practice came from solicitors at Liverpool who had correspondents in New Orleans. His business gradually increased, and having in 1872 received a patent of precedence, he was on the 2nd of November in that year called within the bar as a Queen's Counsel. In addition to his knowledge of law and of commercial matters he had considerable eloquence, and a power of marshalling his facts and his arguments that rendered him extremely effective, particularly before judges. He was less successful in addressing juries, and for some time towards the close of his career did not take *Nisi prius* work, but in the Court of Appeal and House of Lords and before the Judicial Committee of the Privy Council he enjoyed a very large practice, making for some time fully £15,000 a year. The question of raising him to the bench was seriously considered by Lord Cairns, who, however, seems to have thought that the ungrudging hospitality and goodwill with which Benjamin had been received by the English legal profession had gone far enough. For some time towards the close of his career symptoms of diabetes and cardiac weakness manifested themselves in Benjamin, much as they did in Sir George Jessel, another great Jewish lawyer who died a year before him, and he suffered from the results of a fall from a tramcar in Paris, where he had built himself a house, and where he used to spend his vacations with his wife, who was a Frenchwoman. He retired to Paris at Christmas in 1882 and never returned to his practice, his medical advisers having ordered him absolute rest. He only came back to London in order to be entertained by the bench and bar of England at a banquet in the Inner Temple Hall on the 30th of June 1883; and he died at Paris on the 6th of May 1884.

In person J. P. Benjamin was thick-set, stout, and Jewish-looking, with a close-cut beard and an expression of great shrewdness. An early portrait of him is to be found facing page 242 in Jefferson Davis's *Rise and Fall of the Confederate Government*. His political history may be traced in that work, and in American histories and articles dealing with the period in which he was prominent, such as Draper's *American Civil War*, von Holst's *Constitutional History of the United States*, and Stephens's *History of the United States*. Many allusions to his English career will be found in works describing English lawyers of his period, and there are some interesting reminiscences of him by Baron Pollock in the *Fortnightly Review* for March 1898. A portrait of him in his later life was painted by Piercy and engraved by Roffe. His *Treatise on the Law of Sale of Personal Property with References to the American Decisions and to the French Code and Civil Law*—a bulky volume known to practitioners as *Benjamin on Sales*—is the principal text-book on its subject, and a fitting monument of the author's career at the English bar, of his industry and learning. Many of the speeches made by him during his American career have been published. (E. A. Ar.)

Bennigsen, Rudolph von (1824-1902), German politician, was born at Lüneburg on the 10th of July 1824. He was descended from an old Hanoverian family, his father being an officer in the Hanoverian army, who rose to the rank of general, and also held diplomatic appointments. Bennigsen, having studied at the University of Göttingen, entered the Hanoverian civil service. In 1855 he was elected a member of the second chamber; and as the Government refused to allow him leave of absence from his official duties he resigned his post in the public service. He at once became the recognized leader of the Liberal opposition to the reactionary Government, but must be distinguished from Count Bennigsen, a member of the same family, and son of the distinguished Russian general, who was also one of the parliamentary leaders at the time. What gave Bennigsen his importance not only in Hanover, but throughout the whole of Germany, was the foundation of the National Verein, which was due to him, and of which he was president. This society, which arose out of the public excitement created by the war between France and Austria, had for its object the formation of a national party which should strive for the unity and the constitutional liberty of the whole Fatherland. It united the moderate Liberals throughout Germany, and at once became a great political power, notwithstanding all the efforts of the governments, and especially of the king of Hanover, to suppress it. In 1866 Bennigsen used all his influence to keep Hanover neutral in the conflict between Prussia and Austria, but in vain. He took no part in the war, but his brother, who was an officer in the Prussian army, was killed in Bohemia. In May of this year he had an important interview with Bismarck, who wished to secure his support for the reform of the Confederation, and after the war was over at once accepted the position of a Prussian subject, and took his seat in the Diet of the North German Confederation and in the Prussian parliament. He used his influence to procure as much autonomy as possible for the province of Hanover, but was a strong opponent of the Guelph party. He was one of the three Hanoverians, Windthorst and Miquel being the other two, who at once won for the representatives of the conquered province the lead in both the Prussian and German parliaments. The National Verein, its work being done, was now dissolved; but Bennigsen was chiefly instrumental in founding a new political party—the National Liberals,—who, while they supported Bismarck's national policy, hoped to secure the constitutional development of the country. For the next thirty years he was president of the party, and was the most influential of the parliamentary leaders. It was chiefly owing to him that the building up of the internal institutions of the empire was carried on without the open breach between Bismarck and the parliament, which was often imminent. Many amendments suggested by him were introduced in the debates on the constitution; in 1870 he undertook a mission to South Germany to strengthen the national party there, and was consulted by Bismarck while at Versailles. It was he who brought about the compromise on the Military Bill in 1874. In 1877 he was offered the post of vice-chancellor with a seat in the Prussian ministry, but refused it because Bismarck or the king would not agree to his conditions. From this time his relations with the Government were less friendly, and in 1878 he brought about the rejection of the first Socialist Bill. In 1883 he resigned his seat in parliament owing to the reactionary measures of the Government, which made it impossible for him to contiuue his former co-operation with Bismarck, but returned in 1887 to support the coalition of national parties. One of the first acts of the Emperor William II. was to appoint him president of the province of Hanover. In 1897 he resigned this post and retired from public life.

Bennington, capital of Bennington county,

Vermont, U.S.A., situated in the south-western part of the state, on Hoosic river, and traversed by the Bennington and Rutland railway. It contains three villages: Bennington, North Bennington, and Bennington Centre. It was here that General Stark, at the head of a body of Green Mountain boys, gained a notable victory over a detachment of General Burgoyne's army in 1777. Population of the town (1890) 6391, (1900) 8033; of the village (1890) 3971, (1900) 5656.

Benoit, Peter Leonard Leopold (1834-1901), composer and leader of the Flemish musical movement, was born 17th August 1834, at Harlebecke in Flanders. His father and a local village organist were his first teachers. In 1851 Benoit entered the Brussels Conservatoire, where he remained till 1855, studying chiefly under Fétis. During this period he composed music to many melodramas, and to an opera *Le Village dans les Montagnes* for the Park Theatre, of which in 1856 he became conductor. He won a Government prize and a money grant in 1857 by his cantata *Le Meurtre d'Abel*, and this enabled him to travel through Germany. In course of his journeyings he found time to write a considerable amount of music, as well as an essay *L'Ecole de Musique Flamande et son Avenir*. Fétis loudly praised his *Messe Solennelle*, which Benoit produced at Brussels on his return from Germany. In 1861 he visited Paris for the production of his opera *Le Roi des Aulnes* ("Erlkönig") which, though accepted by the Théâtre Lyrique, was never mounted; while there he conducted at the Bouffes-Parisiens. Again returning home, he astonished a section of the musical world by the production at Antwerp of a sacred tetralogy, consisting of his *Cantate de Noël*, the above-mentioned *mass*, a *Te Deum*, and a *Requiem*, in which were embodied to a large extent his theories of Flemish music. By prodigious efforts he succeeded in gathering round him a small band of enthusiasts, who affected to see with him possibilities in the foundation of a school whose music should differ completely from that of the French and German schools. In its main features this school failed, for its faith was pinned to Benoit's music, which is hardly more Flemish than French or German. Benoit's more important compositions include the Flemish oratorios *De Schelde* and *Lucifer*, the latter of which met with complete failure on its production in London in 1888; the operas *Het Dorp int Gebirgte* and *Isa*, the *Drama Christi*; an enormous mass of songs, choruses, small cantatas, and motets. Benoit also wrote a great number of essays on musical matters, notably on his favourite theme of Flemish music. He died at Antwerp on the 8th of March 1901. (R. H. L.)

Bensberg, a village of Prussia, in the Rhine province, 12 miles by rail E. from Cologne. Here is a castle (now cadet college), built by the Elector John William of the Palatinate in 1705. It has iron, lead, zinc, and silver mines. Population (1885), 10,269; (1900), 10,400.

Benson, Edward White (1829-1896), Archbishop of Canterbury, was born on 14th July 1829 at Birmingham. He came of a family of Yorkshire dalesmen, his father, whose name was also Edward White, being a manufacturing chemist of some note; his mother's maiden name was Harriet Baker. He was educated at King Edward VI.'s School, Birmingham, under James Prince Lee, afterwards Bishop of Manchester, and amongst his school-fellows were B. F. Westcott and J. B. Lightfoot, both of whom preceded him to Trinity College, Cambridge, where he was elected a sub-sizar in 1848, becoming subsequently sizar and scholar. The death of a favourite sister in 1850, of typhus, was followed two days afterwards by that of his widowed mother; and as her income consisted almost entirely of an annuity, the youth found himself almost without resources, with a family of younger brothers and sisters dependent upon him. Relations came to his aid (though he refused the offer made by his mother's brother, a devout Unitarian, to adopt one of the children and bring him up as his heir), and presently his anxieties were relieved by Francis Martin, bursar of Trinity, who gave him liberal aid, and treated him ever afterwards as a son. Benson took his degree in 1852 as a senior optime, eighth classic, and senior chancellor's medallist, and was elected Fellow of Trinity in the following year. He became a master at Rugby, first under Dr Goulburn, and then (1857) under Dr Temple, who became his life-long friend; he was also ordained deacon in 1854 and priest in 1856. From Rugby he went, on Dr Temple's recommendation, to be the first headmaster of Wellington College, which was opened in January in 1859; and in the course of the same year he married his cousin, Mary Sidgwick (sister of Professor Henry Sidgwick), to whom he had long been devotedly attached. Wellington College made him widely known, provided a scope for his enthusiastic love of teaching, and developed his administrative abilities; it grew rapidly under his headship, and to him it was due that, instead of becoming merely "a kind of military academy for army preparation," it took its place as a great English public school. By degrees his thoughts began to turn towards other work. His appointment to the prebendal stall of Heydour in Lincoln Minster (1868) gave him an office in a great cathedral chapter, towards which he had always felt greatly drawn; and as examining chaplain to Bishop Christopher Wordsworth he came into close contact with candidates for holy orders. For a short time also, in 1870, he held the same office for Dr Temple, just appointed to the see of Exeter. In 1872 came an offer of the chancellorship of Lincoln; his acceptance of it brought his school work to an end, and opened a new period of his life. As chancellor, the statutes directed him to study theology, to train others in that study, and to oversee the educational work of the diocese. To such work Benson at once devoted himself; and it is not too much to say that through his personal efforts and his studies he did more perhaps than any other man to reinvigorate cathedral life in England. He started a theological college (the *Scholæ Cancellarii*), which has had a prosperous career; he founded night schools, he delivered courses of lectures on church history, and held bible-classes; he was instrumental in founding a society of mission preachers for the diocese, the "Novate Novale;" and owing to his influence a general mission was held in the city of Lincoln in the spring of 1876.

In the winter of the same year he was offered and accepted the newly-constituted see of Truro; he was consecrated on St Mark's Day 1877, and enthroned in St Mary's Church at Truro on 1st May. The "brand-new bishop," as he was called by John Bright, threw himself into his work with characteristic vigour. Cornwall was to him "a land of wonderment, historical, physical, spiritual"; he soon came to know it well, and showed a remarkable power of grappling with its peculiar religious conditions. His knowledge, his sympathy, his enthusiasm made themselves felt everywhere, and by degrees he won the warm affection of the Cornish people. The new diocese was organized rapidly, the ruridecanal conferences of clergy became a real force, and the church life of Cornwall came to have a strength and solidity that had never been possible when it was merely a part of the huge unwieldy diocese of Exeter. A chapter was constituted, the bishop being dean; amongst its members was a canon missioner (the first to be appointed in England), and the *Scholæ Cancellarii* were founded after the Lincoln pattern. Moreover, the

bishop at once set to work to build a cathedral, and the efforts which were made to raise the necessary funds did perhaps more than anything else to draw the whole diocese together. The foundation-stone was laid on 20th May 1880, and the work went steadily forward. The south or Benson transept commemorates his episcopate; and on 3rd November 1887 the cathedral, so far as then completed, was consecrated. The nave will commemorate his primacy.

Archbishop Tait died on 3rd December 1882, and, to the joy of most church-people, Dr Benson was nominated as his successor: his election by the chapter of Canterbury was confirmed on 3rd March 1883, and he was enthroned on 29th March. It may be said without hesitation that his primacy was one of almost unprecedented activity, and that he bore the lion's share of all that was done. No Archbishop of Canterbury since the Reformation exercised such an influence outside the British Isles as he did. Frequent communications passed between him and the heads of the Eastern Churches. With their cordial approval a bishop was again consecrated, after six years' interval (1881-87), to have charge over the Anglican congregations in Jerusalem and the East; and the features which had formerly made the plan objectionable to many English churchmen were now abolished. In 1886, after much careful investigation, he founded the "Archbishop's Mission to the Assyrian Christians," having for its object the instruction and the strengthening from within of the "Nestorian" churches of the East [NESTORIAN CHURCH]. An interchange of courtesies with the Metropolitan of Kieff, on the occasion of the 900th anniversary of the conversion of Russia (1888), led to further intercourse, which has already done much to bring about a better understanding between the English and Russian churches. With regard to the Roman Communion his action was perhaps less happy. In 1894 the Abbé Portal (who, in common with many other French clergy, had been led by his studies to accept the validity of English orders) was in England, and an interview was sought on his behalf with Dr Benson, in which the question was discussed of a possible *rapprochement* with the Papacy. The Archbishop refused to take any part in such a plan, and subsequent events only showed the wisdom of this course. But there were many who felt that, then as at other times, some act of courtesy on the part of the English primate might have smoothed the way for possible action in the future. With the other churches of the Anglican Communion (*q.v.*) the Archbishop's relations were cordial in the extreme, and grew ever closer as time went on. Particular questions of importance, the Jerusalem bishopric, the healing of the Colenso schism in the diocese of Natal, the organization of native ministries, and the like, occupied no small part of his time; and although he held unflinchingly to all the accustomed rights and prerogatives of his see, he did all in his power to foster the growth of local churches. But it was the work at home which occupied most of his energies. That he in no way slighted diocesan work had been shown at Truro. He complained now that the bishops were "bishops of their dioceses but not bishops of England," and did all he could to make the Church a greater religious force in English life. He sat on the Ecclesiastical Courts Commission (1881-83) and the Sweating Commission (1888-90). He brought Bills into Parliament to reform Church Patronage and Church Discipline, and worked unremittingly for years in their behalf. The latter became law in 1892, and the former was merged in the Benefices Bill, which passed in 1898, after his death. He wrote and spoke vigorously against Welsh Disestablishment (1893); and in the following year, under his guidance, the existing agencies for Church Defence were consolidated, and greater stress was laid upon proper instruction than had previously been the case. He was largely instrumental in the inauguration of the House of Laymen in the province of Canterbury (1886); he made diligent inquiries as to the internal order of the Sisterhoods of which he was visitor; from 1884 onwards he gave regular Bible readings for ladies in Lambeth Palace Chapel. But the most important ecclesiastical event of his primacy was undoubtedly the judgment in the case of the Bishop of Lincoln [LINCOLN JUDGMENT], in which the law of the prayer-book is investigated, as it had never been before, from the standpoint of the whole history of the English Church. In 1896 the Archbishop paid a long-promised visit to Ireland, to see the working of the sister Church. He was received with enthusiasm, but the work which his tour entailed over-fatigued him. On Sunday morning, 11th October, just after his return, whilst on a visit to Mr Gladstone, he expired in Hawarden Parish Church of heart failure, just as the Absolution was said at Mattins.

Archbishop Benson left numerous writings, including a valuable essay on *The Cathedral* (London, 1878), and various charges and volumes of sermons and addresses. But his two chief works, posthumously published, are his *Cyprian* (London, 1897), a work of great learning, which had occupied him at intervals since early manhood; and *The Apocalypse, an Introductory Study* (London, 1900), interesting and beautiful, but limited by the fact that the method of study is that of a Greek play, not of a Hebrew apocalypse. The Archbishop's knowledge of the past was both wide and minute, but it was that of an antiquary rather than of an historian. "I think," writes his son, "he was more interested in modern movements for their resemblance to ancient than *vice versâ*." His sermons are very noble, written in a style which is over-compressed and often obscure, but full of love, of faith, of large-heartedness. He was a hymn-writer of a high order, as may be seen, for example, in "O Throned, O Crowned" and "The Splendours of Thy Glory, Lord," which he wrote for the *Wellington College Hymn-book*, which he edited, and in his beautiful version of *Urbs Beata*. His "grandeur in social function" was unequalled, and his interests were very wide. But above all else he was a great ecclesiastic. He paid less attention to secular politics than Archbishop Tait; but if a man is to be judged by the effect of his work, it is Benson, and not Tait, who should be described as a great statesman. His biography, by his son, reveals him as a man of devout and holy life, impulsive indeed and masterful, but one who learned self-restraint by strenuous endeavour.

A. C. BENSON. *Life of Archbishop Benson*, 2 vols. London, 1899.—J. H. BERNARD. *Archbishop Benson in Ireland*, 1897.—*Quarterly Review*, Oct. 1897, art. "Archbishop Benson" (by L. T. Dibdin). (W. E. Co.)

Bentham, George (1800-1884), British botanist, was born at Stoke, near Portsmouth, England, 22nd September 1800. His father, Sir Samuel Bentham, was the only brother of Jeremy Bentham, the publicist, and of scarcely inferior ability though in a different direction. Devoting himself in early life to the study of naval architecture, Sir Samuel went to Russia to visit the naval establishments in the Baltic and Black Seas. He was induced to enter the service of the Empress Catherine II., built a flotilla of gunboats and defeated the Turkish fleet. For this he was made, in addition to other honours, a colonel of a cavalry regiment. On the death of the Empress he returned to England to be employed by the Admiralty, and was sent (1805-07) again to Russia to superintend the building of some ships for the British navy. He attained the rank, under the Admiralty, of inspector-general of Naval Works. He introduced a multitude of improvements in

naval organization, one of the most remarkable being the invention with Marc Isambard Brunel, whom he brought to England, of the machinery for making pulley-blocks. His son, George Bentham, had neither a school nor college education, but early acquired the power of giving sustained and concentrated attention to any subject that occupied him—an essential condition of the success he attained as perhaps the greatest systematic botanist of the 19th century. Another was his remarkable linguistic aptitude. At the age of six to seven he could converse in French, German, and Russian, and he learnt Swedish during a short residence in Sweden, when little older. At the close of the war with France, the Benthams made a long tour through that country, staying two years at Montauban, where Bentham studied Hebrew and mathematics in the Protestant Theological School. They eventually settled in the neighbourhood of Montpellier, where Sir Samuel purchased a large estate.

The mode in which George Bentham was attracted to the botanical studies, which became the occupation of his life, is noteworthy. For it was through the applicability to them of logical methods which he had imbibed from his uncle's writings, and not from any special attraction to natural history pursuits. While studying at Angoulême, a copy of de Candolle's *Flore Française* fell into his hands and he was struck with the analytical tables for identifying plants. He immediately proceeded to test their use on the first that presented itself. The result was successful and he continued to apply it to every plant he came across. A visit to London in 1823 brought him into contact with the brilliant circle of English botanists. In 1826, at the pressing invitation of his uncle, he agreed to act as his secretary, at the same time entering at Lincoln's Inn and reading for the Bar. He was called in due time, and in 1832 held his first and last brief. The same year Jeremy Bentham died, leaving his property to his nephew. His father's inheritance had fallen to him the previous year. He was now in a position of modest independence, and able to pursue undistractedly his favourite studies. For a time these were divided between botany, jurisprudence, and logic, in addition to editing his father's professional papers. Bentham's first publication was his *Catalogue des Plantes Indigènes des Pyrénées et du Bas Languedoc* (Paris, 1826), the result of a careful exploration of the Pyrenees in company with Dr Walker Arnott (afterwards professor of Botany in the University of Glasgow). It is interesting to notice that in it Bentham adopted the principle from which he never deviated, of citing nothing at second-hand, or any fact or reference which he had not himself independently verified. This was followed by articles on various legal subjects: on codification, in which he disagreed with his uncle, on the laws affecting larceny, and on the law of real property. But the most remarkable production of this period was the *Outline of a New System of Logic, with a Critical Examination of Dr Whately's Elements of Logic* (1827). In this the principle of the quantification of the predicate was first explicitly stated. This Stanley Jevons declared to be "undoubtedly the most fruitful discovery made in abstract logical science since the time of Aristotle." Before sixty copies had been sold the publisher became bankrupt and the stock went for waste-paper. The book passed into oblivion, and it was not till 1873 that Bentham's claims to priority were finally vindicated against those of Sir William Hamilton by Herbert Spencer. In 1836 he published his *Labiatarum genera et species*. In preparing this work he visited, between 1830-34, every European herbarium, several more than once. The following winter was passed in Vienna, where he produced his *Commentationes de Leguminosarum generibus*, published in the annals of the Vienna Museum. In 1842 he removed to Pontrilas in Herefordshire. His chief occupation for some succeeding years was his contributions to the *Prodromus Systematis Naturalis Regni Vegetabilis*, which was being carried on by his friend, Alphonse de Candolle. In all these dealt with some 4730 species.

In 1854 he found the maintenance of a herbarium and library too great a tax on his means. He therefore offered them to the Government on the understanding that they should form the foundation of such necessary aids to research in the Royal Botanic Gardens at Kew. At the same time he contemplated the abandonment of botanical work. Fortunately, he yielded to the persuasion of Sir William Hooker, Lindley, and other scientific friends. In 1855 he took up his residence in London, and worked at Kew for five days a week, with a brief summer holiday, from this time onwards till the end of his life. As his friend Asa Gray wrote: "With such methodical habits, with freedom from professional or administrative functions, which consume the time of most botanists, with steady devotion to his chosen work, and with nearly all authentic material and needful appliances at hand, or within reach, it is not so surprising that he should have undertaken and have so well accomplished such a vast amount of work, and he has the crowning merit and happy fortune of having completed all that he undertook." The Government, in 1857, sanctioned a scheme for the preparation of a series of Floras, or descriptions in the English language of the indigenous plants of British colonies and possessions. Bentham began with the *Flora Hongkongensis* in 1861, which was the first comprehensive work on any part of the little-known flora of China. This was followed by the *Flora Australiensis*, in seven volumes (1863-78), the first flora of any large continental area that had ever been finished. His greatest work was the *Genera Plantarum*, commenced in 1862, and concluded in 1883 in collaboration with Sir Joseph Hooker, "the greater portion being," as Sir Joseph Hooker tells us, "the product of Bentham's indefatigable industry." As age gradually impaired his bodily powers, he seemed at last only to live for the completion of this monumental work. When the last revise of the last sheet was returned to the printer, the stimulus was withdrawn: his powers seemed suddenly to fail him. He commenced a brief autobiography. The pen with which he had written his two greatest works broke in his hand in the middle of a page. He accepted the omen, laid aside the unfinished manuscript, and patiently awaited the not distant end. He died on the 10th September 1884, within a fortnight of his 84th birthday.

The scientific world has received the *Genera Plantarum* with as unanimous an assent as was accorded to the *Species Plantarum* of Linnæus. Bentham possessed, as Professor Oliver has remarked, "an insight of so special a character as to deserve the name of genius, into the relative value of characters for practical systematic work, and as a consequence of this, a sure sifting of essentials from non-essentials in each respective grade." His preparation for his crowning work had been practically life-long. There are few parts of the world upon the botany of which he had not touched. In the sequence and arrangement of the great families of flowering plants, different views from those of Bentham may be adopted. But Bentham paved the way by an intimate and exact statement of the structural facts and their accurate relationship, which is not likely to be improved. In method and style, in descriptive work, Bentham was a supreme master. This, to quote Professor Oliver again, is "manifest not only in its terseness, aptness, and precision, but especially in the judicious selection of diagnostic marks, and in the instinctive estimate of probable range in variation, which long experience and innate genius for such work could alone inspire."

(W. T. T.-D.)

Benton Harbor, a city of Berrien county, Michigan, U.S.A., situated in the southern part of the lower peninsula, on St Joseph river and on Lake Michigan, at an altitude of 596 feet. The city has three railways and a large lake commerce. Population (1900), 6562.

Benue, R. See NIGER.

Berar, or the BERARS, the familiar name of a province in Central India, officially styled the Haidarabad Assigned Districts. It is administered on the lines of a British province by a commissioner, who is subordinate to the resident at Haidarabad. The ancient capital was Ellichpur; the administrative headquarters are now at Amraoti, while Akola is the residence of the judicial commissioner. The six districts of Berar are—Amraoti, Akola, Ellichpur, Buldana, Wun, Basim. Its area covers 17,718 square miles. The population in 1891 was 2,897,486; the average density being 164 persons per square mile, ranging from 238 in the fertile plain of Amraoti to 120 in Wun, and only 29 in the hilly tract of Ellichpur. Classified according to religion, Hindus numbered 2,531,791, or 87 per cent. of the total population; Mahommedans, 207,681, or 7 per cent.; aboriginal tribes, 137,108, or 5 per cent., chiefly in the two hilly districts of Wun and Ellichpur; Christians, 1359, of whom 330 were Europeans and 318 Eurasians, leaving 711 for native converts, chiefly in Amraoti and Akola; Jains, 18,952; Parsees, 412; Sikhs, 177; and "others," 6. In 1901 the population was 2,752,418, showing a decrease of 5 per cent., compared with an increase of 8 per cent. in the preceding decade. Excluding the hilly tract in Ellichpur known as the Melghat, which has never been surveyed for revenue, it is estimated that only 2 per cent. of the total area available for cultivation remains unoccupied. The incidence of land revenue is nearly R.1 per acre. In 1897-98, out of a total cultivated area of 6,625,806 acres, only 18,078 were twice cropped. The irrigated area was 80,981 acres, almost entirely from wells, and mainly in the district of Buldana. The two staple crops of Berar are millet and cotton, each of which is ordinarily grown on about one-third of the cultivated area. Next in importance come wheat, oil-seeds, and pulse. In 1897-98, the area under cotton was 2,150,709 acres. The exports of cotton to Bombay average about 326,000 bales of 392 lb, valued at Rs.3,00,00,000 (say £2,000,000 sterling). In 1897 there were altogether 79 cotton factories under inspection. The daily number of operatives employed was 7547. The cotton mill at Badnera has 219 looms and 15,976 spindles, and employs 1186 hands, of whom 677 are adult males. In 1898 the output was 5796 bales of twist and yarn equal to 2,298,767 lb, and 2339 bales of cloth. There are also three oil-mills worked by steam, of which two at Amraoti in 1898 produced 236,150 gallons of oil and 2181 tons of oil-cake. Coal exists, but no mines are worked. Berar is traversed by the Nagpur line of the Great Indian Peninsula railway. The average imports and exports by rail, for the quinquennial period ending 1897, were valued at—imports, Rs.1,87,08,000, and exports (mainly raw cotton) Rs.3,97,56,000. The results of the famine were shown in 1897-98 by a reduction of one-half in the export of grain and oil-seeds, while the export of hides and the import of grain doubled. The export of raw cotton was little affected; but this almost entirely ceased in the still more disastrous year 1899-1900. In 1897-98 the total provincial revenue of Berar amounted to Rs.99,23,458, of which Rs.68,55,550 was derived from land, Rs.10,63,058 from excise, Rs.8,27,641 from stamps, and Rs.4,00,350 from forests. The total provincial expenditure amounted to Rs.1,00,47,081, of which Rs.43,91,423 was devoted to defraying the cost of the Haidarabad Contingent, Rs.43,65,180 to the civil departments, Rs.7,16,137 to public works, and Rs.3,66,816 to famine relief. There was consequently a deficit; and for the first time for more than twenty years nothing could be paid over to the Nizam. In 1897-98 the local revenue amounted to Rs.8,55,967, and the local expenditure amounted to Rs.9,64,676. The municipalities in Berar number 12, with an aggregate population of 170,912. There are 6 district boards, with 21 subordinate *taluk* boards. In 1897-98 the aggregate income of the district boards was Rs.7,14,030, the aggregate expenditure was Rs.6,66,006. The following table gives the chief statistics of education in Berar for the years 1886-87 and 1896-97:—

	1886-87.		1896-97.	
	Schools.	Pupils.	Schools.	Pupils.
Secondary Schools . .	26	4,695	28	3,992
Primary Schools . .	935	38,530	1324	50,085
Special Schools . .	1	96	4	109
Private Institutions . .	26	340	5	157
Total . . .	988	43,661	1361	54,343

Compared with the estimated population of school-going age, the proportion of boys at school rose in ten years from 20·4 to 22·6 per cent.; while the proportion of girls at school has risen from ·7 to 1·8 per cent. The expenditure on education in 1886-87 was Rs.4,20,574, and in 1896-97 Rs.4,54,962. Berar suffered from famine in 1896-97, and again in 1899-1900. In June 1900 the maximum number of persons in receipt of relief was 516,000, or 18 per cent. of the total population. (J. S. Co.)

Berat, chief town of the sanjak to which it gives its name, forming part of the vilayet of Janina, South Albania, Turkey in Europe. The population numbers 12,000, consisting wholly of Albanians, of whom about half are Orthodox Christians, and the remainder Mahommedans.

Beraun (Czech, *Beroun*), an old manufacturing town in the government-district of Horowitz in Bohemia, Austria, south-west of Prague, at the confluence of the Beraun with the Litawa river. It is the seat of important textile industry, sugar-refining, corn-milling, and brewing. Lime-kilns and the manufacture of cement, and smelting and iron works are carried on in the environs. In 1890 it had 7265 Czech inhabitants; in 1900, 9693.

Berbers.—The mingled aboriginal white races of the North African coast—hence known as Barbary—are now chiefly confined to the highlands, where they still maintain their own unwritten language, split up into many dialects, although for nearly a thousand years they have professed Islám. Ethnologists are not agreed as to the division in which to class either their stock or their language, which latter approximates to the Hamitic group in its vocabulary, but to the Semitic in its construction; and until, in recent years, French students made known the peculiarities of the Algerian section, very little had been ascertained regarding them, except that under the Carthaginian generals they were the valiant foes of Rome, and under Arab generals the conquerors of Spain. In Morocco they still maintain a semi-independence. Among themselves they are known as Imazighan, "Free-men" (*s.* Amazigh), and by various local names, but by the Moors as Bráber (*s.* Berber). Whether the Greeks, and through them the Romans, borrowed this name from the natives and applied it to other tribes of uncouth tongue, or whether the natives learned it from the foreigners, is a disputed point. (R. M.*)

Berchem, a town of Belgium, in the province and 2 miles south of the town of Antwerp, of which it is a

suburb. Its railway station is on the line between Antwerp and Brussels. Population (1880), 9384; (1897), 19,696.

Berck-sur-Mer, a seaside resort in the arrondissement of Montreuil, department of Pas-de-Calais, France, 53 miles in direct line W. by N. of Arras, with stations on branch line of railway from Abbeville to Boulogne. It comprises two parts, Berck-ville and Berck-plage. The latter has a fine sandy beach. There are large children's hospitals, the climate proving peculiarly beneficial in the treatment of scrofulous affections. About 100 boats are employed in the fisheries, and herrings form the staple of an active trade. Fishing boats are built. Population (1881), 3999; (1896), 5787.

Beregszász, a corporate town of Hungary, capital of the county of Bereg, 57 miles E. by N. of Tokay. Saxons were the original settlers in the 13th century; now almost the entire population (9629) is Magyar. There are administrative and other offices; also a state gymnasium.

Berezovskiy Zavod, a wealthy village of east Russia, on the eastern slope of the Urals, on Pyshma river, 8 miles north-east of Ekaterinburg. It is one of the largest settlements of the government of Perm and the centre of an important mining region of the same name, where gold is extracted from quartz veins. The crushing of the quartz used to be made at Berezovskiy Zavod, but is now done at other works as well. The population, which was 10,189 in 1885, has decreased since, and has chiefly taken to the manufacture of boots, stone-cutting, and cabinet-making.

Berga, a town of Spain, in the province of Barcelona, on a spur of the Pyrenees, on the right bank of the river Llobregat. It is partly built on rising ground, and partly on the level plain. It has a theatre, casinos, and a fine parish church with three naves. Here was established the first cotton industry of Catalonia, and the house of Targueil invented the "bergadanas" weaving machinery long used in the province. In the neighbourhood there are lignite beds of importance, and barley, oats, corn, and maize are grown in the hills around Berga. It is supposed to be the *Castrum Bergium* of Livy. It was taken and retaken often in the 17th and 18th centuries by the French and Spaniards, and by Liberals and Carlists in the 19th. Population, 5239.

Bergamo, chief town of the province of Bergamo, Lombardy, Italy. A large public slaughter-house, a cattle market, and a provincial asylum for 700 inmates (costing £60,000), have been built, electric tramways and lighting have been introduced, and a funicular railway has been constructed between the modern town and the ancient city on the hill. Several new streets have been opened and works erected to protect the town against torrents from the surrounding heights. The municipal library has, since 1875, been enriched by bequests from Donizetti, Meyer, Spaventa, and Ravelli, and now possesses 160,000 volumes. The Fine Arts Academy, founded in 1797 by Count Giacomo Carrara, has likewise been enriched by legacies. The cathedral has been restored and completed, the ancient baptistery reconstructed by the side of the Colleoni chapel, and the house of the famous Condottiero Colleoni restored. Monuments have been erected to Victor Emmanuel II., Garibaldi, and the musicians Donizetti and Meyer, natives of Bergamo. The elementary schools give instruction to nearly 3000 children. Direct railway communication now exists with Milan, Cremona, Lecco, Monza, Brescia, Venice, Novara, and Turin. Steam tram lines also connect it with Treviglio, Lodi, and Monza. The mining industry (iron, copper, and marble) has been greatly developed since 1875. The commune of Gandino in the province of Bergamo is a centre of woollen industry, while at Fara d'Adda are the largest linen and woollen mills in Italy. Twelve cotton-spinning works have recently been established. The silk industry has maintained its importance in the province, while in the city printing and lithography have especially advanced. Various artificial manure factories supply the demands of agriculture. The cattle markets dispose annually of 50,000 cattle, 12,000 horses, 10,000 sheep, and 60,000 swine, for a total value of £640,000. The city *octroi* in 1899 amounted to £30,000. Population of town (1881) 39,704, (1901) 45,785; of province (1881) 390,775, (1901) 457,983. (L. Bl.)

Bergedorf, a town of Germany, in the territory of Hamburg, 10 miles by rail E. by S. from the city. It produces vegetables and fruit for the Hamburg markets, and carries on tanning, glass manufacture, brewing, and brick-making. It received town rights in 1275, belonged to Lübeck and Hamburg conjointly from 1420 to 1867, and in the latter year was bought by Hamburg. Population (1885), 5209; (1895), 8297; (1900), 10,250.

Bergen, a seaport, fortress, and bishop's see of Norway, forming a separate county (*amt*) by itself, on the W. coast, in 60° 23′ N. lat., and 5° 18′ E. long. The new buildings include St John's church (1893), the Exhibition Building (containing fisheries museum, &c.), an observatory, a fine exchange, a biological station, and an aquarium. Both Ibsen and Björnson were connected with the theatre. Bergen is the birthplace of the poets Holberg (1684-1754) and Welhaven (1807-1873), of Dahl, the painter (1788-1857), of Ole Bull, the violinist (1810-1880), and of Grieg, the composer. There are statues to Holberg (1884) and Christie, president of the Storthing in 1815-16 and 1818. The mercantile fleet in 1899 numbered some 370 vessels, with an aggregate of 541,200 tons, as compared with 350 vessels of 370,600 tons owned by Christiania in the same year, Bergen's preponderance being due to her larger number of iron steamships. In 1879 Bergen ranked after Christiania, Arendal, Stavanger, and Drammen; in 1900 she ranked first. The trade of the town grew from a total of £2,346,700 (imports £1,475,700, exports £871,000) in 1879 to £3,595,600 (imports £2,223,000, exports £1,372,600) in 1897. The staple of the trade is fish—codfish, herrings, cod-liver oil, and other fish products, anchovies, lobsters, &c. The other exports of chief importance are butter, copper ore, and hides. The imports consist principally of coal (125,000 to 190,000 tons annually), steamships, salt, cereals and flour, groceries, wines and spirits. The port was entered and cleared by a total of 690,200 tons in 1898. Bergen is not a great manufacturing city. Its chief industries are connected with the preparation of fish products and with shipbuilding; but there are also cotton and woollen weaving, with manufacture of paper, glass, earthenware, tobacco, cordage, and distilleries. Bergen is connected by rail with Vossevangen in the interior, a distance of 67 miles. In 1896 a beginning was made with the continuance of this line through the fjelds (fells) to connect with Christiania. In the first 50 miles from Vossevangen the line ascends 4080 feet, passing through a tunnel 5796 yards long at an altitude of 2822 feet; the tunnel is to be completed in July 1902. Population (1875), 38,573; (1891), 53,684; (1899), 68,393. (J. T. Bn.)

Bergen-op-Zoom, a town in the province of North Brabant, Holland, about 15 miles north of Antwerp, on the Roosendaal-Flushing railway. Beetroot is cultivated, and a trade is carried on in oysters as well as anchovies. A steam tramway to Antwerp, of recent construction, has given a great impetus to the export trade in fish. The population in 1899 was 13,668.

Bergerac, chief town of arrondissement, department of Dordogne, France, 19 miles S.S.W. of Périgueux, at the intersection of the railways from Libourne to Buisson, and Angoulême to Marmands. Extensive trade is maintained in truffles, grain, and chestnuts, considerable quantities of the last being sent to England. There are fine nurseries, and an important salmon fishery at the Salvette reservoir. Population (1881), 10,022; (1896), 10,697; comm. 13,594; (1900), 15,982.

Berhampore, the name of two towns in British India, in Bengal and Madras. (1) The headquarters of Murshidabad district, in Bengal, is situated on the left bank of the river Bhagirathi, 5 miles below Murshidabad city. Population, about 25,500. Berhampore was fixed upon after the battle of Plassey as the site of the chief military station for Bengal; and a huge square of brick barracks was erected in 1767, at a cost of £300,000. Here was committed the first overt act of the mutiny, on 25th February 1857. No troops are now stationed here, and the barracks have been utilized for a jail, a lunatic asylum, and other civil buildings. The old cemetery contains many interesting tombs, including those of Warren Hastings' first wife, the Irish adventurer George Thomas, and the hero of Mrs Sherwood's tale, *Little Henry and his Bearer*. A college, founded by Government in 1853, was made over in 1888 to a local committee, being mainly supported by the munificence of the late Rani Svarnamayi. (2) The headquarters of Ganjam district, in Madras, is situated in 19° 18′ N. lat. and 84° 48′ E. long., about 9 miles from the sea-coast. It is a station on the East Coast railway, which connects Calcutta with Madras. Population, about 25,500. Berhampore has a military cantonment, containing a wing of a native regiment, sometimes distinguished as Baupur. There is some weaving of silk cloth, and export trade in sugar. There are two churches and four printing-presses. The college, originally founded by Government, is now maintained by the Raja of Kallikota.

Beri-beri.—Beri-beri is described as a specific form of multiple peripheral neuritis, endemic in certain latitudes, and liable to epidemic diffusion. (For peripheral neuritis, see PATHOLOGY, *Neuropathology*.) According to Dr Manson, it is a disease of the greatest antiquity, and known to the Chinese from an extremely remote period. At one time its importance as a tropical disease was generally recognized, but it gradually dropped out of sight and was forgotten, until an epidemic in Brazil in 1863, and the opening up of Japan, where it prevails extensively under another name, brought it again into notice. The recognition of its character as essentially a form of peripheral neuritis is quite recent, and due to the researches of Scheube and Bäly in Japan, and of Pekelharing and Winkler in the Dutch Indies. The geographical distribution of beri-beri is between 45° N. and 35° S. It occurs in Japan, Korea, and on the Chinese coast south of Shanghai; in Manila, Tongking, Cochin China, Burma, Singapore, Malacca, Java, and the neighbouring islands; also in Ceylon, Mauritius, Madagascar, and the east coast of Africa. In the Western hemisphere it is found in Cuba, Panama, Venezuela, and South America. This distribution is curious and unintelligible as it stands. Probably further investigation will show that the disease is much more widely distributed. It has been carried in ships to Australia and to England. Dr Manson has "known it originate in the port of London in the crews of ships which had been in harbour for several months," and he suggests that when peripheral neuritis occurs in epidemic form it is probably beri-beri.

The cause is believed by many authorities to be an infective agent of a parasitic nature, but attempts to identify it have not hitherto been successful. It is "not obviously communicable from person to person" (Manson), but may be carried from place to place. It clings to particular localities, buildings, and ships, in which it has a great tendency to occur; for instance, it is apt to break out again and again on certain vessels trading to the East. It haunts low-lying districts along the coast, and the banks of rivers. Moisture and high temperature are required to develop its activity, which is further favoured by bad ventilation, overcrowding, and underfeeding. Some writers have suggested that it is allied to malaria, but it has not the same geographical distribution, and the symptoms are entirely different. The absence of fever seems to exclude the theory of a micro-parasite. Another hypothesis is that it is caused by unwholesome diet. The experience of the Japanese navy points strongly in this direction. Beri-beri was constantly prevalent among the sailors until 1884, when the dietary was changed. A striking and progressive diminution at once set in, and continued until the disease wholly disappeared. Major Ronald Ross has suggested that beri-beri is really arsenical poisoning. Many facts about it support the idea that it is some form of chronic poisoning, but at present there is nothing pointing to arsenic. One would rather expect it to be some fungoid growth affecting grain, such as rice or maize, or some other food-stuff commonly used in the localities where beri-beri is prevalent, and among sailors. The conditions under which their food is kept on board certain ships might explain the tendency of the disease to haunt particular vessels.

The most susceptible age is from 15 to 40. Children under 15 and persons over 50 or 60 are rarely attacked. Men are more liable than women. Race has no influence. Previous attacks powerfully predispose.

The symptoms are mainly those of peripheral neuritis with special implication of the phrenic and pneumo-gastric nerves. There is usually a premonitory stage, in which the patient is languid, easily tired, depressed, and complains of numbness, stiffness, and cramps in the legs; the ankles are œdematous and the face is puffy. After this, pronounced symptoms set in rapidly, the patient suddenly loses power in the legs and is hardly able to walk or stand; this paresis is accompanied by partial anæsthesia, and by burning or tingling sensations in the feet, legs, and arms; the finger-tips are numb, the calf muscles tender. These symptoms increase; the œdema becomes general, the paralysis more marked; breathlessness and palpitation come on in paroxysms; the urine is greatly diminished. There is no fever, unless it is of an incidental character, and no brain symptoms arise. The patient may remain in this condition for several days or weeks, when the symptoms begin to subside. On the disappearance of the œdema the muscles of the leg are found to be atrophied. Recovery is very slow, but appears to be certain when once begun. When death occurs it is usually from syncope through over-distension of the heart. The mortality varies greatly, from 2 to 50 per cent. of the cases. The disease is said to be extremely fatal among the Malays. After death there is found to be serous infiltration into all the tissues, and often hæmorrhages into the muscles and nerves, but the most important lesion is degeneration of the peripheral nerves. The cerebro-spinal centres are not affected, and the degeneration of the nerve-fibres is more marked the farther they are from the point of origin. The implication of the phrenic and pneumo-gastric nerves, and of the cardiac plexus, accounts for the breathlessness, palpitation, and heart failure; that of the vaso-motor system for the œdema and diminution of urine, and that of the spinal nerves for the loss of power, the impairment and perversion of sensation. According as these nerves are

variously affected, the symptoms will be modified, some being more prominent in one case and some in another.

There is no specific treatment for beri-beri. The most important measure is the removal of patients from the locality. If this is done they generally recover spontaneously, which again is in keeping with the theory of chronic poisoning. Symptoms may be treated as they arise. For prevention it is advisable to move other people from the same locality, or withdraw them from the operation of the same influence whatever it may be.

DR PATRICK MANSON. *Tropical Diseases*, new ed., 1900. A full bibliography is given by Dr Manson in Allbutt's *System of Medicine*. (A. SL.)

Berislav, or BORISLAV, a town of south-west Russia, government and 46 miles N.E. of Kherson, situated on the left bank of the Dnieper. It is supposed to have been founded in 1450 by the Turks. It contains steam flour-mills. The population is 12,081.

Berja, a town of Spain, province of Almeria, in a valley to the east of the Rio Grande. The country around Berja is mostly mountainous, and produces in a few valleys cereals, wine, oil, oranges, esparto grass, and fruits. Lead mines are in the district, and paper, cotton goods, and linen are manufactured in the town. Population (1897), 12,116.

Berkeley, a city of Alameda county, California, U.S.A., situated in 37° 52′ N. lat., and 122° 16′ W. long., on the east shore of San Francisco Bay, adjoining Oakland on the north and opposite San Francisco. It is traversed by two branches of the Southern Pacific railway. It is the site of the University of California, founded in 1868, one of the largest and most prosperous educational institutions in the state. It is richly endowed, having property valued at $8,000,000 and an income exceeding $500,000. Besides the literary, scientific, and engineering departments, which are at Berkeley, it has law, medical, and other departments in San Francisco, and an astronomical observatory (Lick) on Mount Hamilton near San José. Its professors and instructors in all departments in 1900 numbered 483, and its students 3024, about 40 per cent. of whom were women. Population (1890), 5101; (1900), 13,214.

Berkeley Fort. See NILE.

Berkeley, Miles Joseph (1803-1889), British botanist, was born in 1803 at Biggin, Northants, and went to Rugby and Christ's College, Cambridge. He took holy orders, and was curate at Margate and Market Harborough, afterwards being vicar of Sibbertoft. An English country clergyman of good family, he had acquired so enthusiastic a love of cryptogamic botany in his early years that he soon became well known as the leading British authority on Fungi and plant pathology, a position he maintained till very late in life. Berkeley was especially famous as a systematist in mycology, some 6000 species of Fungi being credited to him, but it would be an error to regard him as merely a specialist in this direction. His *Introduction to Cryptogamic Botany*, published in 1857, and his papers on "Vegetable Pathology" in the *Gardener's Chronicle* in 1854 and onwards, show that he had a very broad grasp of the whole domain of physiology and morphology as understood in those days. Moreover, it should be pointed out that Berkeley commenced his work as a field naturalist and collector, his earliest objects of study having been the Mollusca and other branches of zoology, as testified by his papers in the *Zoological Journal* and the *Magazine of Natural History*, between 1828 and 1836. As a microscopist he was an assiduous and accurate worker, as is shown by his numerous drawings of the smaller Algæ and Fungi, and by the admirable dissections of Mosses and Hepatics which he contributed; his investigations into the potato murrain, caused by *Phytophthora infestans*, and the grape mildew, to which he gave the name *Oidium Tuckeri*, and the pathogenic Fungi of wheat rust, hop mildew, and various diseases of cabbage, pears, coffee, onions, tomatoes, &c., were important in results on the life-history of these pests, at a time when very little was known of such matters, and must always be considered in any historical account of the remarkable advances in the biology of these organisms which were made between 1850 and 1880; and when it is remembered that this work was done without any of the modern appliances or training of a properly equipped laboratory, the significance of Berkeley's genius as a pioneer gains considerably in importance. It is as the founder of British mycology, however, that Berkeley's name will live in the history of botany, and his most important work is contained in the account of native British Fungi in Sir W. Hooker's *British Flora* (1836), the *Introduction to Cryptogamic Botany* (1857), and in his *Outlines of British Fungology* (1860), together with his magnificent herbarium of over 9000 species now at Kew. This collection is enriched by numerous notes and sketches, and forms one of the most important type series in the world. Berkeley's writings abound in evidence of his appreciation of the labours of others, whether as collaborators with himself as a collector, as were Broome in England and Curtis in America, or as workers in foreign countries with whom he had corresponded or whose works he had studied, as in the case of the Tulasnes, de Bary, Pringsheim, Fries, and other Continental workers engaged, like himself, in laying the foundations of modern cryptogamic botany. Berkeley died in July 1889. He was a man of refined and courteous bearing, an accomplished classical student, with the simple and modest habits that befit a man of true learning. A list of his publications will be found in the *Catalogue of Scientific Papers* of the Royal Society, and sketches of his life in *Proc. R. S.* vol. xlvii., 1890, p. 9, by Sir Joseph Hooker, and *Annals of Botany*, vol. xi., 1897, by Sir W. T. Thiselton-Dyer. (H. M. W.)

Berkhampstead, Great, a market town and railway station, in the Watford parliamentary division of Hertfordshire, England, 26 miles N.W. of London. The grammar school has been extended, and a high school for girls, on the same foundation, established. The sewerage is improved. A large chemical factory has been established. Area of ancient parish, of which the present parish and urban district is only part (since 1898), 4364 acres; population (1881), 4485; (1891), 5034; (1901), 5219.

Berkshire, a south-eastern county of England, bounded N. and N.E. by the Thames, S.E. by Surrey, S. by Hampshire, and W. by Wilts.

Area and Population.—The area of the ancient county is 462,224 acres, or 722 square miles, with a population in 1881 of 218,363, and in 1891 of 238,709, of whom 117,208 were males and 121,501 females, the number of persons per square mile being 331 and of acres to a person 1·91. In 1901 the preliminary census report gave the population as 254,931. The area of the administrative county, as given in the census returns of 1891, was 461,742 acres, with a population of 236,163; in 1901 (including the county borough of Reading), a population of 252,580. But a slight alteration in the area was made in 1895, by the transference to Berks of the part of the parish of Hungerford in Wilts, and of the parish of Combe in Hampshire, and by the transference to Wilts of part of the parish of Shalbourn in Berks. The registration county comprises 574,298 acres, with a population in 1891 of 268,357, of whom 111,543 were urban and 156,814 rural. Within the registration area the increase of population between 1881 and 1891 was 9·60 per cent. The excess of births over deaths between 1881 and 1891 was 34,690, but the increase in the resident population was only 20,727. The following table gives the numbers of marriages, births, and deaths, with the number of illegitimate births for 1880, 1890, and 1898:—

Year.	Marriages.	Births.	Deaths.	Illegitimate Births.	
				Males.	Females.
1880	1597	7771	4464	191	189
1890	1729	7174	4218	180	152
1898	1935	7031	4210	181	170

The number of marriages in 1899 was 2026, of births 6913, and of deaths 4288.

The marriage-, birth-, and death-rates were all below the average for England, as is also the percentage of illegitimate births. The following table gives the rates to 1000 persons living for a series of years, with the percentage of illegitimate births:—

	1870-79.	1880.	1880-89.	1890.	1888-97.	1898.
Marriage-rate	13·8	12·9	12·6	13·0	13·2	13·7
Birth-rate	31·9	31·5	30·2	26·9	26·8	24·8
Death-rate	18·5	18·1	16·4	15·8	15·2	14·9
Percentage of illegitimacy	5·2	4·8	4·8	4·6	4·6	5·0

In 1891 there were in the county 1430 natives of Scotland, 1422 natives of Ireland, and 596 foreigners.

Constitution and Government.—Berks is divided into three parliamentary divisions, and it also contains the parliamentary borough of Reading and parts of the boroughs of New Windsor and Oxford. There are seven municipal boroughs, Abingdon (6480), Maidenhead (12,980), Newbury (11,061), New Windsor (13,958), Reading (72,214), Wallingford (2803), and Wokingham (3254). Reading is now a county borough. The only urban district is Wantage (3766). The county is in the Oxford circuit, and assizes are held at Reading. The boroughs of Abingdon, Maidenhead, Newbury, New Windsor, Reading, and Wallingford have separate commissions of the peace, and Abingdon, Newbury, New Windsor, and Reading have, in addition, separate courts of quarter sessions. The ancient county is in the diocese of Oxford, and contains 190 ecclesiastical parishes or districts and parts of ten others.

Education.—The number of elementary schools on 31st August 1899 was 249, of which only 23 were board and 226 were voluntary schools, the latter including 201 Church of England schools, 7 Wesleyans, 4 Roman Catholic, and 14 "British and other." The average attendance at voluntary schools was 30,740, and at board schools 7959. The total school board receipts for the year ending 29th September 1899 were £47,431. The income under the Agricultural Rates Act was over £285.

Agriculture.—Much attention is paid to dairy farming, butter and cheese being largely made, and also condensed milk. Sheep are also largely reared, and an excellent breed of pigs is peculiar to the county. About seven-ninths of the total area is under cultivation, and of this about five-ninths is in permanent pasture. Only about 2000 acres are in hill pasture, while over 35,000 acres are under woods, and about 2700 acres under orchards, apples and cherries being largely grown. Although diminishing, the acreage under wheat still amounts to about two-fifths of that under corn crops, the other principal corn crops being oats and barley. Of the green crops turnips occupy much the larger acreage—about one half of the whole, the acreage under potatoes being inconsiderable. The following table gives the acreages of the larger main divisions of the cultivated area at intervals of five years from 1880:—

Year.	Total Area under Cultivation.	Corn Crops.	Green Crops.	Clover.	Permanent Pasture.	Fallow.
1880	375,890	138,462	54,910	41,993	123,918	16,591
1885	377,321	131,100	56,079	43,839	136,004	10,283
1890	376,358	123,745	49,631	42,114	151,984	8,681
1895	367,983	105,101	43,865	41,837	163,520	13,086
1900	364,431	104,512	41,265	41,953	169,304	6,981

The following table gives particulars regarding the principal live stock at the same date:—

Year.	Total Horses.	Total Cattle.	Cows or Heifers in Milk or in Calf.	Sheep.	Pigs.
1880	15,292	35,274	16,414	259,572	28,931
1885	16,055	45,713	19,971	266,546	36,489
1890	15,397	43,461	20,292	231,322	35,371
1895	15,517	39,154	19,052	184,668	33,197
1900	14,717	45,161	21,348	184,797	22,130

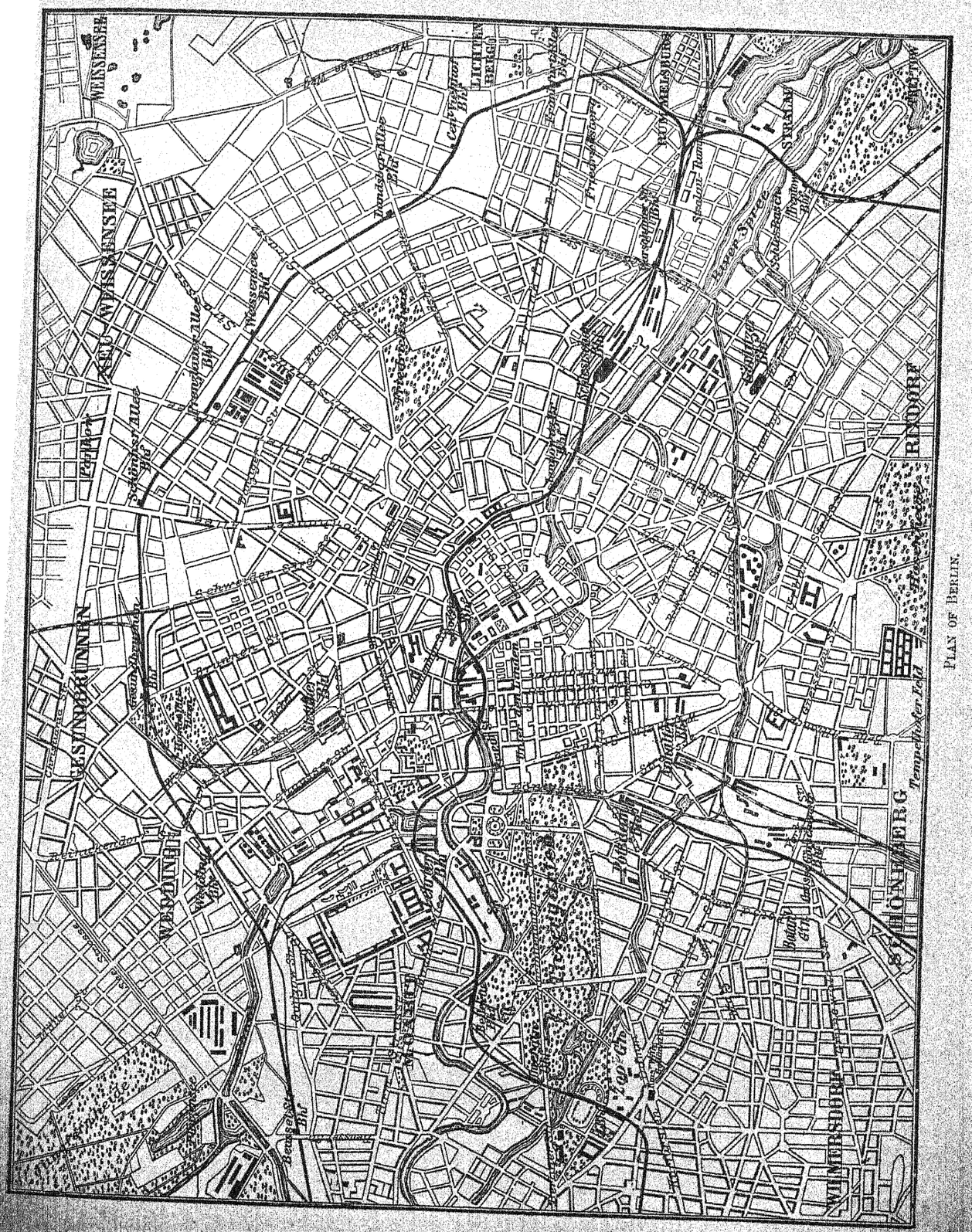
Industries and Trade.—According to the report for 1898 of the chief inspector of factories (1900), the total number of persons employed in non-textile factories and workshops in 1897 was 16,006, as compared with 14,794 in 1896. There were no textile factories. The number employed in non-textile factories was 12,110, the increase between 1895 and 1896 being 7·3 per cent, while between 1896 and 1897 it was 6·1 per cent. No fewer than 5364 were employed in the food industry, a large number in the biscuit works at Reading. Over 2000 persons are employed in factories and workshops in the manufacture of machines, appliances, &c., chiefly in iron foundries and engineering works. Boat-building also gives employment to a good many persons. The clothing trade has been revived at Abingdon, the total number of persons employed in workshops in this industry being 1735. There are extensive seed warehouses at Reading, and the Kennet and Windsor ales retain their repute. Whiting is manufactured from chalk at Kintbury. Of clay 110,953 tons were raised in 1899.

AUTHORITIES.—Chief of the older works is: ELIAS ASHMOLE. *Antiquities of Berkshire*, 3 vols., 1719; 2nd ed. London, 1723; 3rd ed. Reading, 1736. Other works are: MARSHALL. *Topographical and Statistical Details of the County of Berkshire*, London, 1830.—EARL OF CARNARVON. *Archæology of Berkshire*, London, 1859.—KENNEDY. *Birds of Berkshire and Buckinghamshire*, Eton, 1868.—KING. *History of Berkshire* (popular County History series), London, 1887.—LOWSLEY. *Glossary of Berkshire Words*, London, 1888, and *Index to Wills in the Court of the Archdeacon of Berkshire*, 1508-1652, Oxford, 1893. See also *The Berks Archæological Society's Quarterly Journal*, and *Berkshire Notes and Queries*.

Bêrlad, a town in Rumania, chief town of the district of Tutova. There is a fine hospital under the administration of the St Spiridion hospital of Jassy. Bêrlad possesses several soap factories, and its horse fairs are well known throughout Rumania. In the vicinity are some traces of a Roman encampment. Population (1895), 23,000; (1900), 24,484—about one-fourth Jews.

Berlin, the capital of Prussia, and since 1871 the metropolis of the German empire, is situated on the river Spree in 52° 30′ 17″ N. lat. and 13° 23′ 17″ E. long., at a height of about 100 feet above the level of the Baltic. The mean temperature for the ten years 1889-98 was 48·2° Fahr., and the rainfall 22·4 inches. In a general way it may be said that the climate is exhilarating and healthful. The boundaries of the city have not been extended since 1861, and though large and important suburbs have crept up and have practically coalesced with it, the administrative area remains unchanged. It occupies 28 English square miles, with a length from E. to W. of 6, and a breadth from N. to S. of 5½ English miles, contains about 940 streets, 90 open places, and 90 bridges, and has a population (1900) of 1,857,000 inhabitants. If the immediate suburbs be reckoned, Greater Berlin has a population of no less than 2,430,000. Politically, the city is divided into six Reichstag and four Landtag parliamentary constituencies, returning six and nine members respectively, and it must be noted that, despite the enormous increase in population, there has not been in Prussia, in the case of the Landtag, any redistribution of seats since 1860, so that the city is, in proportion to its population, much under-represented. It should have twenty-three members instead of nine.

The oldest part of Berlin, the city and Altkölln, built along the different arms of the Spree, still remains the centre of business activity. The social and official life of the capital centres round Unter den Linden, which runs from the royal palace to the Brandenburger Thor. This street, nearly one English mile in length, and forming a double avenue, is the favourite promenade, and presents Berlin life in all its varying aspects. Many historical scenes have taken place in this famous boulevard, such as the entry of the troops in 1871, and the funeral pageant of the Emperor William I., and no other city in Europe possesses so stately a thoroughfare. Although it has been embellished by the addition of new buildings, notably hotels, restaurants, and cafés, its appearance has undergone no important change. South of Unter den Linden lies the Friedrichstadt, with its parallel lines of straight streets, comprising the Behrenstrasse, the seat of the *haute finance*, the Wilhelmstrasse (with the palace of



PLAN OF BERLIN.

the Reichskanzler) the "official" quarter of the capital, and the long Friedrich and Leipziger Strassen, both of which are flanked by handsome and attractive shops and restaurants, among the latter being the "*bier* palaces" of the great breweries. It is beyond this quarter that great additions have been made. In 1870 Berlin was practically bounded on the south by the Landwehr canal, but it has since extended far beyond, and on this side is now only limited by the Tempelhofer Feld, the "*champ de Mars*" of the capital, where the famous military reviews are held. The Landwehr canal, leaving the Spree at the Schlesisches Thor and rejoining it at Charlottenburg, after a course of six miles, adds no little to the charm of the southern and western districts (the residential quarter of the city), being flanked by fine boulevards and crossed by many handsome bridges, notably the Potsdamer and Victoria Brücke, which carries the traffic from two converging streets into the outer Potsdamer Strasse and the Hercules Brücke, connecting the spacious Lützow Platz with the Thiergarten. To the north of the Unter den Linden lies the university quarter, with numerous hospitals and scientific institutions, which, interspersed with barracks and other military buildings, practically occupies the whole district lying between the Spree and the Oranien and Karl Strassen, the so-called Luisenstadt.

Berlin is the principal residence of the emperor, the seat of the Reichstag and the Prussian diets, and of the various State offices of the empire, the sole exception being the Supreme Court of Justice (*Reichsgericht*) which, despite the exertions of Prussia, remains fixed at Leipzig. Since 1871 the growth of the city and its economic progress have been phenomenal; indeed, it is only in Budapest that any parallel can be found among cities of the eastern hemisphere for such rapid expansion and development. Its population has more than doubled in the last three decades. While in 1871 it amounted to 826,341, in 1890 to 1,578,794, it had in 1900 reached a total (including a garrison of some 20,000 strong) of 1,857,000.

The marriage-rate (1898) was 22·09 per thousand, as against 21·92 for the preceding ten years; the birth-rate, for the same year, 28·93 per thousand, of which 4·58 were illegitimate, as against an average of 31·20 for the 10 years; the death-rate 18·25, a rate which has rapidly diminished, the average for the ten years ending 1898 being 21·00, the average for the whole century from 1798 being no less than 30 per thousand.

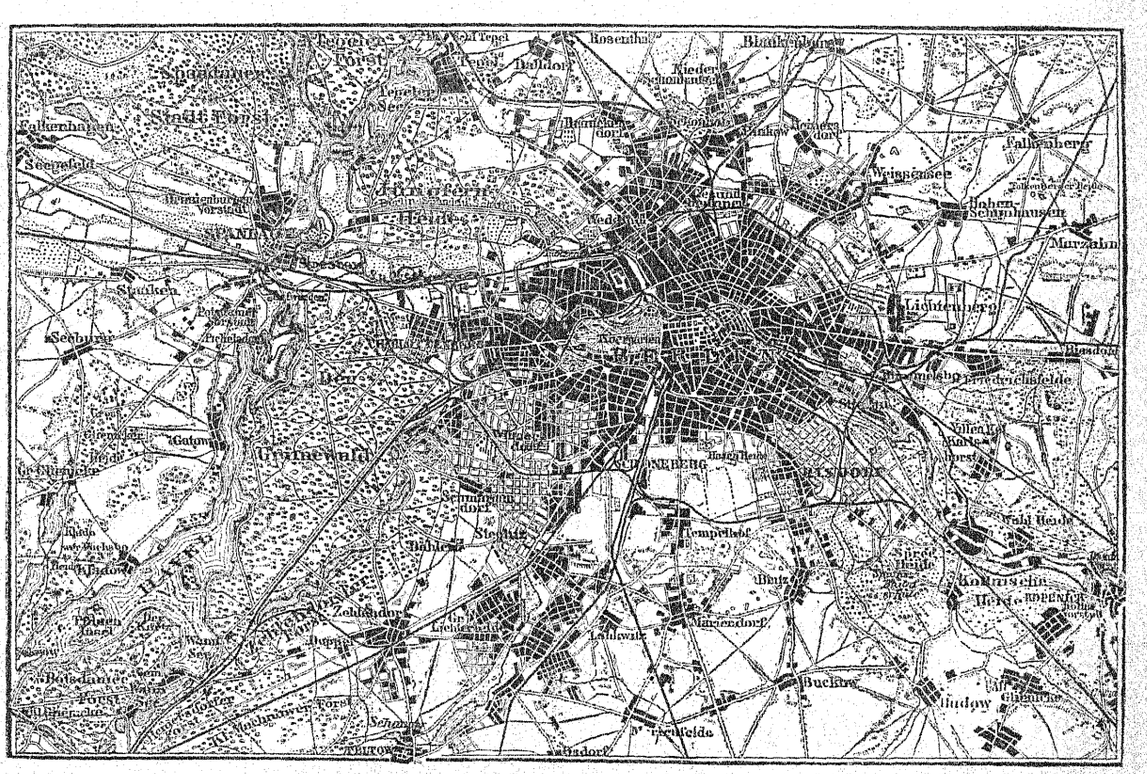
The situation of Berlin, so far from being prejudicial to its growth and prosperity, has been the greatest determining factor in its rapid rise to the position of the greatest industrial and commercial city on the Continent. The Spree with its deep-water channel, and rarely frost-bound, connects it on the east through canals with the Oder, and thus with Stettin and other Baltic ports, and with river navigation in upper Silesia, Poland, and upper Austria, while linking it on the west through the Havel lakes with Hamburg, and with the cities of the upper Elbe. In addition to its waterways, it is also the centre of an extensive railway system bringing it into close connexion with all the leading cities of the Continent.

For administrative purposes the city is divided into 48 wards, with 369 municipal and 102 police districts. After 1870 doubts were often expressed whether the capital would be able to bear the burden of empire, so enormous was the influx of citizens. It is due to the magnificent services of the municipal council that the city was enabled to assimilate the hosts of newcomers, and it is to its indefatigable exertions that Berlin has in point of organization become the model city of Europe. In none other has public money been expended with such enlightened discretion, and in none other has the municipal system kept pace with such rapid growth and displayed greater resource in emergencies. In 1870 the sanitary conditions of Berlin were the worst of any city in Europe. It needed a Virchow to open the eyes of the municipality to the terrible waste of life such a state of things entailed. But open sewers, public pumps, cobble-paved roads, open market-places, and overcrowded subterranean dwellings are now things of the past. The city is excellently drained, well paved, well lighted, and furnished with an abundant supply of carefully filtered water, whilst the cellar dwellings have given place to light and airy tenements, and it justly claims to rank with the cleanest and healthiest capitals in Europe.

The immediate effect upon Berlin of the successful issue of the war of 1870 was electrical. The old Prussian capital girded itself at once to fulfil its new *rôle*. The concentration upon the city of a large garrison flushed with victory, and eager to emulate the vanquished foe in works of peace, and vie with them in luxury, was an incentive to Berliners to put forth all their energy. Besides the military, an enormous immigration of civilian officials took place as the result of the new conditions, and as accommodation was not readily available rents rose to an enormous figure. Building proceeded in hot haste, and in the years immediately following the war whole streets of tenement houses, for the most part badly arranged, ill built, and of no architectural pretensions, were hurriedly erected. The year 1878 marks a fresh starting-point in the development of the city. In that year Berlin was the meeting-place of the famous congress which bears its name. The recognition of Germany as a leading factor in the world's counsels had been given, and the people of Berlin could indulge in the task of embellishing the capital city of the empire in a manner befitting its position. From this time forward, State, municipal, and private enterprise have worked hand in hand to make the capital cosmopolitan. Since the last edition of this work was published Berlin has been enriched by many public buildings, and is able in this respect to vie in magnificence with any other capital in the world. Especially in the matter of churches a striking increase is noticeable. The city now contains 115 Christian places of worship: viz., 99 Evangelical, 15 Roman Catholic, and 1 Greek; and 9 Jewish synagogues, and of these no fewer than 30 have been dedicated during the reign of the Emperor William II. First and foremost among them is the new cathedral (Dom) which replaces the old building pulled down in 1893. It is an imposing edifice of sandstone in the style of the Italian Renaissance, and has a dome rising with the lantern to a height of 380 feet (see article ARCHITECTURE). The Kaiser Wilhelm Gedächtniss Kirche (in the suburb Charlottenburg) with a lofty spire, the Dankes Kirche (in commemoration of the Emperor William I.'s escape from the hand of the assassin Nobiling in 1878) in Wedding, and the Kaiser Friedrich Gedächtniss Kirche on a grassy knoll in the north of the Thiergarten, are worthy of especial notice. In the Montbijou Park, on the north bank of the Spree, and just behind the Royal Museum, has been built the very pretty little English church of St George. The establishment of the imperial Government in Berlin naturally brought with it the erection of a large number of public buildings, and the great prosperity of the country, as well as the enhanced national feeling, has enabled them to be built on a scale of splendour befitting the capital of an empire. First in importance is the Reichstagsgebäude, in which the Reichsrath (imperial council) and the Reichstag (imperial diet) hold their sittings. The building is described in the article on ARCHITECTURE; a special feature is the library, which is exceedingly rich in works on constitutional law. A new house has also been built for the Prussian parliament (Landtag) and the Prussian House

of Lords (Herrnhaus) in the Albrecht Strasse. Other new official buildings are the Patent Office on the site of the old Ministry of the Interior; the new Ministry of Posts (with Post Museum) at the corner of the Mauer and Leipziger Strassen; the Central Criminal court in Moabit; the courts of first instance on the Alexander Platz; the Ministry of Police, and the Reichsversicherungs-amt, which is the centre for the great system of old-age pensions. In addition to these, many buildings have been restored and enlarged, chief among them being the Zeughaus (Armoury), the War Office, and the ministry of public works, while the Marstall (Royal Mews) has been entirely rebuilt and boasts an imposing façade.

Among the public monuments comes first and foremost the bronze equestrian statue of the Emperor William I. (by R. Begas), erected opposite the west portal of the Schloss. The space for the site was gained by pulling down the old houses composing the so-called Schlossfreiheit and damming back the Spree. The monument, which cost £200,000, represents the emperor in a martial cloak, his right hand resting on a field-marshal's baton, reining in his charger, which is led by a female genius of peace. The work is mounted on a high pedestal and is surrounded by a colonnade of Ionic columns. On the square on the south side of the castle is a bronze fountain (also by R. Begas) representing "Neptune on rocks," the gift of the city to the Emperor William II. On the Königsplatz, in the north-east corner of the Thier-



BERLIN (*Environs*).

garten, between the column of Victory and the Reichstagsgebäude, and immediately facing the western façade of the latter, is the bronze statue of Prince Bismarck, unveiled in April 1901, a figure 20 feet in height standing on a granite socket. From the south side of the Königsplatz runs the broad Sieges Allee, lately adorned by thirty-two groups of marble statuary representing famous rulers of the house of Hohenzollern, the gift of the Emperor William II. to the city. The Thiergarten itself, the beautiful park with its thickets of dense undergrowth and winding lanes and lakes, has lost somewhat of its sylvan character owing to building encroachments on the north side and the laying out of new rides and drives. It has in addition to those above enumerated been enriched by statues of Queen Louisa, of Goethe, and Lessing. The smaller parks around the city, as the Friedrichshain, Humboldtshain, and the Victoria park on the Kreuzberg, have not, except in the case of the last, which has received a waterfall, been materially altered.

Berlin is the centre of the North German network of railways. No fewer than twelve main lines concentrate upon it. Internal communication is provided for by the Ringbahn, or outer circle, which was opened in 1871, and by a well-devised system connects the termini of the various main lines. The through traffic coming from east and west is carried by the so-called Stadtbahn, or city railway, which also connects with and forms an integral part of the outer circle. This line runs through the heart of the city, and was originally a private enterprise. Owing, however, to the failure of the company, the great work was taken in hand by the State, and the line opened in 1878. It has four tracks—two for the main-line through traffic, and two for local and suburban service, and is carried at a height of about 20 feet above the streets. Its length is 12 miles, the total cost $3\frac{3}{4}$ millions sterling. The chief stations are Zoologischer Garten, Friedrich Strasse, Alexander Platz, and Schlesischer Bahnhof. Lying apart from the system are the Lehrter Bahnhof for Hamburg and Bremen, the Stettiner for Baltic ports, and the Görlitzer, Anhalter, and Potsdamer termini for traffic to the south, of which the last two are fine specimens of railway architecture. Internal communication is also provided for by an excellent system of tram-lines worked both by horses and by electricity, while

an overhead electric railway runs from the Zoologischer Garten to the Schlesisches Thor, with a branch from the Potsdamer Bahnhof terminating near the Friedrichstrasse Bahnhof.

Industry, Trade, and Commerce.—It is in respect of its manufacture and trade that Berlin has attained its present high pitch of economic prosperity. More than 50 per cent. of its working population are engaged in industry, which embraces almost all branches, of which new ones have lately sprung into existence, whilst most of the older ones have taken a new lease of life. The old wool industry, for example, has become much extended, and now embraces products such as shawls, carpets, hosiery, &c. Its silk manufactures, formerly so important, have, however, gradually gone back. It is particularly in the working of iron, steel, and cloth, and in the by-products of these, that Berlin excels. The manufacture of machinery and steam-engines shows an enormous development. No fewer than 100 large firms, many of them of world-wide reputation, are engaged in this branch alone. Among the chief articles of manufacture and production are railway plant, sewing machines, bicycles, steel pens, chronometers, electric and electric-telegraph plant, bronze, chemicals, soap, lamps, linoleum, china, pianofortes, furniture, gloves, buttons, artificial flowers, and ladies' mantles, the last of an annual value exceeding £5,000,000. The output of its 100 breweries, including those in the suburbs, reached in the year 1898-1899 the enormous total of about 80,000,000 gallons. Berlin is also the great centre and the chief market for speculation in corn and other cereals which reach it by water from Poland, Austria, and South Russia, while in commerce in spirits it rivals Hamburg.

The Börse, where 4000 persons daily do business, is the chief market in Germany for stocks and shares, and its dealings are of great influence upon the gold market of the world. Numerous banks of world-wide reputation, doing an extensive international business, have their seats in Berlin, chief among them, in addition to the Reichsbank, being the Berliner Kassen Verein, the Disconto Commandit, the Deutsche Bank, and the Boden-Credit Bank.

Learning and Art.—Berlin is rapidly becoming not only the centre of the imperial Government, but also of the intellectual life of the nation. The famous Friedrich Wilhelm University, although young in point of foundation (A.D. 1810), has long since outstripped its great rival Leipzig in point of numbers, and can point with pride to the fact that its teaching staff has yielded to none in the number of illustrious names. To its roll must now be added those of Helmholtz, van 't Hoff, Koch, E. Fischer, Waldeyer, and von Bergmann among scientists and surgeons; Mommsen, Treitschke, and Sybel among historians, Harnack among theologians, Brunner among jurists. Taking ordinary, honorary, extraordinary professors, and licensed lecturers (*privat-docenten*) together, its professorial strength consists of 21 teachers in the faculty of theology, 29 in that of law, 134 in that of medicine, and 207 in that of philosophy, altogether 391. The number of matriculated students in the winter term 1898-99 was 5873, as against 4648 in the preceding summer term; the reason of the disproportion being that in the summer term university towns having pleasant surroundings, such as Bonn, Heidelberg, Kiel, and Jena are more largely frequented, the larger towns showing an increased strength in the winter. Berlin is essentially a Prussian university, 4319 of the number above given hailing from the kingdom. Of students from non-German states, the United States of America, with 108 students, come next after Russia, while Great Britain is credited with but 21. It is, however, in the ugly palace of Prince Henry of Prussia, which was given for the purpose in the days of Prussian poverty and distress, that the university is still housed, and although some internal rearrangement has been effected, no substantial alterations have been made to meet the ever-increasing demand for lecture-room accommodation. The garden towards Unter den Linden has been adorned by a bronze statue of Helmholtz, and by marble statues in sitting posture of Wilhelm and Alexander von Humboldt, the last a masterpiece by R. Begas. Technical education is provided in the magnificent buildings erected at a cost of £100,000 in Charlottenburg, which are equipped with all the apparatus for the teaching of science. This college was attended in the winter term 1898-99 by 2425 students. In view of the fact that Charlottenburg is rapidly replacing the Luisenstadt as a students' quarter, the project has been seriously entertained of removing thither the Royal Library, which is in intimate touch with the university and largely used by students. Among other institutions of university rank and affiliated to it are the School of Mines, the Agricultural College, the Veterinary College, the new Seminary for Oriental Languages, and the High School for Music. The Geodetic Institute has been removed to Potsdam. The university is, moreover, rich in institutions for the promotion of medical and chemical science, for the most part housed in buildings belonging to the governing body.

Schools.—Berlin possesses 19 "gymnasia" (schools for the highest branches of a learned profession), of which 6 are under the direct supervision of the provincial authorities and have the prefix *Königlich* (royal), while 11 are municipal and under the control of the civic authorities. These schools were attended in the winter term 1898-99 by 8387 scholars, of whom no less than 1989 were of the Jewish persuasion. There are also numerous Realschulen (schools in which special attention is given to instruction for the higher branches of commercial life), and these were attended by 5138 scholars. The 8 public high schools for girls showed for the same period an attendance of 5320, while the elementary parochial schools show 105,709 boys and 101,642 girls.

Museums.—Many new museums have been erected. The National Gallery, a fine building surrounded by a Corinthian colonnade, and lying between the Royal Museum and the Spree, contains many interesting modern German paintings. The Kunstgewerbe Museum, at the corner of the Koniggrätzer and Albrecht Strassen, contains valuable specimens of applied art and the famous Schliemann treasures. The Royal Museum's picture gallery has become, if not one of the largest, at least one of the best collections of pictures in existence, and there are few great painters of whom it does not contain one or two masterpieces, while the sculpture gallery has been enriched by an unique collection, the result of the excavations at Pergamon.

Theatres.—In nothing has the importance of Berlin become more conspicuous than in theatrical affairs. In addition to the old-established Opernhaus and Schauspielhaus, which are supported by the State, numerous private playhouses have been erected, notably the "Lessing" theatre and the "Deutsches Theater," and it is in these that the modern works by Wildenbruch, Sudermann, and Hauptmann have been produced, and it may be said that it is in Berlin that the modern school of German drama has its home. In art Munich still holds the first place, and though in music Berlin is not able to cope with Leipzig, Dresden, or Munich, yet it is well represented by the Conservatorium, with which the name of Joachim is connected, whilst the more modern school is represented by Xaver Scharwenka.

Politics.—Ever since the revolution of 1848 and the

beginning of parliamentary life in Prussia, Berlin has been the chief support of the Radical party. In the old days of the conflict between Bismarck and the parliament Berlin always supported the opposition, and it continued to do so even after it had become the capital of the empire. It has been represented by men such as Virchow, Lasker, and Richter; and the Radicals, who have lost their influence in other parts of the country, still held in 1901 all the seats in Berlin for the Prussian Landtag. In the town council of Berlin no Conservative is able to find a seat, and they have always elected as chief burgomaster a man of strong Radical sympathies. Hence it has come about that there have been serious collisions between the town council and the court (William II. and the empress having frequently expressed their dissatisfaction with the attitude of the city of Berlin in political and religious matters), which have been intensified on more than one occasion by the fact that the emperor has refused to ratify the appointment of a Radical burgomaster. During recent years the forces of Social Democracy have succeeded in winning most of the seats from the Radicals in the elections to the Reichstag. In 1873 Berlin returned five Social Democrats and one Radical. In 1898 the proportion was four to two. In the town council also the Jews have won a large number of seats, and, of course, support the Liberal majority in the general opposition to the Government, which by such measures as the law controlling the Exchange, increased duties on food, and the support given to the more orthodox parties, has offended both the business interests and the intellectual prejudices of the city.

Environs.—Marvellous as has been the transformation in the city itself, no less surprising results have been effected since 1875 in the surroundings of Berlin. On the east, north, and west the city is surrounded at a distance of some 5 miles from its centre by a thick belt of pine woods, the Jungfernheide, the Spandauer Forst, and the Grunewald, the last named stretching away in a south-westerly direction as far as Potsdam, and fringing the beautiful chain of Havel lakes. These forests enjoyed until quite recent times an unenviable notoriety as the camping-ground and lurking-place of footpads and other disorderly characters. After the opening of the circular railway (Ringbahn) in 1871, private enterprise set to work to develop these districts, and a "villa colony" was built at the edge of the Grunewald between the station West End and the Spandauer Bock. From these beginnings, owing mainly to the expansion of the important suburb of Charlottenburg, has resulted a complete transformation of the eastern part of the Grunewald into a picturesque and delightful villa suburb, which is connected by railway, steam-tramway, and a magnificent new boulevard—the Kurfuerstendamm—with the city. Nowadays the little fishing villages on the shores of the lakes, notably the Wannsee, cater for the recreation of the Berliners, while palatial summer residences of wealthy merchants occupy the most prominent sites. Suburban Berlin may be said now to extend practically to Potsdam.

Government and Administration.—The government is partly semi-military (police) and partly municipal. The police ministry (a branch of the home office) consists of six departments: (1) general; (2) trade; (3) building; (4) criminal; (5) passport; (6) market. It controls the fire brigade and has the general inspection over all strangers, and is responsible for public order. The magistracy (the civil authority) consists (1) of a chief mayor (oberbürgermeister) and (2) of a mayor, both of whom are elected by the council (Stadtverordnete) of 144 members, of whom three are elected for each ward by manhood suffrage. Ratification by the Crown is necessary in the case of the two mayors, and no reason need be given for the withholding of such sanction. (3) Of a council (Stadträthe) of 30 members, of whom 14 are jurists and paid, and who devote themselves exclusively to the service of the city, whilst the services of the remaining 16 are given gratuitously and their office honorary. For general work both magistrates and Stadtverordnete coalesce, and committees are appointed from their body for various purposes, which, however, are usually presided over by magistrates. Their jurisdiction extends to water-supply, the drainage, lighting and cleaning of the streets, the care of the poor, hospitals, and schools. The combined rate for all purposes amounted in 1901 to about 2s. 1d. in the £ of rental assessment.

Public Conveyances.—At the end of 1898 there were in Berlin, according to police returns, 6097 first-class cabs (victorias and broughams), mostly with fare indicators, 1842 second-class (closed cabs), 157 luggage cabs, 551 omnibuses, and 1842 tramcars. In 1898 the omnibus companies carried 53,817,422 passengers, the tramways (now mainly worked by electricity) 212,940,112, and the various local railways 362,594,886, as against 184,935,602 carried in 1888. In the summer of the same year the steamboats plying above and below the city conveyed 765,000 passengers.

Streets.—The public streets have a total length of about 290 English miles. The staff employed in maintaining and cleaning the public roads consists of 36 superior officials, inspectors, and overseers, and 1036 scavengers. The force is well controlled, and the work of cleaning and removing snow after a heavy fall is thoroughly and efficiently carried out. The less important thoroughfares are mostly paved with the so-called Vienna paving, granite bricks of medium size, while the principal streets, and especially those upon which the traffic is heavy, have either asphalt or wood paving.

Water-Supply and Drainage.—The water-supply is mainly derived from works on the Müggel and Tegeler lakes, the river water being carefully filtered through sand. The drainage system is elaborate, and has stood the test of time. The city is divided into twelve radial systems, each with a pumping station, and the drainage is forced through five mains to eighteen sewage farms, each of which is under careful sanitary supervision, in respect both of the persons employed thereon, and the products, mainly milk, passing thence to the city for human consumption. Only in a few isolated cases has any contamination been traced to fever or other zymotic germs. In this connexion it is worth noting that the infectious diseases hospital has a separate system of drainage which is carefully disinfected, and not allowed to be employed for the purposes of manure.

Hospitals.—In no other city of the world is the hospital organization so well appointed as in Berlin, or are the sick poor tended with greater solicitude. State, municipal, and private charity here again join hands in the prompt relief of sickness and cases of urgency. The municipal hospitals are 5 in number, the largest of which is that of Friedrichshain, which is built on the pavilion system, while the State controls 6, of which the world-renowned Charité in the Luisenstrasse is the principal. The hospitals of the nursing sisters (Diaconissen Anstalten) number 8, while there are no less than 51 registered private hospitals under the superintendence of responsible doctors and under the inspection of Government. In all there are 70 hospital establishments with a grand total (1898) of 7677 beds.

Charities.—Berlin is also very richly endowed with charitable institutions for the relief of pauperism and distress. In addition to the municipal support of the poor-houses there are large funds derived from bequests for the relief of the necessitous and deserving poor; while night shelters and people's kitchens have been organized on an extensive scale for the temporary relief of the indigent unemployed. For the former several of the arches of the city railway have been utilized, and correspond in internal arrangement to the like shelters instituted by the Salvation Army in London and various other cities.

Markets.—Open market-places in Berlin are things of the past, and their place has been taken by airy and commodious market halls. Of these, 15 in number, the central market, close to the Alexander Platz station of the city railway with which it is connected by an admirable service of lifts for the rapid unloading of goods, is the finest. It has a ground area of about 17,000 square yards, and is fitted with more than 2000 stalls. The other markets are conveniently situated at various accessible places within the city, and the careful police supervision to which they are subjected, both in the matter of general cleanliness, and in the careful examination of all articles of food exposed for sale, has tended to the general health and comfort of the population.

Abattoir.—The central cattle market and slaughter-houses for the inspection and supply of the fresh meat consumed in the metropolis occupies an extensive area in the north-east of the city on the Ringbahn, upon which a station has been erected for the accommodation of meat trains and passengers attending the market. It is under the superintendence of 72 inspectors-in-chief, and employs altogether 3317 persons. In 1898-99 there were slaughtered 153,675 cattle, 150,202 calves, 409,302 sheep, and 659,553 pigs, altogether 1,372,732 animals. The inspection is

rigorously carried out, and only carcases which have been stamped as having been certified good are permitted to be taken away for human consumption.

Finance.—For the year 1898-99 the receipts into the municipal exchequer amounted to 130·8 millions of marks and the expenditure to 123 millions, showing a surplus of 7·8 millions of marks. The chief items of the receipts were: taxes, 59,864,508; capital and debt administration, 12,791,719; municipal works, 7,006,660; building, 5,927,260; education, 2,868,482; sanitary department, 2,034,895; and poor, 1,190,849 marks. The chief items of expenditure were as follows: building, 25,261,735; education, 20,457,479; capital and debt administration, 16,467,028; poor, 11,810,676; administration, 10,418,715; police, 5,988,267; lighting and street cleaning, 3,698,464 marks.

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Berlin, a town and port of entry, Ontario, Canada, and capital of Waterloo county, 58 miles W. of Toronto, on the Grand river and the Grand Trunk Railway. It is a flourishing manufacturing town, and contains leather, furniture, shirt and collar, felt, glove, button, and rubber factories. The exports for 1898-99 were $595,773, and imports, $876,784. Population (1881), 4054; (1899), 9359.

Berlin, a city of Coos county, New Hampshire, U.S.A., on the Androscoggin river in the White Mountains, in the northern part of the state, on the Grand Trunk and the Boston and Maine Railways. It is in a heavily forested region, and contains lumber camps, sawmills, and pulp-mills. The development of these industries has caused a large influx of population, which increased from 3729 in 1890 to 8886 in 1900.

Bermudas, a group of about 360 coralline islets in the North Atlantic, 580 miles E. of North Carolina, and 677 from New York, 64° 50′ W., and 31° 55′ to 32° 20′ N., this latitude marking the extreme northern range of the coral-building polyps. The total area is 20 square miles, and the population in 1898 was 16,300 (6000 whites, and over 10,000 blacks and coloured), chiefly centred in the horseshoe-shaped St George, which is much the largest of the 18 or 20 inhabited islands, the next in size being St David, Bermuda, Gates, Cooper, Somerset, Bird, and Ireland. The group became an important naval and coaling station in 1869, when a large iron dry dock was towed across the Atlantic and placed in a secure position in St George. The islands are encircled, especially on the north and west, by fringing reefs which are still growing, but leave a few deep passages wide enough to admit the largest vessels. They are now connected by submarine cables with Nova Scotia, Turks Islands, and Jamaica, and, owing to their important strategic position in mid-Atlantic, the British Government maintains a strong garrison of over 3000 men. The imports rose from £286,000 in 1894 to £351,000 in 1898, and the exports from £98,000 to £113,000 in the same period; revenue (1898), £39,000; expenditure, £39,100; debt, £45,600. Most of the food supplies come from the United States and Canada, which countries take in exchange nearly all the exported farm produce, such as onions, potatoes, and lily bulbs. The Bermudas are a British crown colony, with a governor resident at the capital, Hamilton, on Bermuda or Main Island, who is assisted by an executive council of six members appointed by the Crown, a legislative council of nine similarly appointed, and a representative assembly of thirty-six members returned by about 112 voters. (A. H. K.)

Bermudez, a former state of Venezuela, now divided into the states of Barcelona and Sucre, was formed by the districts of Barcelona, Cumaná, and Maturin. It is bounded on the N. by the Caribbean Sea, on the S. by the state of Bolivar; on the E. by the Gulf of Paria and the delta of the Orinoco, and on the W. by the former state of Miranda. Its area is over 31,000 square miles, and its population exceeds 300,000. The state is divided into 22 districts. The capital of the state of Barcelona is the town of the same name (population, 9000); that of Sucre is Cumaná.

Bern, one of the Swiss cantons. Politically it comes after Zürich, even though Bern is the Federal capital. Its total area is 2657 square miles. Of this 2172 square miles are classed as "productive," 586 square miles being covered by forests, and 2½ square miles by vineyards. Of the 485 "unproductive" square miles, 111·3 square miles are covered by glaciers, while a large space is occupied by different lakes. *Population.*—(1880) 530,411, (1900) 587,983. In 1900 there were 221 inhabitants to each square mile. *Religions.*—Protestants, (1880) 463,163, (1900) 506,837; Romanists, (1880) 65,828, (1900) 81,162; Jews, (1880) 1316, (1900) 1572. *Language.*—German-speaking, (1880) 452,039, (1900) 484,544; French-speaking, (1880) 78,640, (1900) 98,132; Italian-speaking, (1900) 4374.

The capital is Bern. The cantonal constitution dates from 1893. The legislature is elected by popular vote in the proportion of one member per 2500 (or fraction over 1250) inhabitants, and is renewed every four years. It elects the nine members of the executive who also hold office for four years. The "obligatory referendum" obtains in the case of all laws, while 12,000 citizens have the right of "initiative" in the case of legislative projects, and 15,000 may demand the revision of the cantonal constitution. In 1897 the state revenue was 27,715,498 frcs. (a rise of 34½ per cent. since 1885), and the state expenditure 27,712,525 frcs. (also a rise of 34½ per cent. since 1885), but in 1898 there was a deficit of 71,640 frcs., while in 1900 there was one of 1,118,685 frcs. In 1897 the public debt was 98,697,000 frcs. There are now many railways in the canton, particularly mountain railways, *e.g.*, to Grindelwald, Lauterbrunnen, Mürren, over the Wengern Alp (or Little Scheidegg), to the Schynige Platten, up the Gurten, &c.; there is even a railway up the Jungfrau in course of construction.

The canton (admitted in 1353) grew out of the conquests and acquisitions of the town of Bern (founded in 1191). The dates of some of these are as follows:—Muri, 1295; Hasli, 1334; Burgdorf and Thun, 1384; Frutigen, 1400; Upper Simmenthal and Unterseen, 1386; Emmenthal, 1420; Lower Simmenthal, 1448-49; Grindelwald and Lauterbrunnen, 1528; and part of the Gruyère, 1555. At the time of the French Revolution (1798), Bern lost many of its former subject lands, *e.g.*, Aargau (1415), Aigle and Grandson (1475), and Vaud (1536). But in 1815 the Congress of Vienna gave the Canton (besides the town of Biel) what is now called the "Bernese Jura," formerly belonging to the prince-bishop of Basel. This last acquisition, being Romanist and French-speaking, has been a great source of trouble to the canton, as it introduced two discordant elements.

Bern, the capital of the canton of that name, and since 1848 the political capital of the Swiss confederation, Zürich being the seat of the federal Polytechnic School, and Museum, and Lausanne the home of the federal tribunal. The Aar is crossed by five lofty bridges, the most recent of which (Kirchfeld and Kornhaus) have done much to create new quarters on the north and south of the old town respectively. The most considerable building in the town is the double Bundesrathhaus, the new portion of which was completed in 1901. Bern never was the see of a bishop, so that it is wrong to give the name of cathedral to the collegiate church or Münster, built in the 15th century, and recently restored. The university (founded in 1834) was attended during the summer of 1901 by 1055 matriculated students (besides 111 "hearers"), the faculty of philosophy being

the most numerous. The town library contains about 85,000 volumes, but the historical relics have now been transferred to the new historical museum on the Kirchfeld, which also houses archæological and ethnological collections. On the Kirchfeld the federal library is now being built. The strict aristocratic government of the town dates from 1295 and lasted till 1798. Population, 63,994.

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Bernard, Claude (1813-1878), French physiologist, was born on 12th July 1813, in the village of Saint-Julien, near Villefranche. He received his early education in the Jesuit school of that town, and then proceeded to the college at Lyons, which, however, he soon left to become assistant in a druggist's shop. His leisure hours were devoted to the composition of a vaudeville comedy, *La Rose du Rhône*, and the success it achieved moved him to attempt a prose drama in five acts, *Arthur de Bretagne*. At the age of twenty-one he went to Paris, armed with this play and an introduction to Saint-Marc Girardin, but the critic dissuaded him from adopting literature as a profession, and urged him rather to take up the study of medicine. This advice he followed, and in due course became "interne" at the Hôtel Dieu. In this way he was brought into contact with the great physiologist Magendie, who was physician to the hospital, and whose official "préparateur" at the Collège de France he became in 1841. Six years afterwards he was appointed his deputy-professor at the Collège, and in 1855 he succeeded him as full professor. Some time previously he had been chosen the first occupant of the newly-instituted chair of physiology at the Sorbonne. There no laboratory was provided for his use, but Louis Napoleon, after an interview with him in 1864, supplied the deficiency, at the same time building a laboratory at the Natural History Museum in the Jardin des Plantes, and establishing a professorship, which Bernard left the Sorbonne to accept in 1868—the year in which he was admitted a member of the Institute. He died in Paris on 10th February 1878, and was accorded a public funeral—an honour which had never before been bestowed by France on a man of science.

Claude Bernard's first important work was on the functions of the pancreas gland, the juice of which he proved to be of great significance in the process of digestion; this achievement won him the prize for experimental physiology from the Academy of Sciences. A second investigation—perhaps his most famous—was on the glycogenic function of the liver; in the course of this he was led to the conclusion, which throws light on the causation of diabetes, that the liver, in addition to secreting bile, is the seat of an "internal secretion," by which it prepares sugar at the expense of the elements of the blood passing through it. A third research resulted in the discovery of the vaso-motor system. While engaged, about 1851, in examining the effects produced in the temperature of various parts of the body by section of the nerve or nerves belonging to them, he noticed that division of the cervical sympathetic gave rise to more active circulation and more forcible pulsation of the arteries in certain parts of the head, and a few months afterwards he observed that electrical excitation of the upper portion of the divided nerve had the contrary effect. In this way he established the existence of vaso-motor nerves—both vaso-dilatator and vaso-constrictor. The study of the physiological action of poisons was also a favourite one with him, his attention being devoted in particular to curare and carbon monoxide gas. The earliest announcements of his results, the most striking of which were obtained in the ten years from about 1850 to 1860, were generally made in the recognized scientific publications; but the full exposition of his views, and even the statement of some of the original facts, can only be found in his published lectures. The various series of these *Leçons* fill seventeen octavo volumes. In addition he published an *Introduction to the Study of Experimental Medicine* in 1865, and a few years later a volume on *General Physiology*.

An English *Life of Bernard*, by Sir Michael Foster, was published in London in 1899. (H. M. R.)

Bernburg, a town of Germany, duchy of Anhalt, on the Saale, 29 miles N. by W. from Halle by rail. A bronze statue of Bismarck was unveiled in 1896. It is the seat of considerable industry, manufacturing machinery and boilers, sugar, pottery, and stoneware, briquettes, chemicals, and lead and zinc smelting. Gardening is extensively carried on. Population (1885), 21,644; (1895), 32,374; (1900), 34,427.

Bernhardt, Sarah [ROSINE BERNARD] (1845-——), French actress, was born in Paris, 22nd October 1845, of mixed French and Dutch parentage, and of Jewish descent; she was, however, baptized at the age of twelve and educated in a convent. Her earliest years were spent in Holland. When she was thirteen she entered the Paris Conservatoire, where she gained the second prize for tragedy in 1861 and the same for comedy in 1862. Her first appearance at the Comédie Française was made in a minor part in Racine's *Iphigénie* without any marked success, and her career there was speedily interrupted by her having the temerity to slap the face of one of the "leading ladies," whom she considered to have insulted her sister. After a year spent in playing burlesque parts at the Porte St. Martin and Gymnase theatres, she took a sudden trip to Spain; but having spent all her money, she returned, and became a member of the company at the Odéon in 1867. There she made her first definite success as the Queen in *Ruy Blas*. During the siege of Paris she organized an ambulance service in the theatre. When peace was restored she left the Odéon for the Comédie Française, thereby incurring a considerable monetary forfeit. Her *début* at the Comédie Française was made in November 1872 as Gabrielle in *Mademoiselle de Belle Isle*. From that time she steadily increased her reputation, in spite of an uphill fight against adverse criticism, two of the most definite steps in her progress being her performances as Phèdre (in December 1874), and Doña Sol in *Hernani* (in November 1877). In 1879 she came to London with the company of the Comédie Française for their famous season at the Gaiety Theatre. By this time her position was securely established. Her amazing power of emotional acting, the extraordinary realism and pathos of her death scenes, the magnetism of her personality, and the beauty of her "voix d'or,"—which could now rage like a tiger, now coo like a dove,—made the public tolerant of her occasional caprices. She had developed some skill as a sculptor, and exhibited at the Salon at various times between 1876 and 1881, gaining honourable mention in 1876. She also exhibited a painting there in 1880. In 1878 she published a prose sketch, *Dans les Nuages*. Her relations with the other *sociétaires* of the Comédie Française having become somewhat strained, a crisis arrived in 1880, when, enraged by an unfavourable criticism of her acting, she threw up her position on the day following the first performance of Augier's *L'Aventurière*. This obliged her to pay a forfeit of

£4000 for breach of contract. Immediately after the rupture she gave a series of performances in London, relying chiefly upon *Adrienne Lecouvreur* and *Frou Frou*. These were followed by tours in Denmark, America, and Russia, during 1880 and 1881, with *La Dame aux Camélias* as the principal attraction. In April 1882 she married M. Jacques Damala, a Greek, in London, but separated from him at the end of the following year. After a fresh triumph in Paris with *Fédora* at the Vaudeville, she became proprietress of the Porte St. Martin theatre. *Nana Sahib* (1883), *Théodora* (1884), *La Tosca* (1887), *Jeanne d'Arc* (1890), and *Cléopatre* (1890), were among her most conspicuous successes at the Porte St. Martin, where she remained till she became proprietress of the Renaissance Theatre in 1893. During those ten years she made several extended tours, including visits to America in 1886-87 and 1888-89. Between 1891 and 1893 she again visited America (North and South), Australia, and the chief European capitals. In November 1893 she opened the Renaissance Theatre with *Les Rois*, which was followed by *Izeyl* (1894), *Gismonda* (1894), *La Princesse Lointaine* (1895). For the next few years she visited London almost annually, and America in 1896. In the autumn of 1896 she made a success with *Lorenzaccio*; and in Easter week of 1897 furnished her audiences with a new sensation by giving performances of a religious drama, *La Samaritaine*, by M. Rostand. In December 1896 an elaborate fête was organized in Paris in her honour; and the value of this public recognition of her position at the head of her profession was enhanced by cordially appreciative greetings from all parts of the world. Early in 1899 she removed from the Renaissance to the Théâtre des Nations, a larger house, which she opened in January with a revival of *La Tosca*. In May of the same year she made the bold experiment of a production of *Hamlet*, in which she played the part of the prince of Denmark. She repeated the impersonation in London not long afterwards, where she also appeared (in 1901) in M. Rostand's *L'Aiglon*, which had been produced in Paris the year before.

Bertani, Agostino (1812-1886), Italian revolutionist, was born at Milan, 19th October 1812. He took part in the insurrection of 1848, though opposed to the fusion of Lombardy with Piedmont. During the Roman republic of 1849, he, as medical officer, organized the ambulance service, and, after the fall of Rome, withdrew to Genoa, where he worked with Sir James Hudson for the liberation of the political prisoners of Naples, but held aloof from the Mazzinian conspiracies. In 1859 he founded a revolutionary journal at Genoa, but, shortly afterwards, joined as surgeon the Garibaldian corps in the war of 1859. After Villafranca he became the organizer-in-chief of the expeditions to Sicily, remaining at Genoa after Garibaldi's departure for Marsala, and organizing four separate volunteer corps, two of which were intended for Sicily and two for the Papal States. Cavour, however, obliged all to sail for Sicily. Upon the arrival of Garibaldi at Naples, Bertani was appointed secretary-general of the Dictator, in which capacity he re-organized the police, abolished the secret service fund, founded twelve infant asylums, suppressed the duties upon Sicilian products, prepared for the suppression of the religious orders, and planned the sanitary reconstruction of the city. Entering Parliament in 1861, he opposed the Garibaldian expedition, which ended at Aspromonte, but nevertheless tended Garibaldi's wound with affectionate devotion. In 1866 he organized the medical service for the 40,000 Garibaldians, and, in 1867, fought at Mentana. His parliamentary career, though marked by zeal, was less brilliant than his revolutionary activity. Up to 1870 he remained an agitator, but, after the liberation of Rome, seceded from the historic Left, and became leader of the extreme Left, a position held until his death on 30th April 1886. His chief work as deputy was an inquiry into the sanitary conditions of the peasantry, and the preparation of the sanitary code, adopted by the Crispi Administration. (H. W. S.)

Berthelot, Pierre Eugene Marcellin (1827-——), French chemist and politician, was born at Paris on the 29th of October 1827, being the son of a doctor. After distinguishing himself at school in history and philosophy, he turned to the study of science. In 1851 he became a member of the staff of the Collège de France as assistant to Balard, his former master, and in 1854 he made his reputation by his doctoral thesis, *Sur les combinaisons de la glycérine avec les acides*, which described a series of beautiful researches in continuation and amplification of Chevreul's classical work. In 1859 he was appointed professor of organic chemistry at the École Supérieure de Pharmacie, and in 1865 he accepted the new chair of organic chemistry, which was specially erected for his benefit at the Collège de France. He became a member of the Academy of Medicine in 1863, and ten years afterwards entered the Academy of Sciences, of which he became perpetual secretary in 1889 in succession to Pasteur. During the siege of Paris he was president of the scientific defence committee, and the experience he gained in that capacity in the manufacture of gunpowder and other munitions of war especially turned his attention to the study of thermo-chemistry as applied to explosives. The results of his researches were published in his book *Sur la force de la poudre et des matières explosives* (1872), which was subsequently followed by the more general treatises, each in two volumes, on *Mécanique chimique fondée sur la thermochimie* (1879), and *Thermochimie* (1897). In the domain of organic chemistry his name is associated with many important discoveries, and in particular he is remarkable for the wide application of synthetic methods in his investigations. Among the books he published on this branch of chemistry may be mentioned *Chimie organique fondée sur la synthèse* (1860), *Leçons sur les principes sucrés* (1862), *Leçons sur les méthodes générales de synthèse* (1864), and *Leçons sur l'isomérie* (1865). Students of chemical history are also greatly indebted to M. Berthelot for his book on *Les origines de l'alchimie* (1885), and his *Introduction à l'étude de la chimie des anciens et du moyen-âge*, as well as for editing various old treatises on alchemy and chemistry. His scientific jubilee was celebrated in Paris in 1901. As to his official life, he was appointed inspector-general of higher education in 1876, and after his election as life senator in 1881 he continued to take an active interest in educational questions, especially as affected by compulsory military service. In M. Goblet's short-lived ministry of 1886-87 he was minister of public instruction, and in the Bourgeois cabinet of 1895-96 he held the portfolio for foreign affairs.

Bertillon, Alphonse (1853-——), French criminologist, was born in Paris in 1853. He was the son of Louis Adolphe Bertillon, a distinguished anthropologist (1821-83), and brother to Jacques Bertillon, a statistician (born 1851), and is sometimes confounded with one or other of these. He published in 1882 a work on *Les races sauvages*, but his chief claim to distinction lies in the system invented by him for the identification of criminals, which is described in an appendix to his *Photographie judiciaire* (Paris, 1890), and has been in use since 1883. Whenever a person passes through the hands of the police, exact measurements are taken—comprising (1) length of head, (2) breadth of head, (3) length of left middle

finger, (4) length of left foot, (5) length of left forearm to the tip of the middle finger—and recorded on a card. The whole of the cards are arranged in three classes according as the first measurement is long, medium, or short; each of these again into three, according to the character of the second measurement, and so on. The number of cards in each subdivision at the end of this process is generally about a dozen, and identification is rendered complete by certain other measurements and observations, and by photographs of the full face and of the profile (right side). On the recommendation of a committee appointed in 1893 by Mr. Asquith, the Bertillon system has been introduced into England, and is used in conjunction with the system of identification by Mr Francis Galton. (See ANTHROPOMETRY.) M. Bertillon was officially appointed in 1894 to report on the handwriting of the *bordereau* in the Dreyfus case, and was a witness for the prosecution before the Cour de Cassation on 18th January 1899.

Berwick-upon-Tweed, a seaport and municipal borough in the Berwick parliamentary division of Northumberland, England, on the northern bank of the Tweed, 47 miles E.S.E. of Edinburgh by rail. In 1899 307 vessels entered with 28,949 tons, and 305 cleared with 28,949 tons. Population of municipal borough (area, 6507 acres) (1881), 13,998; (1901), 13,437 (Berwick, 8277; Tweedmouth, 3086; Spittal, 2074).

Berwickshire, a maritime county of Scotland, forming its S.E. extremity, is bounded on the N.E. by the German Ocean, on the N. by Haddingtonshire, on the W. by Mid-Lothian, on the S.W. by Roxburgh, on the S. by the Tweed, which separates it from Northumberland, and on the S.E. by Berwick-on-Tweed.

Area and Population.—In 1891 the parish of Oldhamstocks was placed wholly in Haddingtonshire, and the Berwick portion of the parishes of Lauder, Earlston, and Mertoun were transferred to parishes in Roxburgh. According to the last official estimate the area of the county (foreshore excluded) is 293,946 acres, or about 459 square miles. The population was in 1881, 35,383; in 1891, 32,406; in 1891, on the above area, 32,290, of whom 15,383 were males and 16,907 females. On the old area, taking land only (294,805 acres or 460·6 square miles), the number of persons to the square mile in 1891 was 70, and the number of acres to the person 9·1. In the registration county the decrease of population between 1881 and 1891 was 8·1 per cent. In 1901 the population was 30,816. Between 1881 and 1891 the excess of births over deaths was 3711, and the decrease of the resident population 2970. The following table gives particulars of births, deaths, and marriages in 1880, 1890, 1899:—

Year.	Deaths.	Marriages.	Births.	Percentage of Illegitimate.
1880	557	182	1020	10·0
1890	475	178	787	9·40
1899	440	178	685	9·6

The following table gives the birth-rate, death-rate, and marriage-rate per thousand of the population for a series of years:—

	1880.	1881-90.	1890.	1891-98.	1899.
Birth-rate . .	28·85	26·60	24·19	23·14	22·89
Death-rate . .	15·75	15·62	14·60	13·98	14·70
Marriage-rate .	5·15	4·80	5·47	5·49	5·94

In 1891 the number of Gaelic-speaking persons in the county was 89, and of foreigners 54. Valuation in 1889-90, £328,457; 1899-1900, £310,720.

Administration.—The county returns a member to parliament. Lauder (803) is the only royal burgh, and it has now no separate representation. Greenlaw is the county town, but steps are being taken to transfer the administrative machinery to Duns (2206), which is a police burgh. The civil parishes number 32. The number of paupers and dependants in September 1899 was 646. Berwickshire forms a sheriffdom with Roxburgh and Selkirk shires, and there is a resident sheriff-substitute at Duns, who sits also at Greenlaw, Coldstream, Ayton, and Lauder.

Education.—Thirty-two school boards manage 64 schools, which had an average attendance of 3882 in 1898-99, and 2 voluntary schools had 72. There is a high school, which is also a technical school, at Duns, and Coldstream and Lauder public schools have secondary departments. Duns school is subsidized by the county council, which pays the expenses of students attending it from a distance.

Agriculture.—The cultivated area was 64·7 of the whole in 1898. Farming is high, and is mixed in the Merse, or borderland, and generally pastoral in the uplands. The following table gives the principal acreages at intervals of five years from 1880:—

Year.	Area under Crops.	Corn Crops.	Green Crops.	Clover.	Permanent Pasture.	Fallow.
1880	194,562	64,044	35,074	58,645	36,517	262
1885	197,290	63,221	32,830	60,488	40,373	278
1890	197,963	59,722	32,400	61,338	44,321	162
1895	191,983	56,928	32,175	58,394	44,418	47
1899	190,701	57,626	31,826	58,182	42,978	64

The following table gives particulars of the live stock during the same years:—

Year.	Total Horses.	Total Cattle.	Cows or Heifers in Milk or Calf.	Sheep.	Pigs.
1880	5412	16,571	3417	267,901	3873
1885	5482	19,415	3782	287,544	4663
1890	5521	17,649	3256	311,440	4974
1895	5836	15,936	3100	307,365	4530
1899	5449	16,832	3119	315,958	3796

Large farms predominate; indeed, the average size of holding—221 acres for 867 farms—is the highest in the kingdom. In 1895, 15·80 per cent. were under 5 acres, 23·41 between 5 and 50 acres, and 60·79 over 50. Sixty-nine holdings were between 50 and 100 acres, 218 between 100 and 300, 120 between 300 and 500, 100 between 500 and 1000, and 20 over 1000 acres. The acreage under wood in 1895 was 15,378. According to the census of 1891, there were 4620 men and 1498 women in the county engaged in agriculture.

Industries and Trade.—The industrial population in 1891 numbered 3279 men and 1075 women. The season for herring is from May to the middle of September, and for white fish from October to the end of May. Eyemouth, Burnmouth, and St. Abb's Head form the Scottish division of the Eyemouth fishery district, which includes a number of Northumberland ports, and for which statistics are given below:—

Year.	Boats.			Value of Gear.	Resident Fishermen and Boys.	Total Value of all Fish.
	No.	Tons.	Value.			
1890	485	4850	£23,236	£30,673	1214	£49,765
1898	165	2269	£13,839	£19,289	545	£29,075
1899	159	2359	£14,977	£22,602	535	£51,133

The value of the herring catch only in 1899 was £33,459. During 1899, 1252 persons were employed in the district in connexion with the various branches of the sea fisheries. The salmon fisheries of the Tweed are very valuable. A light railway (10½ miles) from the Waverley line to Lauder was built in 1900.

Proceedings of Berwickshire Naturalists' Club.—G. HENDERSON. *The Popular Rhymes, Sayings, and Proverbs of the County of Berwick.* Newcastle, 1856.—J. W. BROWN. *The Covenanters of the Merse.* Edinburgh, 1893.—W. S. CROCKETT. *Minstrelsy of the Merse.* Paisley, 1893.—*In Praise of Tweed.* Serkirk, 1899.—J. ROBSON. *The Churches and Churchyards of Berwickshire.* Kelso, 1893.—F. H. GROOME. *A Short Border History.* Kelso, 1887.—J. TAIT. *Two Centuries of Border Church Life.* Kelso, 1889.—Sir T. DICK LAUDER. *Scottish Rivers.* Glasgow, 1890.—MARGARET WARRENDER. *Marchmont and the Humes of Polwarth.* Edinburgh, 1894.—W. K. HUNTER. *History of the Priory of Coldingham.* Edinburgh, 1858.—G. MUIRHEAD. *The Birds of Berwickshire.* Edinburgh, 1892 and 1897. (W. WA.)

Besançon, chief town of department Doubs, France, 241 miles S.E. of Paris, on the railway from Dijon to Belfort. It is the headquarters of the 7th army corps. The ancient library contains nearly 140,000 volumes and 1850 manuscripts, besides 10,000 medals, and there is a popular library with 10,000 volumes. A statue of Cardinal Granvelle (16th cent.) was erected in 1897. The watch-making industry employs about one-fifth of the population, and is said to supply four-fifths of the watches sold in France. The actual number made in 1896 was

113,418 in gold and 345,706 in silver. In recent years considerable advance has been made in enamelling and other decorative processes in connexion with this industry. There is a national school of watch- and clock-making. Population (1881), 39,800; (1896), 36,942, (comm.) 49,178.

Besant, Sir Walter (1836-1901), English author, was born at Portsmouth, 14th August 1836, third son of William Besant of that town. He was educated at King's College, London, and Christ's College, Cambridge, of which he was a scholar. He graduated in 1859 as 18th wrangler, and from 1861 to 1867 was senior professor of the Royal College, Mauritius. From 1868 to 1885 he acted as secretary to the Palestine Exploration Fund. In 1884 he was mainly instrumental in establishing the Society of Authors, a trade-union of writers designed for the protection of literary property, which has rendered great assistance to inexperienced authors by explaining the principles of literary profit. Of this society he was chairman from its foundation in 1884 till 1892. He married Mary, daughter of Mr Eustace Foster-Barham of Bridgwater, and was knighted in 1895. He died at his house, Frognal End, Hampstead, on the 9th of June 1901. Sir Walter Besant practised many branches of literary art with success, but he is most widely known for his long succession of novels, many of which have enjoyed remarkable popularity. His first stories were written in collaboration with Mr James Rice, and two at least of these, *The Golden Butterfly* and *Ready-Money Mortiboy*, are among the most vigorous and most characteristic of his works. Though not without exaggeration and eccentricity, attributable to the influence of Dickens, they are full of rich humour, shrewd observation, and sound common-sense, and contain characters which have taken their place in the long gallery of British fiction. After Rice's death, Sir Walter Besant continued to write alone, and in *All Sorts and Conditions of Men* (1882) produced a stirring story of East End life in London, which set on foot the movement that culminated in the establishment of the People's Palace in the Mile End Road. Other popular novels from his pen were *Dorothy Forster*, *Armorel of Lyonesse*, and *Beyond the Dreams of Avarice*. He also wrote critical and biographical works, including *The French Humorists*, *Rabelais*, and lives of Coligny, Whittington, Captain Cook, and Richard Jefferies, and undertook a series of important historical and archæological volumes, dealing with the associations and development of the various districts of London—a "survey" of the metropolis of the present day. His books on *London*, *Westminster*, and *South London* showed that his mind was full of an attractive subject. No man of his time evinced a keener interest in the professional side of literary work, and the improved conditions of the literary career in England were largely due to his energetic and capable exposition of the commercial value of authorship and to the unselfish efforts which Sir Walter constantly made on behalf of his fellow-workers in the field of letters. (A. WA.)

Bessarabia, a province of south-west Russia, on the Black Sea, bounded by Bukovina (Austria) in the N.W., Rumania in the W. and S., the Black Sea in the S.E., and the Russian provinces of Kherson and Podolia in the N.E. and N. It occupies the space between the Dniester and the Pruth, and, since the Berlin treaty, is separated by the Kilia mouth of the Danube from the Dobruja belonging to Rumania. Area, 17,619 square miles.

Owing to its fertile black earth soil, its level prairies, and its warm climate (year, 50° at Kishineff; January, 26°; July, 72°; 25·2 inches of rain and snow), wheat growing and the culture of the vine and tobacco, as also the raising of fine breeds of sheep, are prosperous. Nearly one half of the total surface (4,468,000 acres) is under corn crops, 1,229,000 acres under meadows, 689,500 under forests, 241,950 under vineyards (17,000,000 gallons of wine), and 4180 under tobacco. Wheat, barley, and linseed, as also wine and wool, are exported. Industry is developing, and there are now several woollen-cloth mills, three foundries, soap-works and tanneries.

The Dniester, down which considerable amounts of timber and wooden ware are shipped from Galicia, as also corn and wool within Bessarabia itself, is an important artery of navigation. Steamers ply up to Moghilev, and on the Pruth up to Leovo. Bessarabia is also well provided with railways, three branches of the Woloczisk to Odessa railway starting westwards and ramifying towards the Rumanian frontier. Population, 988,431 in 1860; 1,933,436 in 1897, of whom 942,179 women, and 302,852 living in towns. Divided into eight districts, the chief towns of which are:—Kishineff, capital of the government (108,796 inhabitants in 1897), Akkerman (28,303), Bendery (31,851), Byeltsy (18,526), Izmail (31,293), Khotin (18,126), Orghyéeff (13,356), and Soroki (15,800). Kagul (7094), on the Pruth, and Reni (6946), on the Danube, a railway terminus opposite Galatz in Rumania, are also worth mentioning.

After the Mongol invasion the Genoese founded their colonies at the mouth of the Dniester. Later the territory became tributary to, and subsequently was annexed by Turkey. Russian troops, in their wars against Turkey, took possession of it five times from 1711 to 1812, when it was finally annexed to Russia. In 1829 the delta of the Danube was added to Bessarabia, but was returned to Turkey by the Paris treaty. Out of it was made the Dobruja, the northern part of which became Russian again in 1878. Bessarabia was peopled in the 19th century by a very motley crowd of Russian immigrants, runaway serfs and Nonconformists, Germans, Greeks, and Bulgarians, in addition to its indigenous inhabitants, Moldavians, and Little Russians (Galicians), with an addition of Jews (181,000) and gipsies, part of whom were serfs. (P. A. K.)

Bessemer, a town of Jefferson county, Alabama, U.S.A., a few miles south-west of Birmingham, a little north of the centre of the state, and on the Southern, the Queen and Crescent, the Louisville and Nashville, and the Kansas City, Memphis and Birmingham railways. It is in the Alabama coal and iron region, and its industries consist chiefly in the smelting and manufacture of iron. Population (1890), 4544; (1900), 6358.

Bessemer, Sir Henry (1813-1898), English engineer, was born on 19th January 1813, at Charlton, in Hertfordshire. Throughout his life he was a prolific inventor, but his name is chiefly known in connexion with the Bessemer process for the manufacture of steel, by which it has been rendered famous throughout the civilized world. Though this process is now largely supplemented, and even displaced, by various rivals, at the time it was brought out it was of enormous industrial importance, since it effected a great cheapening in the price of steel, and led to that material being widely substituted for others which were inferior in almost every respect but that of cost. Bessemer's attention was drawn to the problem of steel manufacture in the course of an attempt to improve the construction of guns. Coming to the conclusion that if any advance was to be made in artillery better metal must be available, he established a small ironworks in St. Pancras, and began a series of experiments. These he carried on for two years before he evolved the essential idea of his process, which is to effect the decarbonization necessary to convert cast iron into steel by forcing a blast of air through the mass of metal when in the molten condition. The first public announcement of the process was made at the Cheltenham meeting of the British Association in 1856, and immediately attracted considerable notice. Many metallurgists were sceptical on theoretical grounds about his results, and only became convinced when they saw that his process was really able to convert melted cast iron into malleable iron in a perfectly fluid state. But though five firms applied without delay for licenses to work under his patents, success did not at once attend his efforts; indeed, after several ironmasters had put the process to practical trial and failed to get good results, it was in danger of being thrust aside and entirely

forgotten. Its author, however, instead of being discouraged by this lack of success, continued his experiments, and in two years was able to turn out a product, the quality of which was not inferior to that yielded by the older methods. But when he now tried to induce makers to take up his improved system, he met with general rebuffs, and finally was driven to undertake the exploitation of the process himself. To this end he erected steelworks in Sheffield, on ground purchased with the help of friends, and began to manufacture steel. At first the output was insignificant, but gradually the magnitude of the operations was enlarged until the competition became effective, and steel traders generally became aware that the firm of Henry Bessemer and Co. was underselling them to the extent of £20 a ton. This argument to the pocket quickly had its effect, and licenses were applied for in such numbers that, in royalties for the use of his process, Bessemer received a sum in all considerably exceeding a million sterling.

Of course, patents of such obvious value did not escape criticism, and invalidity was freely urged against them on various grounds. But Bessemer was fortunate enough to maintain them intact without litigation, though he found it advisable to buy up the rights of one patentee, while in another case he was freed from anxiety by the patent being allowed to lapse in 1859 through non-payment of fees. There is good reason to think that in this latter instance there was real danger. Bessemer, in fact, practically admitted this to be his own opinion by granting the inventor, Robert Mushet, an annuity for life. At the outset he had found great difficulty in making steel by his process—in his first licenses to the trade iron alone was mentioned. Experiments he made with South Wales iron were failures because the product was devoid of malleability; Mr Göransson, a Swedish ironmaster, using the purer charcoal pig-iron of that country, was the first to make good steel by the process, and even he was successful only after many attempts. His results prompted Bessemer to try the purer iron obtained from Cumberland hæmatite, but even with this he did not meet with much success, until Mushet showed that the addition of a certain quantity of *spiegeleisen* (a pig-iron containing manganese) had the effect, for whatever reason, of removing the difficulties. Whether or not Mushet's patents could have been sustained, the value of his procedure was shown by its general adoption in conjunction with the Bessemer method of conversion. At the same time it is only fair to say that whatever may have been the conveniences of Mushet's plan, it was not absolutely essential; this Bessemer proved in 1865, by exhibiting a series of samples of steel made by his own process alone. The pecuniary rewards of Bessemer's great invention came to him with comparative quickness; but it was not till 1879 that the Royal Society admitted him as a fellow and the Government honoured him with a knighthood.

Among Bessemer's numerous other inventions, not one of which attained a tithe of the success or importance of the steel process, were movable dies for embossed stamps, a gold paint, sugar machinery, and a ship which was to save her passengers from the miseries of *mal de mer*. This last had her saloon mounted in such a way as to be free to swing relatively to the boat herself, and the idea was that this saloon should be always maintained steady and level, no matter how rough the sea. For this purpose hydraulic mechanism of Bessemer's design was arranged under the control of an attendant, whose duty it was to keep watch on a spirit-level, and counteract by proper manipulation of the apparatus any deviation from the horizontal that might manifest itself on the floor of the saloon owing to the rolling of the vessel. A boat, called the *Bessemer*, was built on this plan in 1875 and put on the cross-Channel service to Calais, but the mechanism of the swinging saloon was not found effective in practice and was ultimately removed. Bessemer's ideas were indeed of very unequal merit, and he must be numbered with those inventors who at more or less frequent intervals have happy thoughts which occasionally prove of real value, rather than with those who set themselves by a patient process of scientific deduction, based on a firm grasp of scientific principle, to discover a means by which an exactly predetermined object may be practically accomplished. He died at Denmark Hill, in the south of London, on 15th March 1898. (H. M. R.)

Best, William Thomas (1826-1897), English organist, was born at Carlisle 13th August 1826. The son of a solicitor, he received his first instruction from Young the cathedral organist; but when he decided to adopt the profession of music, he set to work to teach himself, as the organs of his youth were mostly very incomplete from a modern standpoint, and the admirers of the greatest master of the organ, Sebastian Bach, were very few. He applied himself especially to Bach's music, and became a player of great skill. His successive appointments were to Pembroke chapel, Liverpool, 1840; to a church for the blind, 1847, and the Liverpool Philharmonic Society, 1848. For a short time (1854-55) he was in London, at the Panopticon in Leicester Square, the church of St Martin's-in-the-Fields, and Lincoln's Inn chapel. In 1855 he returned to Liverpool as organist of St George's Hall, where his frequent performances rapidly became famous throughout England. He held other appointments in or near Liverpool, but the post at St George's Hall was the most important. He held this until 1894, when ill-health obliged him to retire. He had been in the receipt of a civil list pension since 1880, and in 1890 went to Sydney to open the organ there. Best died at Liverpool on the 10th of May 1897. He played concertos at many of the Handel Festivals at the Crystal Palace. His playing was always effective and often artistic; though his style in interpreting Bach was not always of the purest, the service he rendered in popularizing the works of that master must be acknowledged. He published a good deal of church music of a more or less popular kind, and issued many arrangements of organ music, editions of Bach, &c. (J. A. F. M.)

Bethel, eleven miles north of Jerusalem, altitude 2880 feet, now Beitín, a small village of about 360 houses. Population, about 2000.

Bethlehem, *i.e.*, "house of bread," probably so called from the fertility of the vicinity, situated on a projecting spur five miles from Jerusalem, altitude 2550 feet. For a description of the church erected by Constantine in 330, see de Vogüé, *Les Eglises de la Terre Sainte*. There are several monasteries and convents, and British, French, and German schools. The population, 8000, has contained few Moslems since the Moslem quarter was destroyed by Ibrahim Pasha, after an insurrection in 1834.

Bethlehem, a borough of Northumberland county, Pennsylvania, U.S.A., situated in the eastern part of the state, on the north bank of Lehigh river, opposite South Bethlehem, in 40° 37′ N. lat., and 75° 23′ W. long. It is a centre for four railways, and has extensive ironworks, the chief industry. A Moravian college and seminary for young women are situated here. Population (1880), 5193; (1900), 7293.

Bethulie. See Orange River Colony.

Béthune, chief town of arrondissement and railway station, department of Pas-de-Calais, France, 18 miles in

direct line N.N.W. of Arras. It is situated in a very productive coal-field. The fortifications of the town are no longer maintained. Port traffic on the Aire Canal in 1898 amounted to 987,157 tons. Population (1881), 9076; (1896), 10,529; (1901), 11,370.

Betterment. See COMPENSATION.

Bettia, a town of British India, in the Champaran district of Bengal; situated in 26° 48′ N. lat., and 84° 32′ E. long., on the Harha river; station on the Tirhut section of the Bengal and North-Western railway. Population, about 22,000. Bettia is the residence of one of the leading noblemen of Northern Behar, who enjoys a rent-roll of £66,000, and who raised a mortgage loan of £475,000 at 5 per cent. on the London Stock Exchange in 1888. In 1901, owing to a disputed succession, the estate was under the management of the Court of Wards. It comprises land in no less than ten districts, much of which is let on permanent leases to indigo-planters. Besides the palace of the raja, the town contains a middle English school and a female dispensary, entirely supported out of the estate. There is a Roman Catholic mission, with about 1000 converts, which was founded by an Italian priest in 1746.

Betting.—In the early days of horse-racing persons who wished to bet often failed to gratify their inclination because of the difficulty of finding any one ready to wager. To obviate this difficulty the professional bookmaker arose. It was perceived that if a man laid money against a number of horses, conducting his business on discreet principles, he would in all probability receive enough to pay the bettor who was successful and to leave a surplus for himself; for the "bookmaker," as the professional betting man came to be called, had enormous advantages in his favour. He was presumably shrewd and wary, whereas many of those with whom he dealt were precisely the opposite, and benefit arose to him from the mistakes and miscalculations of owners and trainers of horses, and from the innumerable accidents which occur to prevent anticipated success; moreover, if he carried out the theory of his calling he would so arrange his book, by what is called "betting to figures," that the money he received would be more than he could possibly be called upon to pay. In practice, of course, this often does not happen, because "backers" will sometimes support two or three horses in a race only, and the success of one may result in loss to the bookmaker; but in the long run it has been almost invariably found that the bookmaker grows rich and that the backer of horses loses money. It is the bookmaker who regulates the odds, and this he does, sometimes by anticipating, sometimes by noting, the desire of backers to support certain animals. Such things as stable secrets can scarcely be said to exist at the present time; the bookmaker is usually as well able as any one else to estimate the chances of the various horses engaged in races. Notwithstanding that the reports of a trial gallop are of comparatively little value to any except the few persons who know what weights the animals carried when tried, the bookmaker is extraordinarily keen, and frequently successful, in his search for information; and on this the odds depend.

Betting is of two kinds: "post," when wagering does not begin until the numbers of the runners are hoisted on the board; and "ante-post," when wagering opens weeks or months before the event; though of this latter there is far less than was formerly the case, doubtless for the reason that before the introduction of so many new and valuable stakes attention was generally concentrated on a comparatively small number of races. Bets on the Derby, the Oaks, and the St. Leger were formerly common nearly a year before the running of the races, and a few handicaps, such as the Chester Cup, used to occupy attention months beforehand; the weights, of course, being published at a much longer interval prior to the contest than is at present the rule. As regards ante-post betting, bookmakers have their own ideas as to the relative prospects of the horses entered. A person who wishes to back a horse asks the price, and accepts or declines, as the case may be. If the bet is laid it will probably be quoted in the newspapers, and other persons who propose to wager on the race are so likely to follow suit that it is shrewdly suspected that in not a few cases bets are quoted which never have been laid, in order to induce the backers to speculate. According to the public demand for a horse the price shortens. If there is little or no demand the odds increase, the market being almost entirely regulated by the money; so that if a great many people bet on a certain animal the odds become shorter and shorter, till in many cases instead of laying odds against a horse, the bookmaker comes to take odds, that is, to agree to pay a smaller sum than he would receive from the backer if the animal lost. Post betting is conducted on very much the same principles. When the numbers are hoisted bookmakers proclaim their readiness to lay or take certain odds, which vary according to the demand for the different animals. Backers are influenced by many considerations: by gossip, by the opinions of writers on racing, and in many cases, unfortunately, by the advice of "tipsters," who by advertisements and circulars profess their ability to indicate winners, a pretence which is obviously absurd, as if these men possessed the knowledge they claim, they would assuredly keep it to themselves and utilize it for their own private purposes.

The specious promises of such men do infinite mischief, as they so often appeal with success to the folly and gullibility of the ignorant, and it is for this reason that a certain amount of sympathy is felt for the endeavours of persons who have entered upon the forlorn hope of endeavouring to prevent betting. A society was formed called the Anti-Gambling League. A bookmaker was summoned for betting in Tattersall's enclosure, which it was contended contravened the Betting House Act of 1853. This Act had been aimed against what were known as "list houses," establishments then kept by bookmakers for betting purposes, and associated with many disgraceful scandals. In the preamble to his Bill Lord Cockburn began by remarking that "Whereas a new form of betting has of late sprung up," and the Anti-Gambling League sought to argue that this included a form of betting which had not sprung up of late but had on the contrary been carried on without interference for many generations. The Divisional Court held that such betting was an infringement of the Act, but ultimately the question came before the House of Lords, and the decision was reversed. The arguments turned almost entirely upon whether such an enclosure was a "place" within the meaning of the Act, and it was finally held that a place did not mean an enclosure in a racecourse, to which many persons, no doubt, did go for the purpose of betting, whilst others went merely with the object of seeing the races. The law with regard to betting is in fact not a little curious. A few years ago two men were imprisoned for introducing a machine similar to the Pari-Mutuels which are recognized and supported by the French Government and by authorities elsewhere, and from which French municipalities derive handsome sums in relief of rates.

Many attempts have been made in France to interfere with the practice of bookmaking and to induce all who desire to wager on horse-races to support the Pari-Mutuels. On all French racecourses, as on others nearly everywhere else on the Continent, and likewise in the Colonies, where

the Pari-Mutuel is called the Totalizator, this system of betting is carried on. Rows of offices are established behind or near the stands, on each of which lists are exhibited containing the numbers of the horses that are to run in the coming race. At some of these the minimum wager is five francs, at others ten, twenty, fifty, one hundred, five hundred, and in some cases a thousand. The person who proposes to bet goes to the clerk at one of these offices, mentions the number, as indicated on the card, of the horse he wishes to back, and states whether he desires to bet on it to win or for a place only. He receives a voucher for his money. After the race the whole amount collected at the various offices is put together and divided, after a percentage has been deducted for the administration and for the poor. As soon as this has been done, the money is divided and the prices to be paid to winners are exhibited on boards. These prices are calculated on a unit of ten francs. Thus, for instance, if the winner is notified as bringing in twenty-five francs, the meaning is that the backer receives his original stake of ten and fifteen in addition, the money being paid immediately by another clerk attached to the office at which the bet was made. (A. E. T. W.)

Betul, a town and district of British India, in the Narbuda division of the Central Provinces. In 1891 the population of the town was 5260. The administrative headquarters of the district have been transferred to the town of Badnur, 5 miles north, which had in 1891 a population of 5014.

The district of BETUL has an area of 3824 square miles. The population in 1891 was 323,116. Classified according to religion, Hindus numbered 197,774; Mahommedans, 5122; aborigines, 119,008, chiefly Gonds; Christians, 66, of whom 21 were Europeans; "others," 1146. In 1901 the population was 285,324, showing a decrease of 12 per cent., due to the results of famine. The total amount of land revenue and rates is returned at Rs.2,02,865, the incidence of assessment being only two annas per acre of assessed area; the number of police was 321. In 1897-98, out of a total cultivated area of 562,069 acres, only 8309 were irrigated from wells. The principal crops are wheat, millet, other food-grains, pulse, oil-seeds, and a little sugar-cane and cotton. A large part of the area (778,976 acres) is still covered with forests, which yield teak and other timber. The only manufacture is cotton cloth. There is no railway, and good roads are few; nor is any of the rivers navigable. In 1897-98 there were 69 schools attended by 3223 pupils. This district suffered very severely from the famine of 1896-97; in 1897 the death-rate being as high as 73 per 1000. It suffered again in 1900, when in May the number of persons relieved rose to one-third of the total population.

Beust, Friederich Ferdinand von (1809-1886), Austrian statesman, was descended from a noble family which had originally sprung from the Mark of Brandenburg, and of which one branch had been for over 300 years settled in Saxony. He was born on 13th January 1809 in Dresden, where his father held office at the Saxon court. After studying at Leipzig and Göttingen he entered the Saxon public service; in 1836 he was made secretary of legation at Berlin, and afterwards held appointments at Paris, Munich, and London. In March 1848 he was summoned to Dresden to take the office of foreign minister, but in consequence of the outbreak of the revolution was not appointed. In May he was appointed Saxon envoy at Berlin, and in February 1849 was again summoned to Dresden, and this time appointed minister of foreign affairs, an office which he continued to hold till 1866. In addition to this he held the ministry of education and public worship from 1849 to 1853; that of internal affairs in 1853, and in the same year was appointed minister-president. From the time that he entered the ministry he was, however, the leading member of it, and he was chiefly responsible for the events of 1849. By his advice the king refused to accept the constitution proclaimed by the Frankfurt assembly, a policy which led to the outbreak of revolution in Dresden, which was suppressed after four days' fighting by Prussian troops, for whose assistance Beust had asked. On Beust fell also the chief responsibility for governing the country after order was restored, and he was the author of the so-called *coup d'état* of June 1850 by which the new constitution was overthrown. The vigour he showed in repressing all resistance to the Government, especially that of the university, and in reorganizing the police, made him one of the most unpopular men among the Liberals, and his name became synonymous with the worst form of reaction, but it is not clear that the attacks on him were justified. After this he was chiefly occupied with foreign affairs, and he soon became one of the most conspicuous figures in German politics. He was the leader of that party which hoped to maintain the independence of the smaller states, and was the opponent of all attempts on the part of Prussia to attract them into a separate union; in 1849-50 he had been obliged to join the "three kings' union" of Prussia, Hanover, and Saxony, but he was careful to keep open a loophole for withdrawal, of which he speedily availed himself. In the crisis of 1851 Saxony was on the side of Austria, and he supported the restoration of the Diet. In 1854 he took part in the Bamberg conferences, in which the smaller German states claimed the right to direct their own policy independent of that of Austria or of Prussia, and he was the leading supporter of the idea of the *Trias*, *i.e.*, that the smaller states should form a closer union among themselves against the preponderance of the great monarchies. In 1863 he came forward as a warm supporter of the claims of the prince of Augustenburg to Schleswig-Holstein; he was the leader of the party in the German Diet which refused to recognize the Treaty of London, and in 1864 he was appointed representative of the Diet at the Congress of London. He was thus thrown into opposition to the policy of Bismarck, and he was exposed to violent attacks in the Prussian press as a "Particularist," *i.e.*, a supporter of the independence of the smaller states. The expulsion of the Saxon troops from Rendsburg nearly led to a conflict with Prussia. Beust was accused of having brought about the war of 1866, but the responsibility for this must rest with Bismarck. On the outbreak of war Beust accompanied the king to Prague, and thence to Vienna, where they were received by the emperor with the news of Königgrätz. Beust undertook a mission to Paris to procure the help of Napoleon. When the terms of peace were discussed he resigned, for Bismarck refused to negotiate with him.

After the victory of Prussia there was no place for Beust in Germany, and his public career seemed to be closed, but he quite unexpectedly received an invitation from the emperor of Austria to become his foreign minister. It was a bold decision, for Beust was not only a stranger to Austria, but also a Protestant, but the choice of the emperor justified itself. Beust threw himself into his new position with great energy; it was owing to him that the negotiations with Hungary were brought to a successful issue. When difficulties came he went himself to Pesth, and acted directly with the Hungarian ministers. In 1867 he also held the position of Austrian president, and he carried through the measure

parliamentary government was restored. He also carried on the negotiations with the pope concerning the repeal of the concordat, and in this matter also did much by a liberal policy to relieve Austria from the pressure of institutions which had checked the development of the country. In 1868, after giving up his post as minister-president, he was appointed chancellor of the empire, and received the title of count. His conduct of foreign affairs, especially in the matter of the Balkan states and Crete, successfully maintained the position of the empire. In 1869 he accompanied the emperor on his expedition to the East. He was still to some extent influenced by the anti-Prussian feeling he had brought from Saxony. He maintained a close understanding with France, and there can be little doubt that he would have welcomed an opportunity in his new position of another struggle with his old rival Bismarck. In 1867, however, he helped to bring the affair of Luxemburg to a peaceful termination. In 1870 he did not disguise his sympathy for France, and the failure of all attempts to bring about an intervention of the Powers, joined to the action of Russia in denouncing the Treaty of Paris, was the occasion of his celebrated saying that he was nowhere able to find Europe. After the war was over he completely accepted the new organization of Germany, and in a meeting with Bismarck at Gastein laid the foundation for the good understanding between Austria and Germany. In 1871 he interfered at the last moment, together with Andrassy, to prevent the emperor accepting the federalist plans of Hohenwart. He was successful, but at the same time he was dismissed from office. The precise cause for this is not known, and no reason was given him.

At Beust's own request he was appointed Austrian ambassador at London; in 1878 he was transferred to Paris; in 1882 he retired from public life. He died at his villa at Altenberg, near Vienna, on the 24th of October 1886, leaving two sons, who hold positions in the Austrian diplomatic service. His wife, a Bavarian lady, survived him only a few weeks. His elder brother Friederich Constantine, who was at the head of the Saxon department for mines, was the author of several works on mining and geology, a subject in which other members of the family had distinguished themselves.

Beust was in many ways a diplomatist of the old school. He had great social gifts and personal graces; he was proud of his proficiency in the lighter arts of composing waltzes and *vers de société*. His chief fault was vanity, but it was an amiable weakness. It was more vanity than rancour which made him glad to appear even in later years as the great opponent of Bismarck; and if he cared too much for popularity, and was very sensitive to neglect, the saying attributed to Bismarck, that if his vanity was taken away there would be nothing left, is very unjust. He was apt to look more to the form than the substance, and attached too much importance to the verbal victory of a well-written despatch; but when the opportunity was given him he showed higher qualities. In the crisis of 1849 he displayed considerable courage, and never lost his judgment even in personal danger. If he was defeated in his German policy, it must be remembered that Bismarck held all the good cards, and in 1866 Saxony was the only one of the smaller states which entered on the war with an army properly equipped and ready at the moment. That he was no mere reactionary of the whole course of his government in Saxony, and still more so in Austria, shows. His Austrian policy has been there [illegible] criticized, on the [illegible] and that in establishing the [illegible] of dualism [illegible] introduced much to Hungary, and [illegible] valuable [illegible] really [illegible] ation was generally conceded, this is probcomparatively small number of races. Bets on the crisis of the Oaks, and the St. Leger were formerly common

extraordinary difficulty he carried to a successful conclusion a policy which, even if it was not the best imaginable, was probably the best attainable in the circumstances, and it is difficult to name any statesman of the century to whom Austria has more real ground for gratitude.

Beust was the author of reminiscences: *Aus drei Viertel-Jahrhunderten*, 2 vols. Stuttgart, 1887.—An English translation was edited by Baron H. de Worms; and he also wrote a shorter work, *Erinnerungen zu Erinnerungen*, Leipzig, 1881, in answer to attacks made on him by his former colleague, Herr v. Friesen, in his reminiscences. See also Ebeling. *F. F. Graf v. Beust.* Leipzig, 1876. A full and careful account of his political career, especially up to 1866.—*Diplomatic Sketches: No. I, Count Beust.* By Outsider (Baron Carl v. Malortie).—Flathe. *Geschichte von Sachsen*, vol. iii. Gotha, 1877.—Friesen. *Erinnerungen aus meinem Leben.* Dresden, 1880. (J. W. He.)

Beuthen, a mining town of Prussia, province of Silesia, 121 miles by rail S.E. from Breslau. It is the centre of coal and zinc mines, iron and zinc smelting, steam planing and saw milling. Population (1885), 30,602; (1900), 51,500.

Beveren, a town of Belgium, in the province of East Flanders, 29 miles N.E. of Ghent by rail. It has numerous breweries and manufactures of lace and cigars. Population (1880), 7838; (1897), 9104.

Beverley, an ancient municipal borough and a market town in the Holderness parliamentary division of Yorkshire, England, 8 miles N.N.W. of Hull by rail. Since 1889 it has been the seat of a suffragan bishopric. Amongst its public buildings are the minster and the parish church of St Mary's, two of the finest examples of Early English architecture, various Nonconformist chapels, a cottage hospital, waterworks, and (under one building) a corn exchange, butter market, and swimming baths. Its staple trades are tanning, the manufacture of agricultural implements, wood-carving, and matting. It possesses communication with the port of Hull by water, and thence to all parts. The corporation own the gasworks and the electric lighting works. The borough comprises three parishes, with a total area of 2411 acres of common pasture land. Population (1881), 11,425; (1901), 13,183.

Beverly, a seaboard city of Essex county, in Eastern Massachusetts, U.S.A., situated on the north shore of Massachusetts Bay, opposite Salem, and 17 miles N.E. of Boston. The principal village, of the same name, is on the Boston and Maine railway. Beverly received a city charter in 1893. Population (1880), 8456; (1900), 13,884.

Bexley, a large parish, urban district, and village, in the Dartford parliamentary division of Kent, England, 12 miles from London by rail. The urban district includes Bexley Heath, with Welling, and Lamorbey or Halfway Street, and has an area of 5328 acres. Population (1891), 10,605; (1901), over 12,000.

Bezae Codex. See Codex Bezae.

Béziers, chief town of arrondissement, department of Hérault, France, 45 miles W.S.W. of Montpellier, on railway to Narbonne. The Allées Paul Riquet is a handsome promenade adorned with a statue of Riquet. The Canal du Midi here crosses the Orbe by a fine bridge-aqueduct, and about half-a-mile from the town are the large locks of Fonserannes, in which the water is raised 80 feet in 330 yards to the level of the Orb. The distilling of brandy has far outdistanced all other industries, and most of the manufactures of the town are more or less connected with the trade. Population (1881), 37,824; (1896), 41,706, (comm.) 45,260; (1901), 52,310.

Bezwada, a town of British India, in the Kistna district of Madras, on the left bank of the river Kistna, at the head of its delta; population, about 20,000. The

municipal income in 1897-98 was Rs.46,280. Here are the headquarters of the Kistna canal system, which irrigates more than 500,000 acres, and also provides navigation throughout the delta. The anicut or dam at Bezwada, begun in 1852, consists of a mass of rubble, fronted with masonry, 1240 yards long. Here also is the central junction of the East Coast railway from Madras to Calcutta, 267 miles from Madras, where one branch line comes down from the Warangal coalfield in the Nizam's dominions, and another from Bellary on the Southern Mahratta line. It is proposed to construct a third branch to Masulipatam on the coast. There are a Church Mission and high schools.

Bhagalpur, a city of British India, in the Behar province of Bengal, which gives its name to a district and to a division; situated on the right bank of the Ganges, 265 miles from Calcutta. It is a station on the East Indian railway. Population (1881), 68,238; (1891), 69,106; (1901), 75,273, showing an increase of 9 per cent. The chief educational institution is the Tejnarayan Jubilee College, supported almost entirely by fees. The English high school had 335 pupils in 1897, and there are four printing-presses.

The district of BHAGALPUR stretches across both banks of the Ganges. It has an area of 4226 square miles. Population (1881), 1,967,635; (1891), 2,032,694, showing an increase of 3 per cent.; average density, 481 persons per square mile. Classified according to religion, Hindus numbered 1,811,359; Mahommedans, 195,591; aborigines, 24,740; Christians, 534, of whom 140 were Europeans; "others," 470. In 1901 the population was 2,088,565, showing a further increase of 3 per cent. The land revenue and rates in 1897-98 were Rs.7,60,266, and number of police was 473. There were 23,437 boys at school in 1896-97. The registered death-rate (1897) was 30 per 1000. There are 17 indigo factories, employing about 7000 persons, with an out-turn valued at Rs.2,82,000. Other industries include the weaving of tusser silk and the making of coarse glass. A large trade is carried on by rail and river with Lower Bengal. The tract south of the Ganges is traversed by the loop-line of the East Indian railway, and a railway across the northern tract was, in 1901, under construction.

The division of BHAGALPUR stretches across the Ganges from the Nepal frontier to the hills of Chota Nagpur. It comprises the five districts of Monghyr, Bhagalpur, Purneha, Maldha, and the Sonthal Parganas. The total area covers 20,511 square miles; and in 1891 the population was 8,582,490, being an average of 418 persons per square mile; the land revenue and rates in 1897-98 were Rs.38,76,545; the number of police was 2196. In 1896-97 the total number of schools was 5432, attended by 113,240 pupils, of whom 7418 were girls.

Bhamo, in ancient times the capital of the Shan [illegible] of Manmaw, later the seat of a Burmese governor, [illegible] headquarters of a district in the northern division [illegible] Burma (Chinese frontier). It lies wholly in the [illegible] Irrawaddy, which, as well as its tributaries, [illegible] the heart of it. On the east is the river [illegible] plateau, running almost due north and south. [illegible] Irrawaddy there is a regular series of ranges, [illegible] basins of the Kaukkwè, Mosit, Indaw, [illegible] lakes, down which much timber is floated. [illegible] Kaukkwè there is a ridge of hills, which starts [illegible] Mogaung, and diverges to the south, the eastern [illegible] dividing the Kaukkwè from the Mosit, and the west [illegible] forming the eastern watershed of the Nam Yin and running south into Katha. It is an offshoot from the latter of these ridges that forms the third defile of the Irrawaddy between Bhamo and Sinbo. The district covers an area of 9800 square miles, and the population in 1891 was 54,200, but this must now be much below the real number. It is mainly composed of Shan-Burmese and Kachins. The Shan-Burmese inhabit the valleys and alluvial plains on each side of the river. The Kachins, who probably came from the sub-regions of the Himalayas, occupy the hills throughout the district. There are also settlements of Shans, Shan-Chinese, Chinese and Assamese. There are extensive fisheries in the Shwegu and Mo-hnyin circles, and in the Indaw, a chain of lakes just behind the Mosit, opposite Shwegu. These yield Rs.13,000 rental a year. The district abounds in rich teak forests, and there are reserves representing 60,000 acres of teak plantation. Contracts and licenses were issued in 1897 for nearly 26,000 logs. The whole of the country along the banks of the Irrawaddy, the Molè, Taping Sinkan, and Kaukkwè, is generally in a water-logged condition during the rains. The climate in the district is therefore decidedly malarious, especially at the beginning and end of the rains. From November to March there is very bracing cold weather. The highest temperatures range a few degrees over 100° F. up to 106°, and the lowest a few degrees under 40°. The average maximum for the year is about 87°, the average minimum about 62°. The rainfall averages 72 inches a year.

BHAMO, the headquarters of the district, is situated in 24° 16′ N. lat. In 1891 it contained 5798 inhabitants, of whom a considerable number were Chinamen, natives of India, and Shan Chinese. It stretches for a distance of nearly four miles along the Irrawaddy bank in a series of small villages, transformed into quarters of the town, but the town proper is confined mainly to the one high ridge of land running at right angles to the river. The surface of the ground is much cut up by ravines which fill and dry up according to the rise and fall of the river. When the Irrawaddy is at its height the lower portion of the town is flooded, and the country all round is a sheet of water, but usually for no very long time. Here or hereabouts has long been the terminus of a great deal of the land commerce from China. Until some years after the annexation, however, the trade routes were very unsafe owing to attacks from the Kachins. These have now quite ceased, and the roads, which were mere bridle-tracks, have been greatly improved. The two chief are the so-called Santa and Poulaing route, through Manyün (Manwaing) and Nantien to T'êngyüeh, and the southern or Sawadi route by way of Namhkam. Cart roads are now being constructed on both routes, and that south of the Taping river could easily be continued through Manyün to T'êngyüeh if the Chinese should be induced to co-operate. A railway to T'êngyüeh is quite feasible and would doubtless be profitable, but it would never serve a large area of country, could not be prolonged beyond T'êngyüeh, and would be greatly inferior to the route by the Kun-lông ferry. There is a fairly large military garrison in Bhamo distributed between two forts to the north and east of the town. There are in general stationed here a native regiment, two sections of a battery, and the wing of a European regiment. Besides the barracks there are a circuit house, dâk bungalow, courthouse, and post and telegraph offices. There is daily steamer communication, either direct to Mandalay or to the terminus of the railway at Katha, by the vessels of the Irrawaddy Flotilla Company. (J. G. Sc.)

Bhandara, a town and district of British India, in the Nagpur division of the Central Provinces. The town (population about 13,000) is situated on the left bank of the river Wainganga, six miles from a station on the Bengal-Nagpur railway. It has considerable manufactures of cotton cloth and brass-ware, and a first-grade middle school, with a library. The average death-rate for five years is 28 per thousand.

The district of BHANDARA has an area of 3968 square miles. The population in 1891 was 742,850, being 187 persons per square mile. Classified according to religion, Hindus numbered 639,994; Mahommedans, 13,100; aborigines, 89,179, chiefly Gonds; Christians, 121, of whom 13 were Europeans; "others," 456. In 1901 the population was 663,578, showing a decrease of 11 per cent., compared with an increase of 8 per cent. in the

preceding decade. The total amount of land revenue and rates is returned as Rs.4,74,385, the incidence of assessment being Rs.0:5:3 per acre of assessed area; number of police, 237. In 1897-98, out of a total cultivated area of 796,618 acres, 195,416 were irrigated from tanks, &c. The principal crops are rice, wheat, millet, other food-grains, pulse, linseed, and a little sugar-cane. The district is traversed by the main road from Nagpur to the east, and also by the Bengal-Nagpur railway. The number of schools is 152, attended by 7802 pupils. The average death-rate for five years is 32 per thousand. Bhandara suffered in the famine of 1896-97, and yet more severely in 1900.

Bharatpur, or BHURTPORE, a native state of India, in the Rajputana Agency. Its area covers 1961 square miles. In 1881 it had a population of 645,540, and in 1891 of 640,303, giving an average density of 327 persons per square mile. In 1901 the population was 626,120, a decrease of 2 per cent. The estimated gross revenue was Rs.27,00,000; the expenditure on public works in 1897-98 was Rs.5,52,420, of which Rs.1,88,780 was devoted to irrigation; the number of schools was 89, with 6248 pupils; the number of hospitals and dispensaries was 77, attended by 116,228 patients. The present Maharaja, Raghunath Sing, was placed on the throne in 1895, in supersession of his elder brother, who was found unfit. During his minority the administration has been conducted by a native minister, together with a state council, under the general superintendence of the political agent. Imperial service cavalry are maintained. The state is traversed for about 40 miles by the Rajputana railway.

The city of BHARATPUR is 34 miles west of Agra by rail. The population in 1881 was 66,163; in 1891 is was 68,033. The immense mud ramparts still stand. It has a handsome palace, a new hospital, and a high school, with 144 pupils learning English. There are special manufactures of *chauris*, or flappers, with handles of sandalwood, ivory, or silver, and tails also made of strips of ivory or sandalwood as fine as horse-hair.

Bhau Daji (RAMKRISHNA VITHAL) (1822-1874), Hindu physician of Bombay, Sanskrit scholar and antiquary, born in 1822 at the village of Manjare, in the native state of Savantwudi, of humble parents, dealing in clay dolls. Dr. Bhau's career is a striking instance of great results arising from small accidents. An Englishman noticing his cleverness at chess induced his father to give the boy an English education. Accordingly Bhau was brought to Bombay and was educated at the Elphinstone Institution, under Harkness, Bell, and Henderson. He relieved his father of the cost of his education by winning many prizes and scholarships, and on his father's death two years later he cheerfully undertook the burden of supporting his mother and a brother (NARAYEN), who also in after-life became a distinguished physician and surgeon. About this time he gained a prize for an essay on Infanticide, and was appointed a teacher in the Elphinstone Institution. He began to devote his time to the study of Indian antiquities, deciphering inscriptions and ascertaining the dates and history of ancient Sanskrit authors. He then studied at the Grant Medical College, under Morehead, Ballingall, and Giraud, and was one of the first batch who graduated there in 1845. In 1851 he set up as a medical practitioner in Bombay, where his success was so great that he soon made a fortune. He studied the Sanskrit literature of medicine, and also tested the value of drugs to which the ancient Hindus ascribed marvellous powers, among other pathological subjects of historical interest investigating that of leprosy. He was an ardent promoter of education. He was appointed a member of the Board of Education, and was one of the original fellows of the University of Bombay. As the first native president of the Students' Literary and Scientific Society, and the champion of the cause of female education, a girls' school was founded in his name, for which an endowment was provided by his friends and admirers. In the political progress of India he took a great and active interest, and the Bombay Association, and the Bombay Branch of the East Indian Association owe their existence to his ability and exertions. He was twice chosen Sheriff of Bombay, in 1869 and 1871. Various scientific societies in England, France, Germany, and America conferred on him their membership. He contributed numerous papers to the journal of the Bombay branch of the Royal Asiatic Society. He found time to make a large collection of rare ancient Sanskrit manuscripts at great cost and trouble. But his career was cut short by a sudden stroke of paralysis, to which he succumbed in May 1874. His brother, Dr. Narayen Daji (who helped him to set up the charitable dispensary in Bombay), did not long survive him. Dr. Bhau was a man of the most simple and amiable character and manners; his kindness and sympathy towards the poor and distressed were unbounded, and will ever embalm and endear his memory among the Hindus of Bombay. (N. B. W.)

Bhaunagar, or BHAVNAGAR, a native state of India, in Kathiawar, within the Gujarat division of Bombay. Its area covers 2860 square miles; in 1881 the population was 400,323, and in 1891 it was 464,671. The estimated gross revenue in 1897-98 was Rs.38,27,740, of which Rs.9,22,810 was expended on public works, and Rs.2,82,000 on famine relief; the tribute was Rs.1,54,490. The chief, whose title is Thakor Saheb, is a Gohel Rajput. He was educated at the Rajkumar College at Rajkot, and has visited England. The system of administration, formed during his minority, has been continued with admirable results under his personal supervision, and forms a model for other native states. Bhaunagar suffered terribly from the famine of 1899-1900. About 60 miles of the Bhaunagar-Gondal railway run through the state, with its terminus at the town of Bhaunagar, which is the principal port. The town of BHAUNAGAR is situated in 21° 45′ N. lat. and 72° 12′ E. long., on the west coast of the Gulf of Cambay. The population in 1881 was 47,792; in 1891 it was 57,653. It is now the chief port in Kathiawar, though only admitting vessels of small burden. There is a cotton mill, with 208 looms and 12,000 spindles; several steam presses and ginning factories; an arts college, with 102 students in 1896-97; a high school, with 384 pupils; a school for girls, entirely supported by the state; and a state printing-press.

Bhera, a town of British India, in the Shahpur district of the Punjab, situated in 32° 29′ N. lat. and 72° 57′ E. long., on the river Jhelum. It is the terminus of a branch of the North-Western railway. In 1881 it had a population of 15,165; and in 1891 of 17,428; the municipal income in 1897-98 was Rs.19,419. It is an important centre of trade, with manufactures of cotton goods, metal-work, carving, &c. It has two high schools, municipal and Anglo-Sanskrit, and a printing-press, issuing a newspaper.

Bhiwani, a town of British India, in the Hissar district of the Punjab, 38 miles south-east of Hissar town by rail. The population in 1881 was 33,762; in 1891 it was 35,487; the municipal income in 1897-98 was Rs.50,042. It is an important centre of trade with Rajputana, and has three factories for ginning and pressing cotton. It has a Baptist mission and a municipal school.

Bhopal, a native state of India, in the Central India agency, has an area of 6874 square miles. In 1881 it had a population of 954,901; and in 1891 of 952,486, giving an average density of 138 persons per square mile. The estimated revenue is Rs.40,00,000, and it pays a subsidy of Rs.2,00,000 for the Bhopal battalion. For three generations the ruler has been a woman. Sultan Shah Begum succeeded on the death of her mother in June 1901. Besides the Bhopal battalion, a regiment of imperial service cavalry is maintained, under the name of the Victoria Lancers. There is a branch railway from Itarsi to Bhopal city, continued to Jhansi. The British currency has been introduced, and in 1897-98, Rs.71,00,000 of Bhopali coins were converted. The residence of the political agent and the headquarters of the Bhopal battalion are at Sehore, 20 miles west of Bhopal city. The city of BHOPAL, a railway station, had a population in 1881 of 55,402; and in 1891, of 70,338. The palace, with its rock fortress, is called Fatehgarh. An excellent water-supply has been provided from two large artificial lakes. There are two hospitals. In 1897-98 the exports of opium were 678 chests, paying a duty of Rs.3,67,500. The state suffered very severely from famine in 1899-1900. The preliminary returns of the census of 1901 showed a decrease of no less than 40 per cent. in the population of the Bhopal agency, which is not co-extensive with the state of Bhopal.

Bhor, a native state of India, in the Deccan division of Bombay, forming one of the Satara Jagirs; situated among the higher peaks of the Western Ghats. Its area covers 1491 square miles. The population in 1881 was 145,876; in 1891 it was 155,659, giving an average density of 104 persons per square mile; and in 1901 it was 137,269, showing a decrease of 12 per cent.; the estimated gross revenue is Rs.4,30,528; the tribute, Rs.4643; the military force numbers 117 men; the number of schools is 35, with 1328 pupils. The chief, whose title is Pant Sachiv, is a Brahman by caste. The town of BHOR is situated in 18° 9′ N. lat. and 73° 53′ E. long., 25 miles south of Poona. In 1891 the population was 5250. There is a state printing press. The Bhor Ghat, on the northern border of the state, has always been the main pass over the Western Ghats, or means of communication between the sea-coast and the Deccan. Since 1861 it has been traversed by the main line of the Great Indian Peninsula railway.

Bhuj, a town of India, the capital of the native state of Cutch, in the Gujarat division of Bombay, is situated in 23° 15′ N. lat. and 69° 48′ E. long., at the base of a fortified hill. In 1881 it had a population of 22,308, and in 1891 of 25,421. It contains some interesting examples of architecture; a high school, with 131 pupils in 1896-97; a school of art; a library; and a state printing press.

Bhutan, a country of the eastern Himalaya, between the Brahmaputra and the southern face of the mountains. Information respecting it accumulates but slowly. In 1873, Captain Godwin Austen accompanied Sir Ashley Eden's mission to the court of the Deb Raja, and made a survey of the route to Punaka. There has also been a certain amount of geographical sketching combined with trigonometrical observations; and there are the route surveys of native explorers. In 1887-88 two native Indian explorers "R. N." and "P. A." traversed a part of Western Bhutan, but were forced to retire owing to the disturbed state of the districts. They re-entered the country on the east from Dewangiri. Here they explored the Kuru, or Lhobrak Chu, which proves to be the largest river in Bhutan. It drains the tract between the Yamdok Tso and Tigu Lakes, and is fed by the glaciers of the Kulha Kangri and other great ranges. The Lhobrak was finally identified with the Monás river, a geographical discovery of some importance. A previously unknown tribe, the Chingmis, were discovered in Eastern Bhutan, who are socially on a higher level than the Bhutias, and differ from them chiefly in the matter of wearing pigtails. The Monla Kachung pass (17,500 feet), by which "R. N." crossed into Tibet, is nearly on the meridian of Gualpara, and is one of the most important passes between Bhutan and Tibet. East of Bhutan, amongst the semi-independent hill states which sometimes own allegiance to Tibet and sometimes assert complete freedom from all authority, the geographical puzzle of the course of the Sangpo, the great river of Tibet, has been solved by the researches of Captain Harman, and the explorations of the native surveyor "K. P." The Sangpo has been definitely ascertained to be the same river as the Brahmaputra. The tracts inhabited by the aboriginal tribes entitled Lo Nakpo, Lo Karpo, and Lo Tawa ("Lo" signifies "barbarous" in Tibetan), are described as a pleasant country; the lands on either side of the Sangpo being well cultivated and planted with mangoes, plantains, and oranges.

Nothing is known with certainty about the area and population of Bhutan, the former being estimated at 16,800 square miles. The government is nominally vested in a temporal and a spiritual sovereign known as the Deb Raja and the Dharm Raja. Recently official correspondence has been written in the name of the latter instead of the former, but it is not known whether this change possesses any special significance. The people are Buddhists in religion. Trade between Bhutan and Bengal is registered at stations in Jalpaiguri district. In 1897-98 the exports were valued at Rs.1,08,000, chiefly wax, musk, wool, ponies, cattle, fruit and vegetables; the imports were valued at Rs.1,37,000, chiefly cotton piece goods, betel nuts, tobacco, rice, and metals. Some trade is also conducted at fairs on the Assam frontier.

Report on Explorations in Sikkim, Bhutan, and Tibet. Deva Dun, 1889.—TANNER. "Our present Knowledge of the Himalayas," *R.G.S. Proceedings*, vol. xiii. (T. H. H.*)

Biala, the chief town of a government-district in Galicia, Austria, opposite Bielitz, on the river Biala, which at this point forms the boundary between Galicia and Austrian Silesia. It is the chief seat of the Galician textile industry, and an important market for pigs. Population (1890), 7622 (of whom 5493 were Germans); (1900), 8265.

Biancavilla, a town of the province of Catania, Sicily, Italy, situated at the S.W. foot of Mount Etna, 19 miles N.W. from Catania by rail. It is famous for its oranges, and has flour mills. An Albanian colony was settled here in 1480. Population, about 13,500.

Biarritz, a seaside resort of France, department of Basses-Pyrénées, in the arrondissement of Bayonne, 61 miles in direct line W. by N. of Pau, on the railway from Paris *viâ* Bordeaux and Bayonne. Its present popularity is chiefly due to its having been a favourite place of sojourn of the Emperor Napoleon III. and the Empress Eugénie. The town extends in irregular form for nearly two miles along the rugged coast. It is entirely modern, and the chief feature is the casino, finished in 1901. There is an English season early in the year, a Spanish season in the summer, and a Russian season in the autumn. It is connected with Bayonne by a local railway and a tramway. Population (1881), 6488; (1896), 10,544, (comm.) 11,869; (1901), 12,812.

Biberach, a town of Würtemberg, Germany, 23

expenditure included Rs.1,41,191 on railways, and Rs.1,54,462 on irrigation. The military force consists of 500 men, besides the imperial service corps of the same strength, maintained at a cost of Rs.1,56,000. This corps took part in the China expedition of 1900-1. There are 17 schools with 1606 pupils, including a high school affiliated to the university of Allahabad, a school for the sons of nobles, and a girls' school called after Lady Elgin. The railway from Jodhpur is being extended towards Bhatinda in the Punjab; on the northern border, the Ghaggar canal in the Punjab irrigates about 5000 acres. Coal has been found in the state. Drought is of common occurrence. The famine of 1899-1900 was severely felt. The chief agricultural stock consists of camels, and an annual show has been started to improve the breed. The principal industries are the weaving of woollen fabrics, carving, and the making of ivory bracelets ornamented with gold.

The city of BIKANIR has a railway station. The population in 1881 was 43,283; in 1891 it was 56,252. It has special manufactures of fine blankets and sugar-candy.

Bilaspur, a town and district of British India in the Chhattisgarh division of the Central Provinces. The town is situated on the right bank of the river Arpa. The population in 1891 was 11,122. It is now an important junction on the Bengal-Nagpur railway, where the two lines from the west meet on their way to Calcutta, 255 miles from Nagpur.

The district of BILASPUR has an area of 8341 square miles. The population in 1891 was 1,163,897, being 140 persons per square mile. Classified according to religion, Hindus numbered 1,059,457; Mahommedans, 11,101; aborigines, 93,126, chiefly Gonds; Christians, 128, of whom 70 were Europeans; "others," 85. In 1901 the population was 1,011,512, showing a decrease of 13 per cent., compared with an increase of 14 per cent. in the preceding decade. The total amount of land revenue and rates is returned as Rs.5,98,395, the incidence of assessment being 4 annas per acre of assessed area; number of police, 511. In 1897-98, out of a total cultivated area of 1,496,166 acres, only 3159 were irrigated from tanks, &c. The principal crops are rice, wheat, other food-grains, oil-seeds, and a little cotton. There are considerable manufactures of cotton cloth. In 1897-98 the number of schools was 158, attended by 9606 pupils. Bilaspur, which was formerly a very isolated tract, is now traversed in three directions by lines of the Bengal-Nagpur railway. It suffered severely from the famine of 1896-97. In 1897 the general death-rate was as high as 90 per thousand, rising to 297 in Bilaspur town. It suffered no less severely in 1900, when in May the number of persons relieved rose to one-fourth of the total population.

Bilbao, a town of Spain, capital of the Basque province of Biscay, on the river Ansa or Nervion, about 6 miles from the sea. Few cities in Spain have grown so rapidly in size, importance, and wealth as Bilbao in the last thirty years. The population, 17,649 in 1870, rose to 50,734 in 1887, 74,076 in 1897, and 83,213 in 1900. Since 1876 a completely new town has been mapped out, and "new" Bilbao is no longer confined to the right bank of the river. Fine broad streets, splendid squares and public gardens, hotels, villas, palatial new public buildings, a new post office, and numerous schools have come into existence, which vie with those of Madrid and Barcelona. The part of the town on the right bank is, however, still the great centre of business, the narrow streets containing the best of shops. There, too, are the banks, the town hall, the principal clubs, and the four principal churches. In and around Bilbao there are more than thirty convents and monasteries, and at Olaviaga, about a mile off, the Jesuits have built a university, attended by 850 students. Public education is not, however, entirely in the hands of the priesthood and nuns: there are an institute, a normal school to train teachers, a school of arts and handicrafts, a nautical school, and sixteen public primary schools for both sexes. A fine modern theatre has been erected.

A meteorological institute publishes very complete statistics. The mean temperature in 1898 was 58·3° F., the maximum 106°, and the minimum 28·4°. Only eighty-five days were classed as clear, and the total rainfall for the year was 35·22 inches, that being 10·1 inches less than in 1897. During the year 1898 the marriages were 5·96 per 1000, the deaths 32·19, the living births 40·62, the legitimate children 54·26, the illegitimate 11·78. The foundling hospital had 1026 inmates at the close of 1898, with a death-rate of 102·29 per 1000. The prosperity of Bilbao since 1874 has been chiefly due to the development of the mining and metallurgic industries. By reason of this the town has become the centre of a network of railway lines unrivalled in any province in Spain, and the Harbour Works Board, constituted in 1877, has improved the river channel and the bar, made wharves and embankments, lighted the lower third of the river by electricity, so as to allow vessels to enter by night, and constructed a breakwater and counter-mole outside the bar of the river Nervion, between Santurce, Portugalete, and the opposite headland at Algorta, so as to secure deep anchorage and easy access to the river. Dry docks were constructed in 1896. The sums collected as customs duties in Biscay, 95 per cent. of which were drawn from the port of Bilbao, amounted in 1898 to £471,275 (at the old fixed rate of 25 pesetas to each pound sterling). The general movement of shipping in the same year showed 4005 vessels of 2,352,157 tons entered and cleared. Spanish vessels numbered 1754 of 494,877 tons, chiefly engaged in the coasting trade. Great Britain has been at the head of the shipping movement since 1880. In 1898, 157 British vessels entered, with cargoes of 133,701 tons, valued at £313,492, whilst 291 entered in ballast, with a tonnage of 269,876; 6 vessels cleared in ballast with a tonnage of 3430, and 1317 vessels with cargoes of 1,105,696 tons, valued at £1,522,823. The exports are chiefly iron ores, of which Great Britain took from all sources 3,043,000 tons in 1898, France 253,000, Holland and Belgium 968,000, in reality in transit for Germany. The new ironworks become more important every year. Five large firms in 1898 employed over 4000 persons, and produced 191,220 tons of pig iron, 83,423 tons of steel, and 80,910 tons of coke. The export of pig iron rose from 21,952 tons in 1895 to 51,942 tons in 1898. In the coasting trade the exports are mostly pig iron, codfish, and some products of local industries and agriculture. The exports of wines, in great part brought by rail from Navarre and the Ebro valley, has increased from 283,000 gallons in 1894 to 873,000 in 1898. The imports in 1898 included 407,837 tons of coal and 386,792 tons of coke from Great Britain. This total was seriously affected by the Welsh coal strike; in the previous year 431,273 tons of coal alone were imported, chiefly from England. Of great importance also were woods of all kinds from Sweden and Finland, and coastwise from Asturias (141,000 tons). Besides the mining and metallurgic industries, Bilbao has breweries, tanneries, flour mills, glass works, brandy distilleries, and paper, soap, cotton, and mosaic factories. In 1874 Bilbao was for months besieged unavailingly by the second Carlist pretender. Its relief enabled it to retain its title of "Invicta Villa."

(A. E. H.)

Bilejik, chief town of the Ertoghrul sanjak of the Brusa vilâyet in Asia Minor (Byzantine *Belocome*), altitude 1900 feet, situated on a hill 2½ miles from its station on the Ismid-Angora railway. It is an important centre of the silk industry, and has several silk-spinning factories. Population, 10,500 (Moslems, 7200; Christians, 3300).

Bilin (Czech, *Bilina*), a town in the government-district of Dux, in Bohemia, Austria, situated on the Biela, about 5 miles south-west of Teplitz. It is chiefly known for its alkaline mineral waters (from the "Biliner Sauerbrunnen") of which some two million bottles are annually exported. Another export article is a salt recovered from the waters by evaporation. Large quantities of lignite are mined in the vicinity, where there is also a number of limestone quarries. The town, which is very old and possesses the ruins of a castle dating from the 11th century, is further distinguished by the largest mass of phonolite or clinkstone in Bohemia—the "Biliner Stein"—about 1760 feet high. Indeed the town is surrounded by basaltic rocks. Population (1890), 6651, chiefly German; (1900), 7871.

Billiards.—Since 1875 the game of billiards has developed in a somewhat curious manner. Tables, balls, cues, and other implements have not been radically altered, though in some respects their manufacture has improved, but the best class of professional play was, if length of breaks be the measure, undoubtedly better in 1900 than it was twenty-five years before. On the other hand, public matches played now are for the most part less genuine struggles than of old. The reasons for these changes are not difficult to explain. Formerly the stakes were more generally real, and were the chief inducement for exertion and the reward of success; games were short and slow, great caution being exhibited, and players had to be content with slender pay. More recently gate-money has far exceeded the value of any stake, so that the problem before players has been less how to win than how to get the most entrance-money from the public. Much attention has been given to this question, and many clever persons have assisted in its solution; but unquestionably the chief credit for developing the game must be given to John Roberts, sen., and to his son of the same name who has long held the position of champion. Indeed, their careers form the history of modern billiards from 1849, when the elder Roberts challenged Kentfield (who declined to play) for the championship. No useful comparison can be made between the last-named men, and the change of cushions from list to india-rubber further complicates the question. Kentfield represented the best of the old style of play, and was a most skilful performer; but Roberts had a genius for the game, combined with great nerve and physical power. This capacity for endurance enabled him to practise single strokes till they became certainties, when weaker men would have failed from sheer fatigue; and that process applied to the acquisition of the spot-stroke was what placed him decisively in front of the players of his day until a younger generation taught by him came forward. His all-round play, especially in strokes which required great strength or power of cue, was better for at any rate twenty years than that of any contemporary; yet his main influence in developing the game during that period lay in his mastery of the spot-stroke, which became practically the measure of proficiency. "Tell me how many spots you can make, and I will handicap you" was then a common remark. In 1869 the younger generation had caught him up, and soon afterwards surpassed him at this stroke; both W. Cook and J. Roberts, jun., carried it to greater perfection, but they were in turn put entirely in the shade by W. Mitchell and W. J. Peall. The latter's remarkable break (3304), made at the Aquarium in 1890, has never been approached. But this very perfection killed the stroke, for the public wearied of its monotony. Adroit use of this objection was made by professional players who could not play the stroke so well, and "spot-barred" matches were generally introduced. It is curious to realize that John Roberts, sen., developed the game chiefly by means of spot-play, whereas his son continued the process by abandoning it. The public, however, liked quick scoring and long breaks, and therefore a substitute had to be devised. This was provided chiefly by the younger Roberts, whose fertility of resource and manual dexterity eventually placed him by a very long way at the head of his profession. In exhibition matches he barred the spot-stroke and gave his attention chiefly to play which kept the three balls near the spot and under control not far from each other. Thus instead of a long succession of winning hazards he developed a series of two winning hazards (one from where the red ball happened to lie, the next from the spot) followed by a cannon. This style of play was soon brought to great perfection. Stroke followed stroke with rapidity and certainty nearly equalling spot-play, the main difference being that three strokes scored 8 instead of 9. This method is known as top-of-the-table play, and may perhaps be best defined as an endeavour, after every cannon, to leave the opponent's ball near the spot and the red ball near a pocket, so that the next stroke may be an easy winning hazard, to be so played that either a spot-stroke or cannon may be left. Like spot-play, but even to a greater degree, it is a dangerous game for a bad hazard-striker, because in case of a break-down the balls are likely to be left near each other, close to a pocket, and consequently the opening is favourable to the adversary. On the other hand, it presents a rapid means of scoring to a good hazard-striker; few of the strokes are very difficult, judgment rather than execution being required, while strength or force is seldom needed after the necessary position has been gained.

The next development was borrowed from the French game, which consists entirely of cannons; and in America it has practically superseded other forms of the game. Both French and American professors, giving undivided attention to cannons and not being permitted to use the push-stroke, arrived at a perfection in controlling or "nursing" the balls to which English players could not pretend; yet the principles involved in making a long series of cannons were applied, and leading professionals soon acquired the necessary delicacy of touch. The plan is to get the three balls close to each other, say within a space which a hand can cover, and not more than from four to eight inches from a cushion. The striker's ball should be behind the other two, one of which is nearer the cushion, the other a little farther off and farther forward. The striker's ball is tapped quietly on the one next the cushion, and hits the third ball so as to drive it an inch or two in a line parallel to the cushion. The ball first struck rebounds from the cushion, and at the close of the stroke all three balls are at rest in a position exactly similar to that at starting, which is called by the French *position mère*. Thus each stroke is a repetition of the previous one, the positions of the balls being relatively the same, but actually forming a series of short advances along the cushion. With the push-stroke a great number of these cannons could be quickly made, say 50 in 3½ minutes; and, as that means 100 points, scoring was rapid. Most of the great spot-barred breaks contained long series of these cannons, and their value as records is correspondingly diminished, for in such hair's-breadth distances very often no one but the player, and sometimes not even he, could tell whether a stroke was made or missed or was foul. Push-barred, the cannons are played nearly as fast; but with most men the

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Billiards.—Since 1875 the game of billiards has developed in a somewhat curious manner. Tables, balls, cues, and other implements have not been radically altered, though in some respects their manufacture has improved, but the best class of professional play was, if length of breaks be the measure, undoubtedly better in 1900 than it was twenty-five years before. On the other hand, public matches played now are for the most part less genuine struggles than of old. The reasons for these changes are not difficult to explain. Formerly the stakes were more generally real, and were the chief inducement for exertion and the reward of success; games were short and slow, great caution being exhibited, and players had to be content with slender pay. More recently gate-money has far exceeded the value of any stake, so that the problem before players has been less how to win than how to get the most entrance-money from the public. Much attention has been given to this question, and many clever persons have assisted in its solution; but unquestionably the chief credit for developing the game must be given to John Roberts, sen., and to his son of the same name who has long held the position of champion. Indeed, their careers form the history of modern billiards from 1849, when the elder Roberts challenged Kentfield (who declined to play) for the championship. No useful comparison can be made between the last-named men, and the change of cushions from list to india-rubber further complicates the question. Kentfield represented the best of the old style of play, and was a most skilful performer; but Roberts had a genius for the game, combined with great nerve and physical power. This capacity for endurance enabled him to practise single strokes till they became certainties, when weaker men would have failed from sheer fatigue; and that process applied to the acquisition of the spot-stroke was what placed him decisively in front of the players of his day until a younger generation taught by him came forward. His all-round play, especially in strokes which required great strength or power of cue, was better for at any rate twenty years than that of any contemporary; yet his main influence in developing the game during that period lay in his mastery of the spot-stroke, which became practically the measure of proficiency. "Tell me how many spots you can make, and I will handicap you" was then a common remark. In 1869 the younger generation had caught him up, and soon afterwards surpassed him at this stroke; both W. Cook and J. Roberts, jun., carried it to greater perfection, but they were in turn put entirely in the shade by W. Mitchell and W. J. Peall. The latter's remarkable break (3304), made at the Aquarium in 1890, has never been approached. But this very perfection killed the stroke, for the public wearied of its monotony. Adroit use of this objection was made by professional players who could not play the stroke so well, and "spot-barred" matches were generally introduced. It is curious to realize that John Roberts, sen., developed the game chiefly by means of spot-play, whereas his son continued the process by abandoning it. The public, however, liked quick scoring and long breaks, and therefore a substitute had to be devised. This was provided chiefly by the younger Roberts, whose fertility of resource and manual dexterity eventually placed him by a very long way at the head of his profession. In exhibition matches he barred the spot-stroke and gave his attention chiefly to play which kept the three balls near the spot and under control not far from each other. Thus instead of a long succession of winning hazards he developed a series of two winning hazards (one from where the red ball happened to lie, the next from the spot) followed by a cannon. This style of play was soon brought to great perfection. Stroke followed stroke with rapidity and certainty nearly equalling spot-play, the main difference being that three strokes scored 8 instead of 9. This method is known as top-of-the-table play, and may perhaps be best defined as an endeavour, after every cannon, to leave the opponent's ball near the spot and the red ball near a pocket, so that the next stroke may be an easy winning hazard, to be so played that either a spot-stroke or cannon may be left. Like spot-play, but even to a greater degree, it is a dangerous game for a bad hazard-striker, because in case of a break-down the balls are likely to be left near each other, close to a pocket, and consequently the opening is favourable to the adversary. On the other hand, it presents a rapid means of scoring to a good hazard-striker; few of the strokes are very difficult, judgment rather than execution being required, while strength or force is seldom needed after the necessary position has been gained.

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expenditure included Rs.1,41,191 on railways, and Rs.1,54,462 on irrigation. The military force consists of 500 men, besides the imperial service corps of the same strength, maintained at a cost of Rs.1,56,000. This corps took part in the China expedition of 1900-1. There are 17 schools with 1606 pupils, including a high school affiliated to the university of Allahabad, a school for the sons of nobles, and a girls' school called after Lady Elgin. The railway from Jodhpur is being extended towards Bhatinda in the Punjab; on the northern border, the Ghaggar canal in the Punjab irrigates about 5000 acres. Coal has been found in the state. Drought is of common occurrence. The famine of 1899-1900 was severely felt. The chief agricultural stock consists of camels, and an annual show has been started to improve the breed. The principal industries are the weaving of woollen fabrics, carving, and the making of ivory bracelets ornamented with gold.

The city of BIKANIR has a railway station. The population in 1881 was 43,283; in 1891 it was 56,252. It has special manufactures of fine blankets and sugar-candy.

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series is shorter, *massé* strokes being used when the cannon cannot be directly played. To this in professional hands there is no great objection, but with ordinary amateurs the danger of damaging the cloth is so great, and the chance of bringing off the stroke so small, that it would be more sensible to bar the *massé* than to bar the push. It is of course understood that from human and other imperfection the *position mère* is soon lost, and play has to be modified with the view of regaining it as quickly as possible. The most recent alteration in play is that the push-stroke is generally abandoned, perhaps with advantage; the game, therefore, as usually practised is push- and spot-barred.

A few words about the championship are here appropriate. When Kentfield declined to play in 1849, John Roberts assumed the title, and held the position till 1870, when he was defeated by his pupil W. Cook. The following table gives particulars of every match played for the championship, from which it will be seen that four men only have held that position, Roberts, sen., Cook, Roberts, jun., and Bennett; and that since 1885 no competitor has contested the younger Roberts's claim.

Points.	Date.	Players.	Won by
1200	Feb. 11, 1870	Cook *b.* Roberts, sen.	117
1000	April 14, 1870	Roberts, jun., *b.* Cook	478
1000	May 30, 1870	Roberts, jun., *b.* Bowles	246
1000	Nov. 28, 1870	Jos. Bennett *b.* Roberts, jun.	95
1000	Jan. 30, 1871	Roberts, jun., *b.* Bennett	363
1000	May 25, 1871	Cook *b.* Roberts, jun.	15
1000	Nov. 21, 1871	Cook *b.* Jos. Bennett	58
1000	Mar. 4, 1872	Cook *b.* Roberts, jun.	201
1000	Feb. 4, 1874	Cook *b.* Roberts, jun.	216
1000	May 24, 1875	Roberts, jun., *b.* Cook	163
1000	Dec. 20, 1875	Roberts, jun., *b.* Cook	135
1000	May 28, 1877	Roberts, jun., *b.* Cook	223
1000	Nov. 8, 1880	Jos. Bennett *b.* Cook	51
1000	Jan. 12, 13, 1881	Jos. Bennett *b.* Taylor	90
3000	March 30, 31, and April 1, 1885	Roberts, jun., *b.* Cook	92
3000	June 1, 2, 3, 4, 1885	Roberts, jun., *b.* Jos. Bennett	1640

These games were all played on three-inch-pocket tables, and Roberts has fairly contended that he remained champion till beaten on such a table under the rules in force when he won the title or under a new code to which he was a consenting party. The nearest approach to a match for the championship since 1885 was that between Roberts and Dawson (March 20 to April 3, 1899) of 18,000 up, level, half the game at the Argyll Hall, Argyll Street, London, and half at the Egyptian Hall, Piccadilly. The main departure from a championship game lay in the table, which had ordinary, though not easy pockets, instead of three-inch pockets. The match excited much interest, because Dawson, who had already beaten North for the Billiard Association championship, was the first man for many years to play Roberts even. The performances of the players were often disappointing, particularly those by the champion, and the scores at the close of the first week's play (Roberts, 9001; Dawson, 8721) proved how closely the game was contested. Next week's play in the room to which Roberts was accustomed resulted in his favour, and he secured the game by 1814 points. Nevertheless, the result showed clearly that Dawson had greatly lessened the gap which for many years had separated Roberts from the next best player, and that he was entitled to challenge the champion on even terms. After this Dawson improved materially, and in 1899, for the second time, he won the Billiard Association championship. His position was challenged by Diggle and Stevenson, who contested a game of 9000 points. Stevenson won by 2900, but lost to Dawson by 2225 points; he beat him in January 1901, but Dawson reasserted his superiority before the close of the spring.

A matter closely connected with the development of the game is the absence of a satisfactory and authoritative code of laws or rules. Several codes more or less faulty exist, of which perhaps those of the Billiard Association are the best, but they do not command universal respect or acceptance. The want of a club or committee of sufficiently representative persons who shall be to billiards as the M.C.C. is to cricket has made itself apparent.

Record scores at billiards have greatly altered since W. Cook's break of 936, which included 292 spots, and was made in 1873. It may be useful to mention a few of the great breaks, since they are in some degree a measure of development; but too much weight must not be given to them, for tables vary considerably between easy and difficult ones, and comparisons are apt to mislead. Peall, in addition to the break of 3304 (1890) already mentioned, has made 2031 (1888), and has scored 1000 points in 44 minutes. Mitchell has made several breaks over 1000; while Memmott, from Australia, a very sound and steady player, is credited with 423 consecutive screw-back spot-strokes, which total 1269 points. Roberts, the champion, has made 1392 and 1017 spot-barred, and innumerable breaks between 1000 and 100, of which 155 (made in a game for the championship) is far from being the least remarkable. All the leading players have made very long spot-barred breaks, but as some were made push-in and others push-barred, whilst tables varied, no useful purpose is served in recording them.

Respecting the various games of Pool, it may be said that the old-fashioned *Following Pool* has been to a great extent superseded by *Black Pool*, in which hazard-striking has more influence than safety play, and players can join and leave the game on giving due notice. *Single pool*, a very good game, is now seldom seen, but *Pyramids* is still played, though nowadays knocking a ball off the table is a foul stroke, and is scored against the player. *Snooker*, a game combining pool and pyramids, is becoming popular, probably because of its additional element of chance. No universally accepted rules of this game exist, so players must agree before commencing how they will play, or follow the custom of the room.

Snooker is described in the volume on *Billiards* of the "Badminton Library," from which the following is extracted:—"The pyramid balls are set up in the usual way, and the striker always uses the white ball. The black ball is set on the billiard spot, the pink on the centre spot. Blue is placed just below the apex-ball of the pyramid, brown on the centre spot of the D, with yellow and green on the right and left corner spots. . . . A red ball counts one, yellow two, green three, brown four, blue five, pink six, and black seven. The score, if two persons are playing or sides are formed, may be marked on the board as at billiards. A red ball must be taken before a coloured ball can be played at; if the striker, playing on a red, holes it, and takes a coloured ball also, the latter does not count, and is spotted. If, playing on the red, he fails to hole it, but holes a coloured ball, the value of the latter is scored to the other side. . . . After taking a red, the striker must play on one of the coloured balls. If he holes one of them, any other balls that go down by the same stroke count to him. All coloured balls which are holed must be spotted immediately; if the striker plays before all are spotted, the stroke is foul. No red ball is ever put up. . . . If the striker gives a miss, the ball is left where it finally stops. If the striker is by law obliged to play on a red ball or on a coloured ball, but from the position of his own ball is unable to do so directly, he is said to be snookered; he must then make a *bonâ-fide* shot at the proper ball off the cushion, the penalty if he misses being the minimum penalty. . . . When all the red balls have been holed the others must be taken in proper pool order." For greater detail, reference to the "Badminton" volume must be made.

To the bibliography of Billiards given in the article in the ninth edition of the *Encyclopædia Britannica* the following should be added:—W. Cook. *Billiards.* Burroughes and Watts.—J. P. Buchanan. *Hints on Billiards.* Bell and Sons.—*Modern Billiards.* The Brunswick-Balke-Collender Co., New York.—Vignaux. *Manuël du Billard.* Paris, Delarue.—Broadfoot. *Billiards.* Badminton Library (Longmans).—Lococck. *Side and Screw* (Longmans). For those interested in the purely mathematical aspect of the game—Hemming. *Billiards Mathematically treated.* Macmillan.

(W. Bn.)

Billiton (Dutch, *Blitoeng*), an island E. of Banca and W. of Borneo. Its area is 1847 square miles. The coasts are sandy or marshy; the geological formation Devonian and granitic, with laterites; the surface rises to an altitude of from 325 to 1670 feet. The rainfall is heavy, 102 to 126 inches. The products resemble those of Banca. In 1898-99, 82 mines (7553 workmen) produced 93,603 piculs (a picul = 159 lb). The imports and exports, exclusive of tin, have been valued together for recent years at £85,000. The population of 41,558 includes 96 Europeans and about 12,000 Chinese. The natives belong to two classes, the *Orang Darat*, the aborigines (probably Malayan colonists), and the *Orang Sekah*, who live in boats. The capital, Tanjong Padang, on the west coast, has a population of 12,000.

Billroth, Albert Christian Theodor (1829-1894), Viennese surgeon, was born on 26th April 1829, at Bergen, on the island of Rügen, his family being of Swedish origin. He studied at the Universities of Greifswald, Göttingen, and Berlin, and after taking his doctor's degree at the last in 1852, started on an educational tour, in the course of which he visited the medical schools of Vienna, Prague, Paris, Edinburgh, and London. On his return to Berlin he acted for a time as assistant to Professor Langenbeck, and then in 1859 accepted the professorship of surgery at Zürich. Eight years later he was invited to fill the same position at Vienna, and in that city the remainder of his professional life was spent. In 1887 he received the distinction, rarely bestowed on members of his profession, of a seat in the Austrian Herrnhaus. He died at Abbazia, a winter resort on the Adriatic, where he had a beautiful villa, on 6th February 1894. Billroth was one of the most distinguished surgeons of his day. His boldness as an operator was only equalled by his skill and resourcefulness; no accident or emergency could disturb his coolness and presence of mind, and his ability to invent or carry out any new procedure that might be demanded in the particular case with which he was dealing, gained for him the appellation of "surgeon of great initiatives." At the same time he was full of consideration for the comfort and well-being of his patient, and never forgot that he had before him a human being to be relieved, not a mere "case" for the display of technical dexterity. He was especially interested in military surgery, and during the Franco-German war volunteered to serve in the hospitals of Mannheim and Weissenburg. His efforts did much to improve the arrangements for the transport and treatment of the wounded in war, and in a famous speech on the War Budget in 1891, he eloquently urged the necessity for an improved ambulance system, pointing out that the use of smokeless powder and the greater precision of the arms of modern warfare must tend to increase the number of men wounded, and that therefore more efficient means must be provided for removing them from the battlefield. Possessing a clear and graceful style, he was the author of numerous papers and books on medical subjects; his *Lectures on General Surgical Pathology and Therapeutics* ran through many editions, and were translated into many languages, and the same is true of his *Handbook of Sick Nursing at Home and in Hospitals*. He was of an exceedingly artistic disposition, and in particular was devoted to music. A good performer on the pianoforte and violin, he was an intimate friend and admirer of Brahms, many of whose compositions were privately performed at his house before they were published. At the time of his death he was engaged on a book on the *Physiology of Music*. (H. M. R.)

Bills of Exchange.—The Bills of Exchange Act, 1882,[1] codifies for the United Kingdom the law relating to bills of exchange, promissory notes, and cheques. One peculiar Scottish rule is preserved, but in other respects uniform rules are laid down for England, Scotland, and Ireland. After glancing briefly at the history of these instruments, it will probably be convenient to discuss the subject in the order followed by the Act, namely, first, to treat of a bill of exchange, which is the original and typical negotiable instrument, and then to refer to the special provisions which apply to promissory notes and cheques. Two salient characteristics distinguish negotiable instruments from other engagements to pay money. In the first place, the assignee of a negotiable instrument, to whom it is transferred by indorsement or delivery according to its tenor, can sue thereon in his own name; and, secondly, he holds it by an independent title. If he takes it in good faith and for value, he takes it free from "all equities," that is to say, all defects of title or grounds of defence which may have attached to it in the hands of any previous party. These characteristic privileges were conferred by the Law Merchant, which is part of the Common Law, and are now confirmed by statute.

From a legal point of view the history of bills of exchange is short, though somewhat obscure. It is ably summed up by Lord Chief Justice Cockburn in his judgment in *Goodwin* v. *Robarts*, L.R. 10 Ex. pp. 346-358. Bills of exchange were probably invented by Florentine Jews. They were well known in England in the Middle Ages, though there is no reported decision on a bill of exchange before the year 1603. At first their use seems to have been confined to foreign bills between English and foreign merchants. It was afterwards extended to domestic bills between traders, and finally to bills of all persons, whether traders or not. But for some time after they had come into general employment, bills were always alleged in legal proceedings to be drawn *secundum usum et consuetudinem mercatorum*. The foundations of our modern law were laid by Lord Mansfield with the aid of juries of London merchants. No better tribunal of commerce could have been devised. Subsequent judicial decisions have developed and systematized the principles thus laid down. Promissory notes are of more modern origin than bills of exchange, and their validity as negotiable instruments was doubtful until it was confirmed by 3 and 4 Anne, c. 8. Cheques are the creation of the modern system of banking. The codifying Act of 1882 amends the law in a few minor details, and fills up a few gaps which were uncovered by authority, but in the main it is an exact reproduction of the then existing law. The change effected is a change of form, not of substance. Before the Act, the law was to be found in 17 statutes dealing with isolated points, and about 2600 cases scattered over some 300 volumes of reports.

Definition.—By § 3 of the Act a bill of exchange is defined to be "an unconditional order in writing, addressed by one person to another, signed by the person giving it, requiring the person to whom it is addressed to pay on demand or at a fixed or determinable future time a sum certain in money to or to the order of a specified person, or to bearer."[1] The person who gives the order is called the drawer. The person thereby required to pay is called the drawee. If he assents to the order, he is then called the acceptor. An acceptance must be in writing and must be signed by the drawee. The mere signature of the drawee is sufficient (§ 17). The person to whom the money is payable is called the payee. The

[1] This is also the definition given in the United States, by § 126 of the general Act relating to negotiable instruments, prepared by the Conference of State Commissioners on uniform legislation, and it has been adopted in the leading States.

person to whom a bill is transferred by indorsement is called the indorsee. The generic term "holder" includes any person in possession of a bill who holds it either as payee, indorsee, or bearer. A bill which in its origin is payable to order becomes payable to bearer if it is indorsed in blank. If the payee is a fictitious person the bill may be treated as payable to bearer (§ 7).

The following is a specimen of an ordinary form of a bill of exchange :—

£100 LONDON, 1*st January* 1901.

Three months after date pay to the order of Mr J. Jones the sum of one hundred pounds for value received.

BROWN AND CO.

To Messrs. Smith and Sons, Liverpool.

The scope of the definition given above may be realized by comparing it with the definition given by Comyn's *Digest* in the early part of the 18th century:—"A bill of exchange is when a man takes money in one country or city upon exchange, and draws a bill whereby he directs another person in another country or city to pay so much to A, or order, for value received of B, and subscribes it." Comyn's definition illustrates the original theory of a bill of exchange. A bill in its origin was a device to avoid the transmission of cash from place to place to settle trade debts. Now a bill of exchange is a substitute for money. It is immaterial whether it is payable in the place where it is drawn or not. It is immaterial whether it is stated to be given for value received or not, for the law itself raises a presumption that it was given for value. But though bills are a substitute for cash payment, and though they constitute the commercial currency of the country, they must not be confounded with money. No man is bound to take a bill in payment of debt unless he has agreed to do so. If he does take a bill, the instrument ordinarily operates as conditional, and not as absolute payment. If the bill is dishonoured the debt revives. Under the laws of some Continental countries, a creditor, as such, is entitled to draw on his debtor for the amount of his debt, but in England the obligation to accept or pay a bill rests solely on actual agreement. A bill of exchange must be an unconditional order to pay. If an instrument is made payable on a contingency, or out of a particular fund, so that its payment is dependent on the continued existence of that fund, it is invalid as a bill, though it may, of course, avail as an agreement or equitable assignment. In Scotland it has long been the law that a bill may operate as an assignment of funds in the hands of the drawee, and § 53 of the Act preserves this rule.

Stamp.—Bills of exchange must be stamped, but the Act of 1882 does not regulate the stamp. It merely saves the operation of the stamp laws, which necessarily vary from time to time according to the fluctuating needs and policy of the Exchequer. Under the Stamp Act, 1891, bills payable on demand are subject to a fixed stamp duty of one penny, and by the Finance Act, 1899, a similar privilege is extended to bills expressed to be payable not more than three days after sight or date. The stamp may be impressed or adhesive. All other bills are liable to an *ad valorem* duty. Inland bills must be drawn on stamped paper, but foreign bills, of course, can be stamped with adhesive stamps. As a matter of policy, English law does not concern itself with foreign revenue laws. For English purposes, therefore, it is immaterial whether a bill drawn abroad is stamped in accordance with the law of its place of origin or not. On arrival in England it has to conform to the English stamp laws.

Maturity.—A bill of exchange is payable on demand when it is expressed to be payable on demand, or at sight, or on presentation, or when notice for payment is expressed. In calculating the maturity of bills payable at a future time, three days, called days of grace, must be added to the nominal due date of the bill. For instance, if a bill payable one month after sight is accepted on the 1st January, it is really payable on 4th February, and not on 1st February as its tenor indicates. On the Continent generally days of grace have been abolished as anomalous and misleading. Their abolition has been proposed in England, but it has been opposed on the ground that it would curtail the credit of small traders who are accustomed to bills drawn at certain fixed periods of currency. When the last day of grace is a non-business day some complicated rules come into play (§ 14). Speaking generally, when the last day of grace falls on Sunday or a common law holiday the bill is payable on the preceding day, but when it falls on a bank holiday the bill is payable on the succeeding day. Complications arise when Sunday is preceded by a bank holiday; and, to add to the confusion, Christmas Day is a bank holiday in Scotland, but a common law holiday in England. When the code was in committee an attempt was made to remove these anomalies, but it was successfully resisted by the bankers on alleged grounds of practical convenience.

Acceptance.—By the acceptance of a bill the drawee becomes the principal debtor on the instrument and the party primarily liable to pay it. The acceptor of a bill "by accepting it engages that he will pay it according to the tenor of his acceptance," and is precluded from denying the drawer's right to draw or the genuineness of his signature (§ 54). The acceptance may be either general or qualified. As a qualified acceptance is so far a disregard of the drawer's order, the holder is not obliged to take it; and if he chooses to take it he must give notice to antecedent parties, acting at his own risk if they dissent (§§ 19 and 44). The drawer and indorsers of a bill are in the nature of sureties. They engage that the bill shall be duly accepted and paid according to its tenor, and that if it is dishonoured by non-acceptance or non-payment, as the case may be, they will compensate the holder provided that the requisite proceedings on dishonour are duly taken. Any indorser who is compelled to pay the bill has the like remedy as the holder against any antecedent party (§ 55). A person who is not the holder of a bill, but who backs it with his signature, thereby incurs the liability of an indorser to a holder in due course (§ 56). An indorser may by express term either restrict or charge his ordinary liability as stated above. *Primâ facie* every signature to a bill is presumed to have been given for valuable consideration. But sometimes this is not the case. For friendship, or other reasons, a man may be willing to lend his name and credit to another in a bill transaction. Hence arise what are called *accommodation bills.* Ordinarily the acceptor gives his acceptance to accommodate the drawer. But occasionally both drawer and acceptor sign to accommodate the payee, or even a person who is not a party to the bill at all. The criterion of an accommodation bill is the fact that the principal debtor according to the instrument has lent his name and is in substance a surety for some one else. The holder for value of an accommodation bill may enforce it exactly as if it was an ordinary bill, for that is the presumable intention of the parties. But if the bill is dishonoured the law takes cognizance of the true relations of the parties, and many of the rules relating to principal and surety come into play. Suppose a bill is accepted for the accommodation of the drawer. It is the drawer's duty to provide the acceptor with funds to meet the bill at maturity. If he fails to do so, he cannot rely on the defence that the bill was not duly presented for payment or that he did not receive due notice of dishonour. If the holder, with notice of the real state of the facts, agrees to give time

to the drawer to pay, he may thereby discharge the acceptor.

Holder in due Course.—The holder of a bill has special rights and special duties. He is the mercantile owner of the bill, but in order to establish his ownership he must show a mercantile title. The bill must be negotiated to him, that is to say, it must be transferred to him according to the forms prescribed by mercantile law. If the bill is payable to order, he must not only get possession of the bill, but he must also obtain the indorsement of the previous holder. If the bill is payable to bearer it is transferable by mere delivery. A bill is payable to bearer which is expressed to be so payable, or on which the only or last indorsement is an indorsement in blank. If a man lawfully obtains possession of a bill payable to order without the necessary indorsement, he may obtain some common law rights in respect of it, but he is not the mercantile owner, and he is not technically the holder or bearer. But to get the full advantages of mercantile ownership the holder must be a "holder in due course,"—that is to say, he must satisfy three business conditions. First, he must have given value, or claim through some holder who has given value. Secondly, when he takes the bill, it must be regular on the face of it. In particular, the bill must not be overdue or known to be dishonoured. An overdue bill, or a bill which has been dishonoured, is still negotiable, but in a restricted sense. The transferee cannot acquire a better title than the party from whom he took it had (§ 36). Thirdly, he must take the bill honestly and without notice of any defect in the title of the transferor,—as, for instance, that the bill or acceptance had been obtained by fraud, or threats, or for an illegal consideration. If he satisfies these conditions he obtains an indefeasible title, and can enforce the bill against all parties thereto. The Act substitutes the expression "holder in due course" for the somewhat cumbrous older expression "bonâ-fide holder for value without notice." The statutory term has the advantage of being positive instead of negative. The French equivalent "tiers porteur de bonne foi" is expressive. Forgery, of course, stands on a different footing from a mere defect of title. A forged signature, as a general rule, is a nullity. A person who claims through a forged signature has no title himself, and cannot give a title to anyone else (§ 24). Two exceptions to this general rule require to be noted. First, a banker who in the ordinary course of business pays a demand draft held under a forged indorsement is protected (§ 60). Secondly, if a bill be issued with material blanks in it, any person in possession of it has *primâ facie* authority to fill them up, and if the instrument when complete gets into the hands of a holder in due course the presumption becomes absolute. As between the immediate parties the transaction may amount to forgery, but the holder in due course is protected (§ 20).

Dishonour.—The holder of a bill has special duties which he must fulfil in order to preserve his rights against the drawers and indorsers. They are not absolute duties; they are duties to use reasonable diligence. When a bill is payable after sight, presentment for acceptance is necessary in order to fix the maturity of the bill. Accordingly the bill must be presented for acceptance within a reasonable time. When a bill is payable on demand it must be presented for payment within a reasonable time. When it is payable at a future time it must be presented on the day that it is due. If the bill is dishonoured the holder must notify promptly the fact of dishonour to any drawer and indorser he wishes to charge. If, for example, the holder only gives notice of dishonour to the last indorser, he could not sue the drawer unless the last indorser or some other party liable has duly sent notice to the drawer. When a foreign bill is dishonoured the holder must cause it to be protested by a notary public. The bill must be noted for protest on the day of its dishonour. If this be duly done, the protest, *i.e.*, the formal notarial certificate attesting the dishonour can be drawn up at any time as of the date of the noting. A dishonoured inland bill may be noted, and the holder can recover the expenses of noting, but no legal consequences attach thereto. In practice, however, noting is usually accepted as showing that a bill has been duly presented and has been dishonoured. Sometimes the drawer or indorser has reason to expect that the bill may be dishonoured by the drawee. In that case he may insert the name of a "referee in case of need." But whether he does so or not, when a bill has been duly noted for protest, any person may, with the consent of the holder, intervene for the honour of any party liable on the bill. If the bill has been dishonoured by non-acceptance it may be "accepted for honour *supra protest*." If it has been dishonoured by non-payment it may be paid *supra protest*. When a bill is thus paid and the proper formalities are complied with, the person who pays becomes invested with the rights and duties of the holder so far as regards the party for whose honour he has paid the bill, and all parties antecedent to him (§§ 65 to 68).

Discharge.—Normally a bill is discharged by payment in due course, that is to say, by payment by the drawee or acceptor to the holder at or after maturity. But it may also be discharged in other ways, as for example by coincidence of right and liability (§ 61), voluntary renunciation (§ 62), cancellation (§ 63), or material alteration (§ 64).

Conflict of Laws.—A bill of exchange is the most cosmopolitan of all contracts. It may be drawn in one country, payable in another, and indorsed on its journey to its destination in two or three more. The laws of all these countries may differ. Provision for this conflict of laws is made by § 72, which lays down rules for determining by what law the rights and duties of the various parties are to be measured and regulated. Speaking broadly, these rules follow the maxim *Locus regit actum*. A man must be expected to know and follow the law of the place where he conducts his business, but no man can be expected to know the laws of every country through which a bill may travel. For safety of transmission from country to country bills are often made out in sets. The set usually consists of three counterparts, each part being numbered and containing a reference to the other parts. The whole set then constitutes one bill, and the drawee must be careful only to accept one part, otherwise if different accepted parts get into the hands of different holders, he may be liable to pay the bill twice (§ 71). Foreign bills circulating through different countries have given rise to many intricate questions of law. But the subject is perhaps one of diminishing importance, as in many trades the system of "cable transfers" is superseding the use of bills of exchange.

Cheques.

A cheque "is a bill of exchange drawn on a banker payable on demand" (§ 73). For the most part the rules of law applicable to bills payable on demand apply in their entirety to cheques. But there are certain peculiar rules relating to the latter which arise from the fact that the relationship of banker and customer subsists between the drawer and drawee of a cheque. For example, when a person has an account at a bank he is, as an inference of law, entitled to draw on it by means of cheques. A right to overdraw can, of course, only arise from agreement. The drawer of a cheque is not absolutely discharged by the holder's omission to present it for payment within a reasonable time. He is only discharged to the extent of any actual damage he may have suffered

through the delay (§ 74). Apart from any question of delay, a banker's authority to pay his customer's cheques is determined by countermand of payment or by notice of the customer's death (§ 75). Of recent years the use of cheques has enormously increased, and they have now become the normal machinery by which all but the smallest debts are discharged. To guard against fraud, and to facilitate the safe transmission of cheques by post, a system of crossing has been devised which makes crossed cheques payable only through certain channels. The first Act which gave legislative recognition to the practice of crossing was the 19 and 20 Vict. c. 95. That Act was amended in 1858, and a consolidating and amending Act was passed in 1876. The Act of 1876 is now repealed, and its provisions are re-enacted with slight modifications by §§ 76 to 82 of the Bills of Exchange Act, 1883. A cheque may be crossed either "generally" or "specially." A cheque is crossed generally by drawing across it two parallel lines and writing between them the words "& Co." When a cheque is crossed generally it cannot be paid over the counter. It must be presented for payment by a banker. A cheque is crossed specially by adding the name of the banker, and then it can only be presented through that particular banker. A cheque, whether crossed generally or specially, may further be crossed with the words "not negotiable." A cheque crossed "not negotiable" is still transferable, but its negotiable quality is restricted. It is put on pretty much the same footing as an overdue bill. The person who takes it does not get, and cannot give a better title to it, than that which the person from whom he took it had. These provisions are supplemented by provisions for the protection of paying and collecting bankers who act in good faith and without negligence. Suppose that a cheque payable to bearer, which is crossed generally and with the words "not negotiable," is stolen. The thief then gets a tradesman to cash it for him, and the tradesman gets the cheque paid on presentment through his banker. The banker who pays and the banker who receives the money for the tradesman are protected, but the tradesman would be liable to refund the money to the true owner. Again, assuming payment of the cheque to have been stopped, the tradesman could not maintain an action against the drawer. (See also under BANKING.)

Promissory notes.

A promissory note is defined by section 83 of the Act to be an "unconditional promise in writing made by one person to another, signed by the maker, engaging to pay on demand, or at a fixed or determinable future time, a sum certain in money to or to the order of a specified person or to bearer." A promissory note may be made by two or more makers, and they may be liable either jointly, or jointly and severally, according to its tenor (§ 85). For the most part, rules of law applicable to a bill of exchange apply also to a promissory note, but they require adaptation. A note differs from a bill in this: it is a direct promise to pay, and not an order to pay. When it issues it bears on it the engagement of the principal debtor who is primarily liable thereon. The formula for applying to notes the rules as to bills is that "the maker of a note shall be deemed to correspond with the acceptor of a bill, and the first indorser of a note shall be deemed to correspond with the drawer of a bill payable to drawer's order" (§ 89). Rules relating to presentment for acceptance, acceptance, acceptance *supra* protest, and bills in a set, have no application to a note. Moreover, when a foreign note is dishonoured it is not necessary, for English purposes, to protest it. All promissory notes are, under the Stamp Act, 1891, subject to an *ad valorem* stamp duty. Inland notes must be on impressed stamp paper. Foreign notes are stamped with adhesive stamps. For ordinary legal purposes a bank note may be regarded as a promissory note made by a banker payable to bearer on demand. It is, however, subject to special stamp regulations. It is not discharged by payment, but may be re-issued again and again. In the interests of the currency the issue of bank notes is subject to various statutory restrictions. A bank, other than the Bank of England, may not issue notes in England unless it had a lawful note issue in 1844. On the other hand, Bank of England notes are legal tender except by the bank itself.

Foreign laws.

In fundamental principles there is general agreement between the laws of all commercial nations regarding negotiable instruments. As Mr Justice Story, the great American lawyer, says: "The law respecting negotiable instruments may be truly declared, in the language of Cicero, to be in a great measure not the law of a single country only, but of the whole commercial world. *Non erit lex alia Romæ, alia Athenis, alia nunc alia posthac, sed et apud omnes gentes et omni tempore, una eademque lex obtinebit*" (*Swift* v. *Tyson*, 16 Peters 1). But in matters of detail each nation has impressed its individuality on its own system. The English law has been summarized above. Perhaps its special characteristics may be best brought out by comparing it with the French code and noting some salient divergences. English law has been developed gradually by judicial decision founded on trade custom. French law was codified in the 17th century by the "Ordonnance de 1673." The existing "Code de Commerce" amplifies but substantially adopts the provisions of the "Ordonnance." The growth of French law was thus arrested at an early period of its development. The result is instructive. A reference to Marius' treatise on Bills of Exchange, published about 1670, or Beawes' *Lex Mercatoria*, published about 1740, shows that the law, or rather the practice, as to bills of exchange was even then fairly well defined. Comparing the practice of that time with the law as it now stands, it will be seen that it has been modified in some important respects. For the most part, where English law differs from French law, the latter is in strict accordance with the rules laid down by Beawes. The fact is that, when Beawes wrote, the law or practice of both nations on this subject was nearly uniform. But English law has gone on growing while French law has stood still. A bill of exchange in its origin was an instrument by which a trade debt due in one place was transferred in another place. This theory French law rigidly keeps in view. In England bills have developed into a paper currency of perfect flexibility. In France a bill represents a trade transaction; in England it is merely an instrument of credit. English law affords full play to the system of accommodation paper; French law endeavours to stamp it out. A comparison of some of the main points of difference between English and French law will show how the two theories work. In England it is no longer necessary to express on a bill that value has been given for it, for the law raises a presumption to that effect. In France the nature of the consideration must be stated, and a false statement of value avoids the bill in the hands of all parties with notice. In England a bill may be drawn and payable in the same place. In France the place where a bill is drawn should be so far distant from the place where it is payable that there may be a possible rate of exchange between the two. This so-called rule of *distantia loci* is said to be disregarded now in practice, but the code is unaltered. As French lawyers put it, a bill of exchange necessarily presupposes a contract of exchange. In England since 1765 a bill may be drawn payable to bearer, though formerly it was otherwise. In France it must be payable to order; if it were not so it is clear that the rule requiring the consideration to be truly stated would be a nullity. In England a bill originally

payable to order becomes payable to bearer when indorsed in blank. In France an indorsement in blank merely operates as a procuration. An indorsement, to operate as a negotiation, must be to order, and must state the consideration; in short, it must conform to the conditions of an original draft. In England, if a bill is dishonoured by non-acceptance, a right of action at once accrues to the holder. In France no cause of action arises unless the bill is again dishonoured at maturity; the holder in the meantime is only entitled to demand security from the drawer and indorsers. In England a sharp distinction is drawn between current and overdue bills. In France no such distinction is drawn. In England no protest is required in the case of the dishonour of an inland bill, notice of dishonour being sufficient. In France every dishonoured bill must be protested. Opinions may differ whether the English or the French system is better calculated to serve sound commerce and promote a healthy commercial morality. But an argument in favour of the English system may be derived from the fact that as the various Continental codes are from time to time revised and re-enacted, they tend to depart from the French model and to approximate to the English rule. The effect upon English law of its recent codification has yet to be proved. A common objection to codification in England is that it deprives the law of its elastic character. But when principles are once settled common law has very little elasticity. On the other hand no code is final. Modern parliaments legislate very freely, and it is a much simpler task to alter statute law than to alter common law. Moreover, legislation is cheaper than litigation. One consequence of the codification of the English law relating to bills is clear gain. Nearly all the colonies have adopted the Act, and where countries are so closely connected as England and her colonies, it is an obvious advantage that their mercantile transactions should be governed by one and the same law expressed in the same words.

The ordinary text-books on the law of bills of exchange are constantly re-edited and brought up to date. The following among others may be consulted:—Byles, *Bills of Exchange;* Chalmers, *Bills of Exchange;* Daniel, *Law of Negotiable Instruments* (United States); Nouguier, *Des lettres de change et des effets de commerce* (France); Thorburn, *Bills of Exchange Act, 1882* (Scotland); Story, *Bills of Exchange* (United States); Hodgins, *Bills of Exchange Act, 1890* (Canada). (M. D. Ch.)

Bills of Lading. See Affreightment.

Bills of Sale. See Sale.

Bilma, or Hawar. See Sahara.

Biloxi, a city of Harrison county, Mississippi, U.S.A., on the coast of Mississippi Sound, in the southern part of the state, on a line of the Louisville and Nashville railway. It is a place of resort, both in summer and winter, for the people of New Orleans and Mobile, and has numerous hotels, and an excellent water-supply. Population (1880), 1540; (1900), 5467.

Bilston, a market town (under an urban district council), and railway station, of Staffordshire, England, 2½ miles S.E. of Wolverhampton (of which parliamentary borough it forms part). Recent erections are the post-office, the market hall (rebuilt), and baths and wash-houses (rebuilt). Area, 1867 acres; population (1901), 24,034.

Bimetallism.—From mediæval times until the beginning of the 19th century coins of both gold and silver were current in the leading commercial countries of Europe, ordinances being issued from time to time by the governments concerned with the object of fixing their relative value, or more correctly, their equivalency as legal tender. Both metals were, moreover, as a rule coined at the mints without restrictions as to quantity. England was the first to abandon this system and to adopt gold as the sole standard of value; at a later date the United States followed this example; and, in 1873, the Latin Union, of which France was the leading nation, took the first steps in the same direction. From this date monometallism prevailed all over Europe, silver coins in gold-using countries becoming mere tokens. The object of bimetallists is to revert to a monetary system somewhat similar to that which prevailed in the Latin Union before 1873, though it is generally admitted that the proposed Bimetallic Union must cover a wider area. Bimetallism is, in fact, a currency system which would establish a right on the part of the debtor to discharge his liabilities at his option in either of the two metals at a ratio fixed by law. For this system to be successful it is obvious that a fixed ratio or value between the metals must be maintained. From 1820 to 1870 the ratio of the value of silver to gold (taking annual averages) appears to have varied between the limits of 15·19 to 1 and 15·95 to 1—a variation of about 5 per cent. during a period of 50 years, and a variation which bimetallists accounted for by the inefficiency of the currency ordinances. Between 1872 and 1900 the ratio varied between the limits of 15·65 to 1 and 35·03 to 1—a variation of about 124 per cent. in a period of twenty-eight years—a period during which there were no currency ordinances with regard to the relative value at which metals could be freely coined. This increase of instability is the true basis of the bimetallic controversy, a controversy which may be divided under three heads: (1) Was the change in the stability of the relative value of the metals due to the changes in the monetary systems of the world, or was it due to the increased production of silver or to other similar causes? (2) Would it be possible to establish a fixed ratio of value between the metals by the enactment of bimetallic laws? (3) Would such a change in the English monetary system, if practicable, be on the whole advantageous? With regard to the last question the aim of bimetallists is, by linking the metals together, both to create a more stable standard of value, and to limit the variations in the rate of exchange between gold- and silver-using and bimetallic countries, and also, by increasing the volume of metal in the currency, to produce a rise in prices, or, at all events, to prevent a further fall.

In the article on Money (*Ency. Brit.* xvi. 731) the history of this controversy is brought up to the year 1883. Since that date there have been no great changes in the monetary systems of Europe or America, though the discussion on this problem has never ceased. The report issued by the Royal Commission of 1888 to inquire into the recent changes in the relative values of the precious metals probably constitutes the most important contribution to this debate. The evidence given before the Commission is also of great value, that of Professor Alfred Marshall, from a theoretical point of view, being specially worthy of study. On that occasion Professor Marshall advocated a monetary system under which certificates would be issued, each standing for a certain amount of gold *and* a certain amount of silver, the ratio between the two being fixed by international agreement—a system which would have undoubted theoretical advantages. The bimetallic question was also dealt with by the Royal Commission on Agricultural Depression of 1897. In September 1889 a Bimetallic Congress sat in Paris; and, in November 1892, a conference was held at Brussels, on the initiative of the United States, to consider what measures could be taken "to increase the use of silver." Most of the important States were represented, but no resolution was arrived at.

At this time the fall in the gold price of silver had seriously interfered with the finances of India, where silver was the standard. In May 1893 a committee appointed

by the Government reported in favour of closing the Indian mints to the free coinage of silver, with a view to the establishment of a gold standard. This policy was adopted, but the effects hoped for were not produced as quickly as was anticipated, and a second committee was appointed in 1899. They reported in favour of keeping the mints closed to the free coinage of silver, of maintaining the rupee at a value equivalent to 16 pence, and of taking other steps in the direction of establishing a gold standard in India. The bimetallists were much dissatisfied with these decisions.

Bimetallism has in recent years attracted more attention in the United States than anywhere else. Although gold had been adopted for some time as the standard of value, nevertheless in 1878 the Government of that country commenced a systematic coinage of silver without regard to the quantity of silver coin required by the nation. This plan was adopted partly because it was regarded as a step in the right direction by convinced bimetallists; partly as a result of pressure applied by the silver-producing States, and partly through the unreasoning advocacy of "cheap and abundant money." The agitators were not satisfied, and in 1889 and 1890 the agitation in favour of the free coinage of silver became formidable. In the latter year, as a further palliative measure, the Sherman Act was passed, by which the Treasury was bound to purchase a large quantity of silver every month. This Act was repealed in 1893. The agitation, however, continued in full force, and the presidential election of 1896 turned largely on the bimetallic question. Mr McKinley, the Republican candidate, upheld the maintenance of the gold standard, but only until an international agreement should sanction the free coinage of silver. Mr Bryan, the Democratic candidate, was in favour of the free coinage of silver at a ratio of 16 to 1, without waiting for the co-operation of other nations, and used the famous phrase, "You shall not crucify mankind on a cross of gold." McKinley was elected by a large majority, and in his inaugural address again expressed his adherence to international bimetallism. In 1897 the Wolcott Commission visited Europe, and advocated the reopening of the Indian mints; but their mission produced no results. In 1898 the Spanish war drove the currency question, for the time being at all events, out of the field of American politics. In 1900 its revival by Mr Bryan produced no effect on the Presidential contest, except perhaps in rendering the re-election of Mr McKinley the more overwhelming.

The above are the principal *events* connected with the bimetallic controversy in recent years. It is far more difficult to indicate with any certainty the changes of *opinion* which have taken place during this period. Perhaps a majority of economists now admit the validity of the theoretical arguments brought forward by bimetallists to prove that the relative value of gold and silver might, within limits, be fixed by legislation. Many keen opponents of bimetallism, who believe that legislative arrangements would break down in practice, agree with those monometallic members of the Gold and Silver Commission of 1888, who admitted that "in any conditions fairly to be contemplated in future, a stable ratio might be obtained if" the United Kingdom, Germany, the United States, and the Latin Union "were to accept and strictly adhere" to bimetallism at a ratio approximating to that obtaining in the market. On the other hand, though bimetallism thus defined would probably tend to increase the stability of the standard of value, yet Prof. Edgeworth has given reasons for believing that no great change would be produced in this respect. The benefits thus obtained would be much the same in the long run whatever ratio of value were adopted. But it is evident from the writings of bimetallists that, with few exceptions, they would only be satisfied with such a ratio as would cause a great inflow of silver into the currency of the world; and, as this would certainly tend to make prices rise, it is fair to conclude that the hope of producing this result is the true stimulus which keeps the bimetallic controversy alive. The benefits and evils likely to arise from rising and falling prices have been much discussed. Rising prices would, so it is argued, increase the volume of trade. But in reply it is urged that the main reason for anticipating such a result from an inflation of prices due to currency legislation is that the real wages of labour would thus be reduced, a result in itself always most objectionable. Bimetallists, however, contend that, even if the labourer should suffer at first, he would gain in the long run because he would eventually share in benefits arising from the increase of trade. At present the value of gold appears to be diminishing, and if the desire for a rise in prices is the true underlying force of the bimetallic movement, this agitation is likely to be less vigorous as long as this fall in the value of gold continues; for the desired effect will thus be produced without the aid of exceptional legislation.

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Bimlipatam, a town of British India, in the Vizagapatam district of Madras; situated in 17° 53′ N. lat. and 83° 30′ E. long., on the sea-coast 18 miles N. of Vizagapatam. Population, about 10,000; municipal revenue (1897-98), Rs.13,840. It was formerly a Dutch factory, and is now the principal port of the district. The anchorage is an open roadstead, with a lighthouse at Santapalli. In 1897-98, the total seaborne trade of this and the subordinate ports amounted to Rs.94,17,240, of which nearly half was conducted with foreign countries. The principal exports are oil-seeds and sugar.

Binang, a town in Luzon, Philippine Islands, on a small river flowing into the Laguna de Bay, and distant about a mile from its western shore. It is one of the most important towns of the province of Laguna, and is surrounded by an extensive and extremely fertile plain, which produces very large quantities of rice, as well as a great variety of tropical fruits. A ready market for these products is found in Manila, which is reached by way of the Laguna de Bay and the Pasig. The language is Tagalog. Population, 20,000.

Binche, a town of Belgium, in the province of Hainaut, 11 miles S.E. of Mons by rail. It has iron- and glass-works, tanneries, and an important industry in boot- and shoe-making, and the making of Brussels lace (*appliqué*) employs many women and girls. Population (1880), 8252; (1897), 11,121.

Bingen, a town of Germany, grand-duchy of Hesse-Darmstadt, on the left bank of the Rhine, 19 miles W. from Mainz. The Rochus chapel, where thousands of persons gather on the first Sunday after 16th August, was rebuilt in 1889-94 after a fire. Of late Bingen has grown in importance as a trading-place, and new quays and a harbour have been built. Coal and iron enter largely into the trade. Population (1885), 7178; (1900), 9670.

Binghamton, capital town of Broome county, New York, U.S.A., situated in 42° 07′ N. lat. and 75° 56′ W. long., in the southern part of the state, on the north branch of Susquehanna river, at the mouth of the Chenango river, at an altitude of 863 feet. It has three railways: the Delaware and Hudson; the Delaware, Lackawanna, and Western; and the New York, Lake Erie, and Western. The city is built on both sides of both the Susquehanna and the Chenango. It is a manufacturing city of importance. In 1890 the manufacturing capital was $9,058,651. There were 10,191 persons employed, and the product was valued at $15,040,152, consisting principally of boots and shoes, flour and tobacco. The last comprised nearly one-fifth of the whole. The assessed valuation of real and personal property was in 1900, $21,130,730, and the tax rate was $23.80 per $1000. The debt was only $710,555. Since 1880 the city has had a very rapid growth, due probably to increase in railroad communications and in manufactures. Binghamton was named after William Bingham, who purchased the site of the city. The first settlement was made in 1799, under the name of Chenango. In 1834 it was incorporated as the village of Binghamton, and in 1867 received a city charter. Population (1880), 17,317; (1900), 39,647, of whom 4272 were foreign-born. The death-rate in 1900 was 17·6.

Bingley, a market town and railway station in the Otley parliamentary division of Yorkshire, England, on the Aire, 5½ miles N.W. of Bradford. The grammar school has been enlarged, a technical school and free library have been provided, and a cottage hospital has been built. Bradford water-works supply water. Area of urban district, 11,831 acres; population (1891), 17,381; (1901), 18,451.

Bintang, the chief island of the Rhiouw archipelago, on the south side of the Strait of Singapore, in 1° 13′-0° 50′ N., 104° 13′-104° 37′ E. The Chinese cultivate gambier and pepper successfully, and there is a considerable trade in wood. The seat of the Dutch government is at Tanjong Pinang on the south-west coast, a small port of 4000 inhabitants (160 Europeans and about 2000 Chinese).

Bio-bio, a province of Southern Chile, situated between 37° 15′ and 38° 40′ S. lat., and 71° 05′ and 73° 02′ W. long. Its area is 4158 square miles. The population in 1895 numbered 88,749. The capital, Los Angeles, had a population of 7868 in 1895. The province is divided into three departments.

Birbhum, a district of British India, in the Burdwan division of Bengal, situated in the Gangetic plain and partly on the hills, being bounded on the south by the river Ajai. The administrative headquarters are at Suri, which is the only town in the district. The area comprises 1752 square miles. The population in 1881 was 792,031; in 1891, 798,274, giving an average density of 455 persons per square mile. Classified according to religion, Hindus numbered 593,602; Mahommedans, 169,752; aborigines, 34,289; Christians, 542, of whom 68 were Europeans; "others," 89. In 1901 the population was 901,223, showing an increase of 13 per cent. The total amount of land revenue and rates is returned at Rs.10,84,185; the number of police at 272; the boys at school (1896-97) were 24,165, being 41·3 per cent. of the male population of school-going age; the registered death-rate in 1897 was 29·7 per thousand. The principal industry is the spinning and weaving of silk, chiefly from tusser or jungle silkworms. In 1897 the total out-turn of silk was valued at Rs.22,85,100. There are also seven lac factories, whose produce is valued at Rs.26,700. The loop-line of the East Indian railway runs through the district for 68 miles, with a junction at Nalhati for Murshidabad.

Birch, Samuel (1813-1885), English Egyptologist and antiquary, was born 3rd November 1813, and was the son of the rector of St Mary Woolnoth, London. From an early age he manifested a tendency to the study of out-of-the-way subjects, and after a brief employment in the Record Office obtained in 1836 an appointment in the Antiquities Department of the British Museum on account of his knowledge of Chinese. He soon extended his researches to Egyptian, and when the cumbrous department came to be divided he was appointed to the charge of the Egyptian and Assyrian branch. In the latter language he had assistance, but for many years there was only one other person in the institution—in a different department—who knew anything of ancient Egyptian, and the entire arrangement of the department devolved upon Birch. He found time nevertheless for Egyptological work of the highest value, including a hieroglyphical grammar and dictionary, translations of *The Book of the Dead* and the Harris papyrus, and numerous catalogues and guides. He further wrote what was long a standard history of pottery, investigated the Cypriote syllabary, and proved by various publications that he had not lost his old interest in Chinese. Paradoxical in many of his views on things in general, he was sound and cautious as a philologist; while learned and laborious, he possessed much of the instinctive divination of genius. He died on 27th December 1885. (R. G.)

Birds.—The first attempt at a classification of birds based upon the theory of descent—in fact the first phylogenetic tree of the Class of birds—is due to E. Haeckel (*Generelle Morphologie der Organismen*, vol. ii. p. 139, Berlin, 1866), who divided the whole Class into two Sub-classes: *Saururæ* and *Ornithuræ*, the latter into the two legions of *Autophagæ s. Nidifugæ* and *Pœdotrophæ s. Insessores*. His further Sub-divisions or Orders are significant, since they are accompanied by short hints as to probable lines of development and mutual relationship of the various Orders. With Huxley, "On the Classification of Birds . . ." *Proc. Zool. Soc.*, 1867, pp. 415-472, began the earnest search for anatomical characters as affording the only trustworthy clue to the natural system. His concise diagnoses of the Orders and Sub-orders are based upon various other characters besides those yielded by the palatal bones. He took pains to show that the lineal sequence of his groups does not, and cannot, indicate their relationship, and he published a separate phylogenetic outline (*Ibis*, 1868, pp. 357-362). A. H. Garrod expected much from the combination of a few anatomical characters which were taken from the various organic systems, and which presumably could not stand in direct correlation with each other—notably the carotid arteries, the configuration of the nasal bones, the oil-gland, cæca, and, above all, certain muscles of the thigh. Laying, however, more stress upon the mere presence or absence than upon the quality of these characters, and using their combinations in a rather mechanical way, his ultimate system (published in *Proc. Zool. Soc.*, 1873, pp. 624-644, and 1874, pp. 111-113) resulted in a failure. He was, however, the first to show clearly the relationship of the heron-like birds with the *Steganopodes*, of the stork-like birds with the American vultures, the great difference between the latter and the other birds of prey, the connexion of the Gulls and Auks with the Plovers, and that of the Sandgrouse with the Pigeons—discoveries expressed in the newly-established terms of the Orders *Ciconiiformes* and *Charadriiformes*. Garrod, his equally short-lived successor W. A. Forbes,

Classifications.

and F. E. Beddard, have amassed a vast amount of anatomical facts, giving a new impetus to ornithotomy at home and abroad. New light was in the meantime thrown upon the whole study of scientific ornithology by the discovery of the remains of toothed birds in the Cretaceous deposits of Kansas. The results of the indefatigable labours of the late O. Marsh were published by him in his grand volume, *Odontornithes* (Washington, 1880). In 1884 Prof. A. Newton (see *Ency. Brit.* vol. xviii. pp. 43-49) made an attempt to indicate those points in recent classifications which then seemed to have been established on a pretty sure footing, though therein he had no intention of inventing (as has sometimes been supposed) a new system of birds. He broke up the unnatural assembly of the *Odontornithes*, separated the *Striges* entirely from the *Accipitres*, and showed by many suggestions, and by critical discernment in the acceptance of the results of other workers, that the old-fashioned traditions have been given up, and that no classification can hope for recognition unless it be based upon the consideration of as many anatomical characters as possible. This principle was also recognized by L. Stejneger, who in the fourth volume of *The Standard Natural History* (Boston, 1885) brought out an elaborate, and to a great extent new, classification. It is eclectic, the author having welded together what seemed to him well established by other taxonomists, in addition to a careful compilation from the available literature of whatever characters he considered taxonomically serviceable. Anatomy, eggs, nesting habits, food, geographical distribution, have all been laid under contribution, and on the purely anatomical characters he laid in some cases more stress than would have been done by comparative anatomists. His classification stands as follows:—

Stejneger's.

Sub-class I. **Saururæ.** Order Ornithopappi: Archæopteryx. Laopteryx.
Sub-class II. **Odontotormæ.** Order Pteropappi: Ichthyornis. Apatornis.
Sub-class III. **Odontoholcæ.** Order Dromæopappi: Hesperornis. Enaliornis.
Sub-class IV. **Eurhipiduræ.** Super-order I. Dromæognathæ, with the Orders *Struthiones, Æpyornithes, Apteryges, Crypturi, Gastornithes.*
Super-order II. Impennes. Order *Ptilopteri:* Spheniscidæ.
Super-order III. Euornithes, divided into 13 Orders with 31 Super-families.
(1) *Cœomorphæ:* Colymboideæ, Heliornithoideæ, Alcoideæ, Laroideæ, Procellaroideæ; (2) *Grallæ:* Chionoideæ, Scolopacoideæ, Eurypygoideæ, Cariamoideæ, Gruioideæ; (3) *Chenomorphæ:* Anhimoideæ [Palamedeæ], Anatoideæ, Phœnicopteroideæ; (4) *Herodii:* Ibidoideæ, Ardeoideæ; (5) *Steganopodes:* Phæthontoideæ, Fregatoideæ, Pelecanoideæ; (6) *Opisthocomi;* (7) *Gallinæ;* (8) *Pterocletes;* (9) *Columbæ;* (10) *Accipitres;* (11) *Psittaci;* (12) *Picariæ:* Cuculoideæ; Coracioideæ with Steatornithidæ, Podargidæ, Caprimulgidæ, Coraciidæ, Leptosomatidæ; Colioideæ; Alcedinoideæ with Meropidæ, Todidæ, Momotidæ, Alcedinidæ, Bucerotidæ; Upupoideæ with Upupidæ and Irrisoridæ; Picoideæ with six families, including Bucconidæ and Galbulidæ; Trogonoideæ; Micropoideæ with Cypselidæ and Trochilidæ; (13) *Passeres:* Menuroideæ; Eurylæmoideæ; Tyrannoideæ; Formicaroideæ; Passeroideæ.

The establishment of *Eurhipiduræ* as a Sub-class, the isolation of the *Impennes*, and their elevation to the rank of a Sub-order are anatomically unjustifiable. The *Procellariæ* are put into one Super-family with the Auks and Gulls, while the latter are separated from their close allies the *Scolopacoideæ*. The Owls still remain with the *Accipitres*, and the great difference between the *Cathartæ* and the other birds of prey is not indicated. *Opisthocomus* is relegated to a position lower than the *Gallinæ*. The Ibises form a Super-family, while Storks and Herons are each reduced to family rank. On the other hand, the arrangement of the Orders *Grallæ*, *Picariæ*, and *Passeres* marks a decided progress.

The year 1888 heralded a new epoch in scientific ornithology. Prof. M. Fuerbringer's *Untersuchungen zur Morphologie und Systematik der Vogel*, published as a jubilee work by the "Natura Artis Magistra" Society of Amsterdam, is a monumental production. The first of the two gigantic volumes is devoted chiefly to a minute description of the bones, muscles, and nerves of the region of the shoulder-girdle. The second volume contains the results, not only from the standpoint of the pure morphologist, but also with a view to their applicability to a systematic arrangement of birds. The author, fully aware of the impossibility of deducing a sound classification from the study, be it ever so minute, of one organic system, or of part of the body only (in the present case of the region of the shoulder-girdle), reviewed also the enormous literature relating to most other organs, sifting and tabulating whatever characters could possibly be of taxonomic value. Being a highly accomplished morphologist, he distinguished especially in the muscular, nervous, and skeletal systems, between primary and secondarily acquired features, and he produced an entirely new, strictly genealogical system, logically worked out. He grouped the recent and extinct birds into about 46 Gentes, groups which, with few exceptions, will stand the test of time. These 46 Gentes are combined into 24 Sub-orders, including no less than 9 intermediary Sub-orders. The latter are the weak spot in his system. Since it is left undecided to which of the principal 8 Orders they belong, the 8 Orders lose much in practical value; and this is all the more to be regretted as Fuerbringer has given us entirely new views by his establishment of these greater and greatest Groups. Moreover, he gives no diagnoses of either Orders, or Sub-orders, or Gentes, or Families, but leaves the reader in the embarrassing position of drawing his own conclusions, after the perusal of pages and pages of detail, in which every imaginable view has been discussed, or at least hinted at. Consequently only those who are well trained in anatomy will, by attentive study, derive the full benefit from this monumental and most suggestive work. It has already become, and will remain, an inexhaustible fount of information, not always acknowledged. There is, lastly, another difficulty, not very patent. The work took several years to get through the press, and during this time the author found it necessary to modify, and even to change completely, some of his views on the systematic position of several groups, notably the relationship of *Hesperornis*, *Palamedeæ*, and *Ratitæ*. Hence there are discrepancies in the second volume, not easily understood and reconciled with his final very determined views, unless the reader does not shirk the laborious task of following up the argumentations which are often separated by hundreds of pages. Fuerbringer was the first to show clearly that the *Ratitæ* are the retrograde descendants of volant ancestors, that the various Groups of existing *Ratitæ* represent cases of convergence, that the *Ratitæ* are as such a polyphyletic Group, and he has gone fully into the interesting question of the development and subsequent loss of the power of flight. The loss took place not only in different Groups, but also at various geological periods. Of course the author does not assign any taxonomic value to such cases of isomorphism. Only a few of the more prominent advances in classification can here be mentioned—the complete separation of *Hesperornis* from the *Ratitæ* and its near relationship with the *Colymbo-Podicipedidæ;* final proof that the *Odontornithes* are not a natural Group; affinity of *Apteryx* with the *Crypturi* and *Ralliformes;* *Sphenisci* recognized as allied to the *Tubinares* and *Steganopodes;* establishment of the Group *Coraciiformes*.

Fuerbringer.

Fuerbringer's classification stands as follows. The 90 families have here been omitted for want of space, save those, the assigned position of which is of particular interest:—

Sub-class I. **Saururæ.** Order ARCHORNITHES. Gens. Archæopteryges.

Sub-class II. **Ornithuræ.**

Order.	Sub-order.	Gens.
STRUTHIORNITHES	*Struthioniformes*	Struthiones.
RHEORNITHES	*Rheiformes*	Rheæ.
HIPPALECTRYORNITHES	*Casuariiformes*	Casuarii.
	Intermediary Sub-orders.	
	Æpyornithiformes	Æpyornithes.
	Palamedeiformes	Palamedeæ.
PELARGORNITHES	*Anseriformes*	Gastornithes.
		Anseres.
	Podicipitiformes	Enaliornithes.
		Hesperornithes.
		Colymbo-Podicipites.
	Ciconiiformes	Phœnicopteri.
		Pelargo-Herodii.
		Accipitres.
		Steganopodes.
	Intermediary Sub-orders.	
	Procellariiformes	Tubinares.
	Aptenodytiformes	Impennes.
	Ichthyornithiformes	Ichthyornithes.
CHARADRIORNITHES	*Charadriiformes*	Laro-Limicolæ.
		Parræ.
		Otides.
	Intermediary Sub-orders.	
	Gruiformes	Eurypygæ, including Rhinochetus, Aptornis.
		Grues.
	Ralliformes	Fulicariæ (Heliornithidæ + Rallidæ).
		Hemipodii (Mesitidæ + Hemipodidæ).
ALECTORORNITHES	*Apterygiformes*	Apteryges (including Dinornithidæ).
	Crypturiformes	Crypturi.
	Galliformes	Galli (including Opisthocomidæ).
	Intermediary Sub-orders.	
	Columbiformes	Pterocletes.
		Columbæ.
	Psittaciformes	Psittaci.
CORACORNITHES	*Coccygiformes*	Coccyges.
		Galbulæ.
	Pico-Passeriformes	Pico-Passeres: Pici; Passeres: Pseudoscines, Passeridæ.
		Macrochires: Cypselidæ, Trochilidæ.
		Colii.
		? Trogones.
	Halcyoniformes	Halcyones.
		Bucerotes (Bucerotidæ + Upupidæ).
		Meropes.
		? Todi (Todidæ + Momotidæ).
	Coraciiformes	Coraciæ.
		Caprimulgi.
		Striges.

Another comprehensive work on the anatomy and classification of birds, which has appeared since the publication of Professor Newton's article ORNITHOLOGY (*Encyclopædia Britannica*, vol. xviii.), is the volume *Aves* of *Bronn's Classen und Ordnungen des Thierreichs*. Begun originally by E. Selenka, the anatomical part was taken up in 1884 by H. Gadow, by whom it was completed in 1891, and in 1893 it was followed by the systematic part. Harmonious intercourse with Fuerbringer and the benefit of the latter's work enabled the present writer not only to continue the same lines of morphological research, but also further to investigate those questions which were still left in abeyance or seemed to require renewed study. The resulting "classification is based on the examination, mostly autoptic, of a far greater number of characters than any that had preceded it; moreover, they were chosen in a different way, discernment being exercised in sifting and weighing them, so as to determine, so far as possible, the relative value of each, according as that value may vary in different groups, and not to produce a mere mechanical 'key' after the fashion become of late years so common" (Newton's *Dictionary of Birds*, Introduction, p. 103). It is not the quantity but the quality of the anatomical and bionomic characters which determines their taxonomic value, and a few fundamental characters are better indications of the affinities of given groups of birds than a great number of agreements if these can be shown to be cases of isomorphism or heterophyletic, convergent analogy. Nature possesses three great educational or developmental schools—terrestrial, aquatic, and aerial life. Each of these affords animal, vegetable, or mixed diet. Animal diet implies the greatest variety with regard to locality and the modes of procuring the food. Each of these schools impresses its pupils, in the case of the birds, with its own stamp, but there are many combinations, since in the course of phyletic development many a group of birds has exchanged one school for another. Originally terrestrial groups have taken to an entirely aquatic life, and *vice versâ;* others, originally endowed with the power of flight, have become, or are transforming themselves into, absolutely cursorial forms; some members of one group live entirely on seeds, while others have become fierce fishers, and so forth. Only by the most careful inquiry into their history can

Gadow.

their relationship or pedigree be unravelled. Gadow's system is given below.

NEWTON'S *Dictionary of Birds*, 1893-96, is the latest standard work on ornithology. Under its various headings, anatomical, bionomic, geographical, historical, and systematic, and in the 120 pages of the introduction, it contains condensed accounts of, or at least references to, wellnigh everything which pertains to ornithology.—H. SEEBOHM. *Classification of Birds.* London, 1890. Based upon Fuerbringer and not a genetic system, with "diagnoses" based upon mechanical combinations of striking, but often arbitrarily selected characters.—R. B. SHARPE. *A Review of Attempts to Classify Birds.* Budapest, 1891. Likewise based upon Fuerbringer and not genetic. Simply a linear arrangement of well-selected groups, with enumeration of anatomical and bionomic characters selected from Stejneger and Seebohm. Dr Sharpe is also the author of by far the greater number of volumes of the *Cat. Birds, Brit. Mus.*, a gigantic descriptive work which was finished in 1898.—ST. G. MIVART. *The Elements of Ornithology.* London, 1892.—F. E. BEDDARD. *Structure and Classification of Birds.* London, 1898.—H. H. EVANS. *Birds, Cambridge Natural History*, vol. ix. London, 1899.

Much had naturally been expected from the study of fossil birds, but, so far as the making of classifications is concerned, they have proved rather a source of perplexities. So long as the characters of new fossils are only of specific and generic value, it is mostly possible to assign the birds to their proper place, but when these characters indicate new Families or Sub-orders, for instance *Hesperornithes*, *Ichthyornithes*, *Palælodi*, their owners are put outside the more tersely constructed classifications applicable to modern birds. It is no exaggeration to say that the genus, often even the species, can be determined from almost any recent bone, but in the case of Miocene, and still more, of Eocene fossils, we have often to deal with strange Families, which either represent an extinct side branch, or which connect several recent Groups with each other. Our artificially-established classifications collapse whilst we gain further insight into the mutual affinities of the existing Groups. Of course this must be so if evolution is true. But it also follows that, if every extinct and recent bird were known, neither Species, nor Genera, nor Families, nor Orders could be defined. We should be able to construct the pedigree of every Group, in other words, the gigantic natural system, but there would be no classification. Much light has also been thrown by fossil birds upon the study of geographical distribution. The key to the distribution of recent groups lies in that of the extinct forms. Not only have many absolutely new Families been discovered, but many kinds of modern birds are now known to have existed also in countries where they are now extinct. There were, for instance, trogons, secretary-birds, parrots, and other now Ethiopian forms in Miocene France. Ostriches, undistinguishable from *Struthio*, have been found in Samos and in the Sivalik Hills.

Palæontology.

The proper study of fossil birds may be said to have begun with the late A. Milne-Edwards, whose magnificent *Oiseaux fossiles de la France* was published from 1867-71. This work deals chiefly with mid-Tertiary forms. A new impetus was given by the late O. Marsh, who, as we have seen, since 1870 discovered a great number of bird remains in the Cretaceous strata of North America. The most important result is the proof that until the end of the Cretaceous epoch most, if not all, birds were still possessed of teeth. In 1877 a second specimen of *Archæopteryx* was discovered. This Berlin specimen supplements our knowledge of that in the British Museum. It has been fully described by W. Dames in *Palæontolog. Abhandl.* bd. ii. pt. 3, Berlin, 1884. *Archæopteryx* is already a typical bird, possessed of the power of flight, owing to the transformation of its anterior extremities into typically avine wings with remiges. It still retains various very archaic characters, *e.g.*, teeth, amphicœlous vertebræ, those of the tail numbering about twenty, and although they carry about twelve pairs of well-developed rectrices, they are not yet condensed into a pygostyle. The latter character is, however, of no absolutely distinctive value, it being only peculiar to the majority of the *Carinatæ*. Hence the inadvisability of retaining the term *Saururæ* in opposition to *Ornithuræ*. *Archæopteryx* has only slightly narrowed the enormous gap between birds and reptiles. The attempt to look for the ancestors of birds among the Pterosauria is as futile as the various attempts to seek them amongst any of the known groups of Dinosauria. A great number of other fossil birds has been described from various parts of the world, notably by Cope, Fraas, Lund, Lydekker, Seeley, &c., but the most recent and bewildering mass of new forms was discovered by Ameghino chiefly in mid-Tertiary strata of Argentina (see *Revista Argentina de Historia Natural*, i. 1891; *Boletin. del Inst. Geograf. Argentin.* xv., 1895; and the sumptuous publication in the *Anales del Museo de la Plata*, 1891, by F. P. Moreno and A. Mercerat). Many of the bones indicate birds of gigantic size, and they were collectively called Stereornithes by Moreno, who not unnaturally considered them as allied to the *Ratitæ*. Some of these birds were undoubtedly flightless. The most remarkable genus is *Phororhacos*, with an enormous skull of more than two feet in length. Renewed investigation by Mr Andrews of some of the material now in the British Museum has shown that *Stereornithes* has to be abolished as a taxonomic group. *Phororhacos* belongs to the early *Gruiformes*, perhaps with *Pelecyornis* and *Liornis*. *Dryornis* seems to belong to the *Cathartæ*, anyhow to the *Falconiformes*, while *Mesembriornis* is a direct forerunner of the present *Rheæ*.

In conclusion, the present writer gives his classification of birds in which the extinct forms have been intercalated so far as possible. The few characters assigned to the various groups are sufficiently diagnostic when taken together, although they are not always those upon which the classification has been established :—

CLASS AVES.

I. Sub-class **Archæornithes.**—The three fingers and their metacarpals remain separate, each with a claw. Well-developed remiges. Both jaws with alveolar teeth. Amphicœlous. Caudal vertebræ more than thirteen, without a pygostyle, but with about twelve pairs of rectrices. *Archæopteryx*, *A. lithographica*, *s. macroura*, and *A. siemensi*, two specimens from the upper Oolite of Solenhofen, Bavaria.

II. Sub-class **Neornithes.**—Metacarpals fused. Second finger the longest. Not more than thirteen caudal vertebræ.

I. Division RATITÆ.—Terrestrial, flightless. Without sternal keel. Quadrate bone with single proximal knob. Without pygostyle. Coracoid and scapula fused. Compound Rhamphotheca. Adult without apteria. With copulatory organ. A collective polyphyletic or heterogeneous group, originally cosmopolitan; with certainty existing since the Miocene.

1. Order **Struthiones.**—With pubic symphysis. Two toes only, third and fourth. *Struthio*, ostrich, Miocene of Samos, Pliocene of north-west India, now Africa and Arabia.
2. Order **Rheæ.**—With long ischiadic symphysis. Three toes. *Mesembriornis*, miocene or pliocene of Argentina. *Rhea*, South America.
3. Order **Casuarii.**—Three toes. Aftershaft as long as the other half. *Casuarius* and *Dromæus*, Australian region. *Hypselornis*, Pliocene of Sivalik Hills.
4. Order **Apteryges.**—Four toes. Bill long and slender. New Zealand.
5. Order **Dinornithes.**—Three or four toes. Bill short. Anterior

extremities extremely reduced. *Dinornis*, numerous species, recently extinct, New Zealand.

6. Order **Æpyornithes.**—*Æpyornis*, recently extinct, Madagascar. To the Ratitæ belong possibly also the imperfectly known *Diatryma*, Eocene of New Mexico, *Gastornis* and *Dasornis*, Eocene of Europe, *Genyornis* of Pleistocene, Australia.

II. Division Odontolcæ.—Marine, flightless, without sternal keel. Upper and lower jaws with teeth in furrows. Cretaceous epoch. *Enaliornis*, England, vertebræ chiefly biconcave; *Hesperornis*, North America, vertebræ heterocœlous.

III. Division Carinatæ.—With keeled sternum.

1. Order **Ichthyornithes.**—Power of flight well developed. Vertebræ still amphicœlous. With small pygostyle. Incisura ischiadica. With alveolar teeth. Cretaceous. *Ichthyornis*, *Apatornis*.

2. Order **Colymbiformes.**—Plantigrade, nidifugous, aquatic. All toes webbed, fourth largest, hallux short; metatarsus laterally compressed; tibia with high, pyramidal crest. Bill straight, pointed, with simple sheath.
   - Sub-order 1. Colymbi, Divers. Front toes completely webbed. Periarctic. *Colymbus*.
   - Sub-order 2. Podicipedes, Grebes. Toes lobated. Cosmopolitan.

3. Order **Sphenisciformes.**—Nidicolous, marine. Flightless, wings transformed into rowing paddles. Spheniscl, penguins. Antarctic and southern temperate coasts. Since the Eocene.

4. Order **Procellariiformes.**—Well flying, pelagic, nidicolous. Hallux absent or vestigial. Rhamphotheca compound. Cosmopolitan. Tubinares, petrels and albatrosses.

5. Order **Ciconiiformes.**—Swimmers or waders. Desmognathous, without basipterygoid processes; with one pair of sterno-tracheal muscles.
   - Sub-order 1. Steganopodes.—Well flying, aquatic, nidicolous; with all the four toes webbed together. Rhamphotheca compound; cosmopolitan. *Phaëthon*, tropic-bird; *Sula*, gannet; *Phalacrocorax*, cormorant, and *Plotus*, snake-bird; *Fregata*, frigate-bird; *Pelecanus*. Here also *Pelagornis*, Miocene of France; *Argillornis* and probably *Odontopteryx* from the London Clay.
   - Sub-order 2. Ardeæ.—Piscivorous, nidicolous, waders; with complicated hypotarsus and with long cervical apteria. *Ardeidæ*, cosmopolitan; including *Cancroma*, *Balæniceps*, *Scopidæ*, Ethiopian. *Proherodias*, Eocene of England.
   - Sub-order 3. Ciconiæ.—Carnivorous, nidicolous, waders; with simple hypotarsus and without cervical apteria. Cosmopolitan. *Ciconiidæ*, storks. *Ibidæ*, ibises and spoonbills. *Propelargus*, Oligocene.
   - Sub-order 4. Phœnicopteri.—Flamingos. Nidifugous, waders; without simple hypotarsus and without cervical apteria. Front toes completely webbed; hallux very short or absent; vegetable feeders, chiefly confervæ. *Phœnicopterus*, cosmopolitan. Oligocene *Elornis* and, allied, *Palælodus*.

6. Order **Anseriformes.**—Desmognathous, nidifugous; with two pairs of sterno-tracheal muscles, with complete basipterygoid processes and with a penis.
   - Sub-order 1. Palamedeæ.—Screamers. Ribs without uncinate processes. Hypotarsus simple. Neotropical. *Chauna*, *Palamedea*.
   - Sub-order 2. Anseres.—Family Anatidæ. Hypotarsus complex. *Anser*, *Anas*, *Cygnus*, since Miocene. *Cnemiornis*, Pleistocene, New Zealand, flightless.

7. Order **Falconiformes.**—Birds of prey. Carnivorous, desmognathous, nidicolous, without functional cæca. Terrestrial, aerial.
   - Sub-order 1. Cathartæ.—American vultures. With nares perviæ. *Catharistes*, condor; *Cathartes*.
   - Sub-order 2. Accipitres.—With nares perviæ. *Gypogeranidæ*, secretary-bird, Ethiopian; Miocene, France. *Vulturidæ*, Old World vultures, excluding Australia. *Falconidæ*, cosmopolitan, since the Eocene. *Harpagornis*, Pleistocene, New Zealand; *Lithornis*, Eocene, England. *Pandionidæ*, pandion.

8. Order **Tinamiformes.**—Nidifugous, with incisura ischiadica, without pygostyle. Herbivorous, terrestrial, neotropical. *Crypturi*, tinamous.

9. Order **Galliformes.**—Schizognathous, herbivorous, terrestrial. With ten functional remiges. With strong spinæ sterni.
   - Sub-order 1. Mesites. Without basipterygoid processes, and with large spina interna. *Mesites*, Madagascar.
   - Sub-order 2. Turnices.—Hemipodes. Nidifugous; vomer large; sternum without processus obliqui. Hallux absent or vestigial. Old World. *Turnix*, *Pedionomus*.
   - Sub-order 3. Galli.—With large spina communis, and with large processus obliqui. Hallux functional. *Megapodiidæ*, Australian region. *Cracidæ*, curassows and guans, neotropical. *Gallidæ*, cosmopolitan.
   - Sub-order 4. Opisthocomi.—Arboreal, with long spina externa; without basipterygoid processes. *Opisthocomus*, hoatzin, Guiana and Venezuela.

10. Order **Gruiformes.**—Legs of the wading type. Without basipterygoid processes. Without spina interna. Nidifugous. Essentially schizognathous. *Rallidæ*, cosmopolitan, since Oligocene. *Rallus*, *Fulica*, *Ocydromus*, &c., *Gallinula nesiotis*, Tristan d'Acunha, flightless. *Notornis*, New Zealand, flightless, nearly extinct. *Aptornis*, New Zealand, flightless, extinct. *Aphanapteryx* (Mauritius) = *Erythromachus* (Rodriguez) = *Diaphorapteryx* (Chatham Island), flightless and recently extinct. *Gypsornis*, upper Eocene, France. *Gruidæ*, cranes, cosmopolitan, allied *Phororhacos*, Tertiary of Argentina. *Dicholophidæ*, cariamas, neotropical. *Otididæ*, bustards. *Rhinochetidæ*, kagus, New Caledonia. *Eurypygidæ*, sun-bittern, neotropical. *Heliornithidæ*, finfoots, tropical.

11. Order **Charadriiformes.**—Schizognathous. With eleven remiges, of which the terminal very short. Aquinto-cubital. Spinæ sterni short, separate.
   - Sub-order 1. Limicolæ.—Nidifugous, without spina interna sterni. Hypotarsus complicated. *Charadriidæ*, plovers. *Chionididæ*, sheath-bill. *Glareolidæ*, wading swallows and coursers. *Thinocorytidæ*, seed-snipes. *Œdicnemididæ*, thick-knees. *Parridæ*.
   - Sub-order 2. Lari.—Aquatic, vomer complete. Without basipterygoid processes. Front toes webbed; hallux small or absent. Large supraorbital glands. Since Miocene. *Laridæ*, gulls, cosmopolitan. *Alcidæ*, auks, northern half of periarctic region.
   - Sub-order 3. Pterocles.—Sand-grouse. Nidifugous. Vomer vestigial. With large crop and cæca. Hallux vestigial or absent. Africa to India. *Pterocles* and *Syrrhaptes*.
   - Sub-order 4. Columbæ.—Pigeons. Nidicolous. Vomer vestigial. With large crop, vestigial cæca. *Columbidæ*, cosmopolitan, since Miocene. *Dididæ*, flightless, recently extinct. *Didus*, dodo, Mauritius. *Pezophaps*, solitaire, Rodriguez.

12. Order **Cuculiformes.**—Desmognathous, nidicolous; zygodactylous, or with the outer toe reversible.
   - Sub-order 1. Cucull.—Cuckoos. Quinto-cubital. *Cuculidæ*, cosmopolitan. *Musophagidæ*, plantain-eaters and touracos, Ethiopian.
   - Sub-order 2. Psittaci.—Parrots. Zygodactylous; aquinto-cubital. Cosmopolitan, chiefly tropical. *Trichoglossidæ*, lories, Austro-Malayan. *Nestor*, New Zealand. *Cyclopsittacus*, *Eos*, *Lorius*, &c. *Psittacidæ*, tongue smooth, incl. *Stringops*.

13. Order **Coraciiformes.**—Nidicolous. Nares imperviæ, holorhrinal. Down restricted to the apteria or absent. Thirteen to fifteen cervical vertebræ. Mostly desmognathous. Deep plantar tendons connected with each other.
   - Sub-order 1. Coraciæ.—Either (1) with long spina externa sterni, and *Coraciidæ*, rollers, Old World. *Momotidæ*, neotropical, motmots and todies. *Alcedinidæ*, kingfishers, cosmopolitan or (2) with long spina communis. *Meropidæ*, bee-eaters, Old World. *Upupidæ*, hoopoes and hornbills, palæarctic and palæotropical.
   - Sub-order 2. Striges.—Owls. Outer toe reversible. Schizognathous. Long cæca. Flexor tendons normal. Hypotarsus simple. Cosmopolitan.
   - Sub-order 3. Caprimulgi.—Nightjars. Nocturnal. With gaping mouth. Ten remiges and ten rectrices. Spinæ sterni vestigial. Cæca functional. *Steatornithidæ*, *Steatornis*, oil-bird or Guacharo, South America. *Podargidæ*, Australasian, *Caprimulgidæ*, cosmopolitan.
   - Sub-order 4. Cypseli.—Tenth terminal remex the longest. With short spinæ sterni. Without cæca. *Cypselidæ*, swifts, cosmopolitan. *Trochilidæ*, humming-birds, American.
   - Sub-order 5. Colii.—Mouse-birds. First and fourth toes reversible. Ethiopian.
   - Sub-order 6. Trogones.—Trogons. Heterodactyle, first and second toes directed forwards, third and fourth backwards. Tropical. *Trogon gallicus*, Miocene, France.
   - Sub-order 7. Pici.—Zygodactylous. Tendon of the m. flexor hallucis longus sending a strong vinculum to of the middle flexor profundus, the tendon of w goes to the third toe only. *Galbulidæ*, puff-birds jacamars, neotropical. *Capitonidæ*, barbets, tr *Rhamphastidæ*, toucans, neotropical. *Picidæ*, peckers, cosmopolitan, excepting Madagascar Australian region.

14. Order **Passeriformes**.—Nidicolous. Ægithognathous, without basipterygoid processes. Spina externa sterni large, spina interna absent. Quinto-cubital, toes normal. Apparently since the upper Eocene.

Sub-order 1. PASSERES ANISOMYODÆ.—Syrinx muscles entirely lateral or attached to the dorsal or ventral corners of the bronchial semi-rings. (1) *Subclamatores*. Deep plantar tendons connected by a vinculum. *Eurylæmidæ*, broad-bills, Indian and Indo-Malayan. (2) *Clamatores*. Deep flexor tendons not connected. *Pittidæ*, paleotropical. *Xenicidæ*, New Zealand. *Tyrannidæ*, *Formicariidæ*, *Pteroptochidæ*, American.

Sub-order 2. PASSERES DIACROMYODÆ.—Syrinx muscles of either side attached to the dorsal and ventral corners of the rings. Hallux strong, with a large claw. (1) *Suboscines* with *Menura*, lyre-bird, and *Atrichia*, scrub-bird, in Australia. (2) *Oscines*, the true singing-birds, with more than 4500 recent species, are mostly divided into some thirty "families," few of which can be defined.

The fourteen orders of the Carinatæ are further congregated into four "Legions":—

I. COLYMBOMORPHÆ = **Ichthyornithes** + **Colymbiformes** + **Sphenisciformes** + **Procellariformes**.

II. PELARGOMORPHÆ = **Ciconiiformes** + **Anseriformes** + **Falconiformes**.

III. ALECTOROMORPHÆ = **Tinamiformes** + **Galliformes** + **Gruiformes** + **Charadriiformes**.

IV. CORACIOMORPHÆ = **Cuculiformes** + **Coraciiformes** + **Passeriformes**.

These four legions are again combined into two "Brigades," the first of which comprises the first and second legions, while the second brigade contains the third and fourth legions. Thus the whole classification becomes a rounded-off phylogenetic system, which, at least in its broad outlines, seems to approach the natural system, the ideal goal of the scientific ornithologist. The main branches of the resultant "tree" may be rendered as follows:—

			CORACIOMORPHÆ	
			+	
ODONTOLCÆ...	COLYMBO-MORPHÆ	+ PELARGO-MORPHÆ	ALECTOROMORPHÆ...	RATITÆ
		NEORNITHES		

The Odontolcæ seem to be an early specialized offshoot of the Colymbo-Pelargomorphous brigade, while the Ratitæ represent a number of side branches of early Alectoromorphæ. The Ratitæ branched off, probably during the Eocene period, from that still indifferent stock which gave rise to the Tinami + Galli + Gruiformes, when the members of this stock were still in possession of those archaic characters which distinguish Ratitæ from Carinatæ. It follows that new groups of Ratitæ can no longer be developed since there are no Carinatæ living which still retain so many low characters, *e.g.*, configuration of the palate, precoracoid, pelvis, intestinal convolutions, copulatory organ, &c. Loss of the keel is coordinated with the power of using the forelimbs for locomotion; although a "Ratite" character, it is not sufficient to turn a *Notornis*, *Cnemiornis*, or *Stringops*, not even a *Phororhacos* into a member of the Ratitæ.

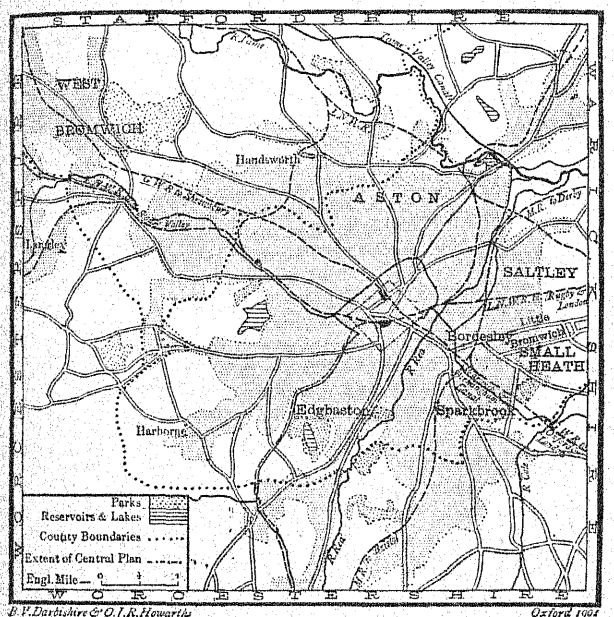
Another branch of the Alectoromorphæ, in particular of the Galliformes, when these were still scarcely separated from the Gruiformes, especially rail-like birds, leads through Opisthocomi to the Cuculiformes. These are, again in an ascending direction, connected with the Coraciiformes, out of which have arisen the Passeriformes, and these have blossomed into the Oscines, which, as the apotheosis of bird life, have conquered the whole inhabitable world. (H. F. G.)

Birejik, or BIR (Assyrian *Til Barsip*, classical *Apamea-Zeugma*), altitude 1170 feet, built on a limestone cliff 400 feet high, on the left bank of the Euphrates, in the Aleppo viláyet. It is situated at one of the most important crossings of the Euphrates, where there was, in ancient times, a bridge of boats, and where there is now a ferry on the caravan route from Aleppo to Diarbekr and Mosul. In the massacres of 1895 most of the Armenians were killed or forced to embrace Islám. Population before 1895, 9500 (Moslems, 8000; Christians, 1500).

Birkenhead, an English seaport, market town, township, rural deanery, and municipal and parliamentary borough, in the hundred of Wirral and county and diocese of Chester, situated on the western bank of the river Mersey, directly opposite Liverpool. The boundaries were extended in 1877, and the population nearly doubled between 1871 and 1881, when there were 84,006 inhabitants; in 1901 the population was 111,000. The rateable value increased from £404,578 in 1881 to £547,449 in 1899. On incorporation in 1877, the townships of Tranmere (1071 acres), Oxton (814 acres), and part of Higher Bebington (246 acres) were included in Birkenhead, the total area of which thus became 3850 acres. The extension coincided with the grant to the town of its municipal charter, and the government is now conducted by a mayor, 14 aldermen, and 42 councillors. Birkenhead has 21 churches belonging to the Established Church, and 41 belonging to various nonconforming bodies. A town-hall and sessions court, built at a total cost of £109,000, were opened in 1887. The water-supply of the town is derived from four pumping stations, all but one inside the borough boundary. The pumping power of the engines is 358,000 gallons per hour, and the total yield per week 27,000,000 gallons. The consumption for 1899 was over 700 million gallons, at an average rate of about 17 gallons per head per day. In 1893 a school board of 15 members was created. It had in 1901 four large schools under its control, with accommodation for 3095 children. Mersey Park, in the south end of the borough, was opened in 1885; a track of moorland, measuring 45 acres, in the township of Thurstaston, at a distance of six miles from Birkenhead, was allotted to the borough as an open space in 1883. In 1900 a portion of a piece of land known as Meols Common, comprising upwards of 54 acres of pasture land, lying on the shore of Liverpool Bay, about three miles from the borough, was vested in the corporation. The Birkenhead ferry service is now carried on by five steamers with a total carrying capacity of 7356 persons, while the goods traffic is conveyed by three large steamboats. In 1897 the corporation further acquired the rights over the Rock Ferry and the New Ferry, at the south end of the borough. The total number of passengers carried by the ferries in 1899 was $8\frac{1}{2}$ millions. In connexion with the free library, two branch reading-rooms and libraries were opened in 1894. In 1879 lairages to deal with the imported cattle trade were opened by the dock board at Woodside and on the south side of Wallasey Dock, with accommodation for 3164 oxen and 10,000 sheep. During the year ending 31st December 1899, 152,661 oxen and 275,424 sheep passed through these lairages, quite apart from the cattle landed at the North Wallesey Lairage, just outside the borough boundary. Large new abattoirs were opened in 1887. The hospital accommodation of the borough has been increased by the opening in 1883 of an enlarged children's hospital, and in 1895 of a specially commodious infectious diseases hospital at Flaybrick. The supply of electric light is undertaken by the municipal authorities, and the generating works were opened in 1896. The tramway system has been reorganized, in order to be worked by electric traction under the control of the corporation. In 1878 the old Monks Ferry station on the Great Western system was superseded by the opening of the Woodside passenger station, and a few years later the Birkenhead town station was also opened. In 1886 the Mersey tunnel, connecting Birkenhead with Liverpool, was opened by the Prince of Wales. This system extends from Rock Ferry and Park stations on the Cheshire side to the low level at central station in Liverpool, and has connexions on the Cheshire side with the Great Western, London and North-Western, Wirral, and other local systems. In 1896 the Wrexham, Mold and Connah's Quay railway was opened, thus bringing the

mineral and coal districts of Flintshire and North Wales into touch with the Birkenhead docks; a considerable traffic has resulted. A handsome Young Men's Christian Association building and a commodious theatre have been erected. In 1897 the ruins of the ancient Benedictine Priory were purchased by private subscription and presented to the town. They have been carefully restored at the expense of the corporation. The general trade of the borough has increased, and latterly shipbuilding and ship repairing have developed to a considerable extent.

Birmingham, one of the chief manufacturing towns (a county borough) of England, in Warwickshire, 112½ miles (by rail) from London, with an area of about 30 square miles. The greatest length from N.E. to S.W. is about 7 miles, and the greatest breadth a little over 4 miles, the form being roughly oblong. The London and North-Western, the Midland, and the Great Western railways run through Birmingham, the two former having a joint station in New Street, and the latter a separate



MAP OF SUBURBS OF BIRMINGHAM.

station in Snow Hill. The population grew from 360,000 in 1875 to 408,000 in 1881, to 430,000 in 1891, and, certain extensions having been made in the boundaries during the interval, in 1901 was found to be 522,182. The death-rate was 24·8 per 1000 in 1875, 19·1 in 1885, and 20 in 1899. The following table shows the number of births, deaths, and marriages in recent years:—

	Births.	Deaths.	Marriages.
1870	8678	5784	2230
1880	9456	5414	2074
1890	7966	6263	2544
1898	8351	5603	2753

The boundaries and parliamentary representation of the city have undergone considerable changes since 1875. At that date the town (which became a city in 1889) still returned the three representatives assigned in 1867. By the Representation of the People Act of 1885 this number was increased to seven, and a corresponding number of parliamentary divisions created. By the Provincial Local Government Board Act of 1891 four Local Board districts were added to the city of Birmingham for local government—Harborne (Staffordshire), Balsall Heath (Worcestershire), Saltley, and the rural hamlet of Little Bromwich (Warwickshire). These districts were by the Act declared to be in the county of Warwick, though still remaining in their respective counties for the exercise of freehold votes. By this Act the boundaries of the city were made coterminous for parliamentary, municipal, and school board purposes. No change was made in poor-law areas or in existing ecclesiastical rights. Since 1875 considerable changes have been made in the laying out of principal streets. In the year named a great Improvement Scheme was initiated, with the twofold object of clearing away a mass of insanitary property from the centre of the town (in some parts of which an alarmingly high death-rate prevailed) and of constructing a main thoroughfare from the centre to the N.E. outlet, commencing from New Street, near the principal railway station, to Bull Street, and thence continuing to the Aston Road. The scheme received parliamentary sanction in 1876, and was finished in 1882, the total cost being £1,520,657. This led to an almost total extinction of the residential quarter in the centre of the town. The great thoroughfare thus created is called Corporation Street. It was rapidly lined with buildings of considerable beauty, these being erected on leases of seventy-five years' duration, at the expiration of which they become the property of the Corporation.

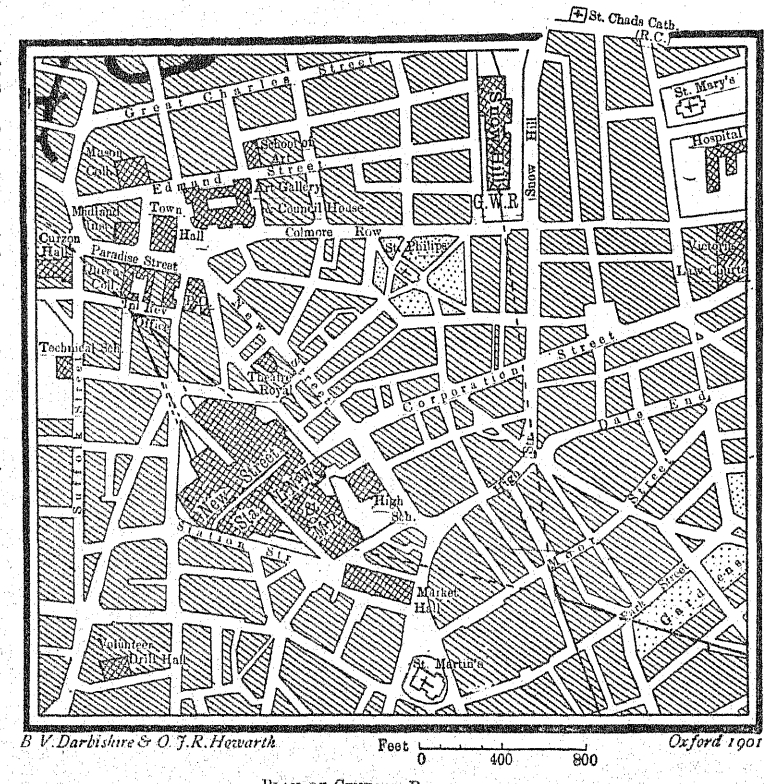
The most marked extension of building has been eastwards and southwards in Saltley, Balsall Heath, and Small Heath, and to the N.W. in the direction of the Handsworth boundary, but building sites are being rapidly filled up in all quarters. Edgbaston, the fashionable suburb, owing to the strict rules enforced by the ground landlord, still remains remarkably open, and is an almost unique example of a semi-rural district, where almost every house has a garden, extending to within less than a mile of the centre of a city of more than half a million inhabitants. This feature has had a most important effect in preserving the local life of Birmingham intact, inasmuch as the richer and more influential inhabitants, instead of residing at a distance from the centre, as in so many large towns, remain in close contact with the general community and take a full share in municipal government and the administration of charities. Edgbaston is however becoming partly surrounded by manufacturing districts, specially to the S.W. where the growing districts of Selly Oak and Bournville, with their ever-increasing factories, interpose between it and the country proper. On the E. side of the city the transition from town to country is well defined, but to the N.W. the exit from Birmingham conducts from one populous district to another. On that side Birmingham has joined hands with the Black Country, nearly the whole of the road to Dudley, 10 miles distant, having the character of a street.

Drainage.—The sewage of the city is dealt with by a body known as "The Birmingham, Tame, and Rea District Drainage Board," constituted in 1877. It consists of nineteen members, of whom twelve are elected from the City Council, the others representing districts outside the municipal area. The total area drained is over 45,000 acres, and is likely to be increased, the whole of the sewers falling to a common outlet at Saltley, adjacent to a sewage farm of 2000 acres in the valley of the Tame. After being purified in tanks by precipitation with lime the fluid matter is passed through the land and issues as clear water into the Tame. The solid residuum is dug into the land. The board has power to serve precepts on the various local bodies included within the area. In 1899 the precept on the Birmingham corporation amounted to £32,725, representing three-fourths the total expenditure of the board.

Lighting and Water.—Both the gas and the water supplies are in the hands of the corporation. The two local gas companies were bought out in 1875. In that year 290,000 tons of coal were carbonized; in 1899 the quantity was 515,000, in addition to which 1,400,000 gallons of oil were also used for gas manufacture. Since 1875 the annual sale of gas has increased from 2327 to 5201 million cubic feet. The capital expenditure has increased from £2,000,000 to £2,283,000, *i.e.*, a reduction of capital per 1000 cubic feet of gas sold from 17s. 8d. to 9s. 2d. £680,000 has been appropriated from the profits of the undertaking, and from the interest on the invested reserve fund, in aid of the rates. The rates in the lighting area have been indirectly relieved by £200,000 by means of reduced charges for public lighting: the Art Gallery building has been provided, and a reserve of £658,000 accumulated. The corporation has taken over the electric supply from 1st January 1900, the purchase money being £420,000. The water was acquired in 1876. In contrast to the gas undertaking, the water has never been looked upon as a profit-making concern, this being expressly disavowed, and the motive of public

policy declared by the promoters of municipalization. The present sources of supply are the rivers Bourne and Blythe, the Plant Brook, and the Perry Stream, and eight deep wells. The works can provide 20 million gallons daily in dry weather. The area supplied covers 129¾ square miles, with an estimated population of 800,000. Owing to the rapid increase of demand, a new reservoir has been constructed at Shustoke on the Bourne, with a capacity of 400 million gallons. This brought the total capital authorized up to date to £2,097,860, the whole of which has been raised and expended. In 1891 the demand having risen to nearly 17 millions a day, new sources of supply had to be considered, and it was determined to seek an entirely new supply in Wales. By an Act of 1892 power was given to acquire the watershed of the rivers Elan and Claerwen, tributaries of the Wye in Radnor and Brecon shires, and to construct the necessary works, the capital authorized being £6,000,000. The works for the first instalment of the Welsh scheme are now in hand. These comprise a large storage and compensation reservoir, and two storage reservoirs on the river Elan. The estimate formed in 1891 for the present works was £3,621,950, but the actual cost will be greater. It may be mentioned that the capitalized value of the gas and water undertakings, as regards works now in operation (excluding the Welsh scheme), is about £4,500,000, against which is to be set an accumulated sinking fund amounting to nearly £800,000.

Administration.—In 1883 the various Acts of past years were combined into the Birmingham Corporation Consolidation Act, which gave further powers to erect assize courts, increase the area of gas supply, impose Free Library rate, and conduct a municipal School of Art. The poor-law administration has, since 1875, been put on a more popular basis. In 1882 a superintendent relieving officer was appointed, and a system of cross visitation started for the purpose of checking abuses of outdoor relief. In the same year the Guardians built an infirmary with 1300 beds. In 1878 they decided to build cottage homes in a rural district for the purpose of bringing up permanent pauper children. Each home has 30 inmates under the care of a "foster parent." There are 400 inmates altogether. Workhouses have been thoroughly modernized, the principle of separating children adopted, and infirmaries built. Women first sat on the Board of Guardians in 1880. In 1889 Birmingham was created a city, and a grant made of an official coat-of-arms carrying supporters. The title of lord mayor was conferred on the chief magistrate in 1897. The police force has increased from 500 in 1875 to 700 in 1899. In 1875 the amount of assessment to the borough rate was £1,254,911, the rate being 3s. 10½d. in the £ (of which 3d. was for the School Board), and the income about £300,000. In 1898-99 the income from rates was £535,659 at 5s. 1½d. in the £ on a gross assessment of £2,297,542, and the total debt to be provided for £9,380,000, of which about seven millions is represented by gas and water liabilities and by the dwelling-house improvement fund. The School Board rate for the same year was 1s. 0·64d. in the £ (included in the aforementioned 5s. 1½d.). The City Council consists of eighteen aldermen and fifty-four councillors, selected from eighteen wards; it is divided into seventeen committees, most of which consist of eight members. The corporation is the largest employer of labour in the borough; it employs over 5000 persons, and is also a large landowner. The administration of justice was performed from 1838 to 1884 by a Court of Quarter Sessions, with a recorder, and a Court of Petty Sessions. In 1884 Birmingham was made an assize district of Warwickshire. In connexion with this event new law courts had to be created.



PLAN OF CENTRAL BIRMINGHAM.

Religion.—The total sittings provided by the various churches of all denominations in Birmingham amount to about one quarter of the total population. In 1892 the Establishment had 108 churches and mission rooms, and other denominations 159 places of worship. This number has not materially changed. Three new churches belonging to the Establishment were consecrated in the period 1875-1897. Since 1897 two more have been consecrated and one commenced; three have been closed, and arrangements made for rebuilding in other districts.

Charities.—The old General Hospital had in 1875, 2000 in- and 25,000 out-patients. This has now been replaced by a splendid new erection on St Mary's Square, which both for external and internal merit ranks amongst the foremost hospitals of the kingdom. The building was commenced in 1894 and finished in 1897 at a total cost of £206,000. In that year the number of in-patients was 4119; out-patients, 54,217. The work of the Queen's Hospital has risen from 1300 and 17,000 in- and out-patients in 1875 to 2020 and 28,559 in 1898. The various medical and other charities mentioned as existing in 1875 are, with few exceptions, still in operation, and on an increased scale. Most of the hospitals and dispensaries, of which there are now fourteen, have been made free since that date.

Tramways.—The tramways belong to private companies, which hold leases from the corporation. Steam, electric, horse, and cable traction are employed. The total length is over 33 miles. The rent paid to the corporation during the period 1893-1900 was £8762.

Education.—The foundation of the *schools of King Edward VI.* derive an income, from endowments, of £37,000, as against £15,000 in 1875, and there is prospect of further increase. The principal school—the Boys' High School—is held in the building erected in New Street in 1840. It has a classical and a modern side, and educates about 500 boys. Adjoining it, in a new building opened in 1896, is a large high school for girls, with 300 pupils. There are also on the foundation seven middle schools, called grammar schools, four for girls and three for boys, situate in different parts of the city, and containing about 1900 pupils altogether. The schools have numerous scholarships tenable at the schools as well as exhibitions to the universities and other places of higher education. *Queen's College*, with its medical and theological departments, was in 1875 flourishing on the former, languishing on the latter side. In 1882 a large part of the scientific teaching, hitherto done by special professors in Queen's College, was taken over by Mason College, and in 1892 the whole medical department was removed to the same institution under an order from the Court of Chancery. This change helped to advance the Birmingham *Medical School* to a position of high repute. The theological students of Queen's College are extremely few. The idea of developing Queen's College into a university had long existed. The idea was destined to be realized in connexion with *Mason College*. The foundation deed (dated 1870) of this college, the first stone of which was laid in 1875, declares the founder's intention to be that of promoting "thorough systematic education and instruction specially adapted to the practical, mechanical, and artistic requirements of the manufactures and industrial pursuits of the Midland district . . . to the exclusion of mere literary education and instruction." Subsequent deeds (1874 and 1881) added Greek and Latin, and provided that instruction may be given in all such other subjects as the trustees may from time to

time judge necessary, while once in every fifteen years the provisions of the deed may be varied to meet changing needs—theology only being definitely excluded. In 1897 a new Act was passed at the instance of the trustees, creating a court of 180 members, and removing the theological restriction. A measure of popular control is given through the appointment by the City Council of five out of the eleven trustees. The college opened in 1880 with 53 students; in 1884-85 the number was 525; in 1898-99 there were 666. In 1898 a public meeting carried a resolution in favour of creating a university. It was estimated that a quarter of a million was needed to endow and equip a university on the scale proposed. Including £50,000 offered by Mr Carnegie, the Pennsylvania ironmaster, and an equal amount from an anonymous donor, the rest from local subscribers, in the autumn of 1899, £325,000 had been subscribed, and the Privy Council was at once petitioned for a charter, which was granted. The draft provides for the incorporation of "the *University of Birmingham*" with faculties of science, arts, medicine, and commerce, with power to grant degrees, and for its government by a court of governors (of which women may be members), a council, and a senate. Mason College is merged in the university. It will be seen that one of the faculties is that of commerce, constituting a distinctive feature in the scheme of the university, the object being to bring its teaching into close touch with the industrial life of the city, the district, and the kingdom. *Elementary education* has passed chiefly into the hands of the School Board. In 1870 the existing voluntary schools provided accommodation for 30,000 children, about half of what was necessary. The School Board was elected for the first time in 1870. In 1898, 88,944 places had been provided, of which 56,868 were in board, and 31,751 in denominational, and 325 in private schools. The percentage of average attendance to the number on the books is about 82 in the denominational and 84 in the board schools. There were fifty-seven schools under the board, exclusive of two special schools for deaf and three for feeble-minded children. There are also under the board sixteen evening continuation schools, nine for boys and men, seven for girls and women; six commercial evening schools, three for each sex. There are two higher-grade schools, with a combined attendance of 585. The cost of the School Board to the rates has now amounted to about £120,000 per annum, and the total expenditure of the board, exclusive of capital, to £200,000 per annum. The *Municipal School of Art* was formed by the transference to the Corporation in 1885 of the then existing School of Art and the Society of Arts, and by the erection of a noble building in Margaret Street, the site having already been given and a portion of the cost provided by private donors. There are one central school and two branch schools. Evening classes are also held in six of the board schools. In 1899 there were 1300 students in the central school and 3828 in the branches and classes. The *Midland Institute* still continues an important work of higher education. A marked development took place in 1885, when, fresh room having been provided by the removal of the School of Art hitherto held in the building, the industrial department was greatly enlarged, resulting in the creation of one of the best metallurgical schools in the kingdom. The present number of students in the industrial department is 2499. On the erection of the Municipal Technical School the whole of the scientific teaching of the Midland Institute was transferred to the former. The *Municipal Technical School* was established in 1893 in the building of the Midland Institute, and in 1895 was housed in a noble building of its own, in Suffolk Street, at a cost of £93,000. It contains metallurgical and engineering workshops and laboratories, lecture theatres for the teaching of chemistry and physics, a women's department, and rooms for the teaching of machine drawing and building construction. There are 2595 students in the evening classes and 195 boys in the day school. The books in the *Birmingham Library* increased from 40,000 in 1875 to about 65,000 in 1899. The old building, its home for 100 years, has been demolished and a new one erected. The free libraries of the city are supported by a rate of about 1½d. in the £. There is one central library, having 140,000 volumes in the reference and 30,000 in the lending departments respectively, and nine free libraries in other parts of the city, each with a lending department and a reading room. The net borough expenditure on this item amounted in 1898-99 to about £14,000.

Miscellanea.—There are ten principal banks, five theatres, and six clubs; two morning and two evening papers, and four weekly papers. The great musical festival is still held triennially for the benefit of the General Hospital. Seven new parks or recreation grounds have been added since 1875, making the total twelve.

Public Buildings.—The noble block of buildings comprising the Council House and Art Gallery was commenced in 1874, the front portion completed in 1879, the rear in 1881. It completes the fine group of buildings, of which the Town Hall and Mason College are the other conspicuous members. The style is Renaissance, and the material is Darley Dale, Spinkwell, and Wrexham stone. The entrance is surmounted with a pediment filled with groups of excellent sculpture. The erection of that part which forms the Art Gallery was the work of the Gas Committee, to whom the council granted the site on condition that they would build such a gallery over their own office, the council having no powers at the time to raise the required funds. The cost of the Council House, exclusive of the art gallery, was £163,805. The *Art Gallery* contains a fine collection of modern paintings, including masterpieces of David Cox, Millais, Hunt, Henry Moore, Albert Moore, Briton-Riviere, Burne-Jones. In the industrial hall are rich stores of Oriental metal work, Limoges enamel, English and foreign glass, Japanese ceramics. In the side galleries are various textiles, and Persian, Rhodian, Grès de Flandres, and other pottery. There is a remarkable collection of Wedgwood wares. Notable also is the collection of arms, which is probably the most complete in existence. The purchase of pictures has been made from time to time by means of an Art Gallery purchase fund of £12,000, privately contributed and placed under the control of the corporation. Many valuable works of art have been presented by individuals. Few additions have been made of late years to ecclesiastical architecture (a feature in which the city is not rich). Christ Church, noted for its ugliness and standing in front of the Council House, was pulled down in 1899. A remarkably rich set of stained-glass windows by Burne-Jones has been inserted in St Philip's Church. Among the Nonconformists the best specimen of architecture is the Church of the Old Meeting (Unitarian) in Bristol Road, opened in 1885. The Assize Courts in Corporation Street, known as the *Victoria Courts*, are among the most beautiful public buildings of the city. Begun in 1887, after Birmingham had been created an Assize district, they were completed in 1891 at a cost of £110,000. The beautiful entrance and the great hall (80 × 40), lighted by noble windows of stained glass, are notable. The style is Renaissance; the colour red on the exterior, buff on the interior. The central block of the façade is flanked by turrets and richly treated. Among other public buildings erected since 1875 are the splendid lecture theatre of the Midland Institute, the new Post Office, the inland revenue office, the County Court, the School Board offices, the Volunteer Drill Hall—additional tokens of the amazing public activity of Birmingham during the last quarter of the 19th century.

Manufactures.—Birmingham manufactures retain their character of multitudinous variety. Among changes since 1875 may be noted the rapid growth in the jewellery and the gun trades, and in the making of metal tubes of all kinds. The following figures issued by the Assay Office, showing the amount of gold and silver marked in successive years, will give some idea of the growth of the jewellery trade:—

	Gold. ozs.	Silver. ozs.
1870	48,123	84,323
1880	81,606	239,835
1890	193,426	1,098,250
1895	239,472	1,796,056
1899	362,481	2,823,525

The year 1897 was famous for a sudden development of cycle manufacturing, followed in 1899 by an almost equally sudden collapse. But the variety of manufactures is such that a misfortune occurring to one is not likely to destroy the general prosperity of the city.

Social Life.—One of the most marked features of social life in Birmingham is the fact that contrasts in the distribution of wealth are less strongly marked than in most other great cities. The distance between the poorest and the richest is bridged over by a larger number of intermediate gradations. Colossal fortunes are few; on the other hand there is a numerous class of rich men. These, however, for the greater part are actually engaged in trade or manufactures, and hold their place in local life rather on account of industry pursued than of wealth possessed. The number of the leisured class, enjoying large incomes without participating in any local industry, is relatively small, but is said to be on the increase. There are many manufacturing companies, but great private firms are also numerous. In regard to labour conditions, the system of small masters, so rarely found at the present day, still holds its own in the manufactures of Birmingham, and shows no present signs of extinction. These facts give to the social relationships of the community a remarkable closeness, integrity, and permanence. (L. P. J.)

Birmingham, capital of Jefferson county, Alabama, U.S.A., situated in the central part of the state, in 33° 30′ N. lat. and 86° 47′ W. long., at an altitude of 600 feet. It is an important railway centre, being entered by five lines: the Central of Georgia, the Kansas City, Memphis and Birmingham, the Louisville

and Nashville, the Queen and Crescent, and the Southern. It is the most important point south of Pennsylvania for iron smelting and manufacturing. For this it has unequalled facilities, since in its immediate neighbourhood, at Red Mountain, are great deposits of iron ore, with limestone and coal for smelting. The city contains many blast furnaces, foundries, and other ironworks. Birmingham has had a very rapid growth owing to this development of the iron industry. In 1880 the population was only 3086, but in 1890 it had jumped to 26,178, and in 1900 to 38,415, of whom 1776 were foreign-born and 16,575 were negroes. The assessed valuation of real and personal property in 1900, on a basis of about 60 per cent. of the full value, was $16,387,226, the tax rate $22 per $1000, and the net debt $2,127,262.

Birsk, a district town of S.E. Russia, government of and 69 miles N.W. of Ufa, on Byelaya river. It is an important centre for trade with the Bashkirs. Population, 8603.

Biscay, a maritime province—one of the Basque Provinces—in the north of Spain, with 52 miles of coast, and an area of 849 square miles, divided into 5 administrative districts and 120 parishes. Its population was 235,659 in 1887, and 290,222 in 1897. The increase of population has been chiefly in Bilbao, Abando, Baracaldo, Portugalete, Santurce, and Sestao, owing to the growth of the mining and metallurgic industries. The birth-rate per 1000 was 38·5, the death-rate 30·9, and the marriage-rate 7·3. Only a few hundred emigrate annually. The climate is rather inclement and variable. The thermometer seldom drops below freezing-point, however, nor does snow fall frequently in winter except on the highest heights. The rainfall is on an average greater than in any province except those of the extreme north-west. The mountainous slopes of the province are studded with the traditional Basque "Caserio," or farmhouse, in which the hardy peasantry live on the *métayer* system, dividing the profits of the soil with absentee landlords. The soil is not very fertile except in some valleys and sheltered hillsides. Only 10,567 acres are devoted to the culture of wheat, 13,437 to maize, 6005 to pod fruit, 1742 to vines. There are, in all, 143,214 head of live stock, including 5259 horses, 825 mules, 2003 asses, 49,587 cattle, 61,642 sheep, 6848 goats, and 17,050 pigs. Except iron and zinc mining and calcination of ores, the industries of Biscay are declining, through peninsular and foreign competition, especially those connected with wool, petroleum, tanneries, and the export of fish, in particular "sardinas." The fishing fleet, however, still consists of several hundred boats, manned by nearly 5000 men and boys. Another very important industry is the manufacture of dynamite and other explosives at Galdacano, closely connected with the mining interests. There are also potteries, paper, soap, and shoe factories, flour mills and breweries, and the many springs and spas are frequented by people from all parts of Spain. The chief source of the province's prosperity lies in its mines; there were, in 1898, 2 sulphur, 12 zinc, 2 lead, and 204 iron ore productive mines, and 1037 unproductive. In some concessions the veins produce less and less every year. 11,105 persons were engaged in the iron ore mines, all but 76 in outside employment, and the total production of iron ore in 1898—5,073,338 tons—was 181,111 tons less than in 1897. The principal classes of ore are the limonite, or rubio, of all kinds of which from 4,000,000 to 4,250,000 tons, on an average, were extracted in 1896, 1897, and 1898; the red hæmatite or campanil, the output of which dwindled from 440,000 tons in 1896 to 275,800 tons in 1898, and will soon become nil; and the spathic or siderite, calcined carbonate, of which 300,000 tons were extracted in 1896, 454,300 in 1897, and 477,700 in 1898. It is estimated that there are only from 40,000,000 to 50,000,000 tons of iron ore still to be mined, so that at the present rate of extraction the output would cease in about ten years. Nearly all the iron ores are sent abroad. Bilbao is the only port of any importance. The mining and industrial interests of Biscay have been very materially assisted by the quick and important development of means of communication of every kind. The provincial and parish roads, kept up by the local government, are excellent. No province in Spain had at the close of the 19th century such a complete network of railways, and they have all been built since 1870. (A. E. H.)

Bisceglie, a fortified seaport town and episcopal see of the province of Bari, Apulia, Italy, 21 miles by rail N.W. from Bari. In 1897 the port was cleared by 499 vessels of 151,568 tons. The population (1901) was 30,885.

Bischofswerda, a town of Germany, on the Wesenitz, which empties into the Elbe 12 miles W.S.W. of the town, and in the circle of Bautzen, kingdom of Saxony. It has a branch railway line to Zittau. There are a commercial and a technical school, cloth and artificial flower factories, glass-works, potteries, and in the neighbourhood large granite quarries. It is famous as the scene of a battle in 1813 between the French and the Allies on Napoleon's retreat from Moscow. It was the residence of Bishop Benno in the 11th century, and the "Bishop's Road" still runs from here to Meissen. Population (1890), 5612; (1900), 6610.

Bischweiler, a town of Germany, in the imperial territory of Alsace-Lorraine, district of Lower Alsace, 23 miles by rail N. by E. from Strasburg. It has manufactures of jute and machinery, brewing, and iron-founding. Hops are extensively grown. Population (1885), 6815; (1900), 7875.

Bishop Auckland, a market town and railway station in the Bishop Auckland parliamentary division of Durham, England, on the Wear and Gaunless, 11 miles S.S.W. of Durham city. Recent buildings are a temperance hall, church institute, memorial hall, fever hospital, accident hospital, and theatre (rebuilt). Area of urban district, 950 acres; population (1881), 10,097; (1901), 11,966.

Bishop Stortford, a market town and railway station in the Hertford parliamentary division of Hertfordshire, England, on the Stort, 14 miles E.N.E. of Hertford. The old church of St Michael's has been restored and a hospital opened. There are also grammar schools and other first-class educational establishments, including the Roman Catholic convent of St Mary. The church of St Joseph has also been established. There are important cattle and horse markets. Area of civil parish (an urban district), 3285 acres; population (1881), 6704; (1891), 6595; (1901), 7143.

Bishop Wearmouth. See SUNDERLAND.

Biskra, a town in Algeria, capital of a canton in the department of Constantine, 150 miles by rail S. by W. of Constantine. It is in communication with Philippeville by a railway which is to be extended as far as Tuggurt and Wargla. Since 1894-95 Biskra has grown into great repute as a winter residence, laying itself out rapidly in hotels, villas, and casinos. The climate is uncommonly healthy, the sky serene, and there is very seldom any rain. In spite of its proximity to the Sahara desert, the French enjoy excellent sanitary conditions. Only 700 in 1890, the French population in 1900 numbered 1500, and the

number of visitors every winter reaches an average of 20,000. The local population in 1880 was 6955; in 1891, 7165; in 1900, 8417.

Bismarck, capital of Burleigh county, North Dakota, U.S.A., and capital of the state. It is situated a little south of the centre of the state, on the east bank of the Missouri river, at an altitude of 1670 feet, and is on the main line of the Northern Pacific railway. The river is navigable at high water for 1200 miles above this point, and much freight is shipped from here by this route. The state Capitol, which cost $500,000, is a fine building. Population (1880), 1758; (1900), 3319.

Bismarck, Otto Eduard Leopold von, Prince, Duke of Lauenburg (1815-1898), the great German statesman, was born on 1st April 1815, at the Manor House of Schönhausen, his father's seat in the Mark of Brandenburg. The family has, since the 14th century, belonged to the landed gentry, and many members had held high office in the kingdom of Prussia. His father (d. 1845), of whom he always spoke with much affection, was a quiet, unassuming man, who retired from the army in early life with the rank of Rittmeister. His mother, a daughter of Mencken, cabinet secretary to the king, was a woman of strong character and ability, who had been brought up at Berlin under the "Aufklärung." Her ambition was centred in her sons, but Bismarck in his recollections of his childhood missed the influences of maternal tenderness. There were several children of the marriage, which took place in 1806, but all died in childhood except Bernhard (b. 1810, d. 1893), Otto, and one sister, Malvina (b. 1827), who married in 1845 Oscar von Arnim. Young Bismarck was educated in Berlin, first at a private school, then at the gymnasium of the Graue Kloster (Grey Friars). At the age of seventeen he went to the University of Göttingen, where he spent a little over a year; he joined the corps of the Hannoverana and took a leading part in the social life of the students. He completed his studies at Berlin, and in 1835 passed the examinations which admitted him to the public service. He was intended for the diplomatic service, but spent some months at Aix-la-Chapelle in administrative work, and then was transferred to Potsdam and the judicial side. He soon retired from the public service; he conceived a great distaste for it, and had shown himself defective in discipline and regularity. In 1839, after his mother's death, he undertook, with his brother, the management of the family estates in Pomerania; at this time most of the estate attached to Schönhausen had to be sold. In 1844, after the marriage of his sister, he went to live with his father at Schönhausen. He and his brother took an active part in local affairs, and in 1846 he was appointed *Deichhauptmann*, an office in which he was responsible for the care of the dykes by which the country, in the neighbourhood of the Elbe, was preserved from inundation. During these years he travelled in England, France, and Switzerland. The influence of his mother, and his own wide reading and critical character, made him at one time inclined to hold liberal opinions on government and religion, but he was strongly affected by the religious revival of the early years of the reign of Frederick William IV.; his opinions underwent a great change, and under the influence of the neighbouring country gentlemen he acquired those strong principles in favour of monarchical government as the expression of the Christian state of which he was to become the most celebrated exponent. His religious convictions were strengthened by his marriage to Johanna von Puttkamer, which took place in 1847.

In the same year he entered public life, being chosen as substitute for the representative of the lower nobility of his district in the Estates-General, which were in that year summoned to Berlin. He took his seat with the Extreme Right, and distinguished himself by the vigour and originality with which he defended the rights of the king and the Christian monarchy against the Liberals. When the revolution broke out in the following year he offered to bring the peasants of Schönhausen to Berlin in order to defend the king against the revolutionary party, and in the last meeting of the Estates voted in a minority of two against the address thanking the king for granting a constitution. He did not sit in any of the assemblies summoned during the revolutionary year, but took a very active part in the formation of a union of the Conservative party, and was one of the founders of the *New Prussian Gazette*, better known as the *Kreuzzeitung*, which has since then been the organ of the Monarchical party in Prussia. In the new parliament which was elected at the beginning of 1849, he sat for Brandenburg, and was one of the most frequent and most incisive speakers of what was called the Junker party. He took a prominent part in the discussions on the new Prussian constitution, always defending the power of the king. His speeches of this period show great debating skill, combined with strong originality and imagination. His constant theme was, that the party disputes were a struggle for power between the forces of revolution, which derived their strength from the fighters on the barricades, and the Christian monarchy, and that between these opposed principles no compromise was possible. He took also a considerable part in the debates on the foreign policy of the Prussian Government; he defended the Government for not accepting the Frankfort constitution, and opposed the policy of Radowitz, on the ground that the Prussian king would be subjected to the control of a non-Prussian parliament. The only thing, he said, that had come out of the revolutionary year unharmed, and had saved Prussia from dissolution and Germany from anarchy, was the Prussian army and the Prussian civil service; and in the debates on foreign policy he opposed the numerous plans for bringing about the union of Germany, by subjecting the Crown and Prussia to a common German parliament. He had a seat in the parliament of Erfurt, but only went there in order to oppose the constitution which the Parliament had framed. He foresaw that the policy of the Government would lead it into a position when it would have to fight against Austria on behalf of a constitution by which Prussia itself would be dissolved, and he was, therefore, one of the few prominent politicians who defended the complete change of front which followed the surrender of Olmütz.

Parliamentary career.

It was probably his speeches on German policy which induced the king to appoint him Prussian representative at the restored Diet of Frankfort in 1851. The appointment was a bold one, as he was entirely without diplomatic experience, but he justified the confidence placed in him. During the eight years he spent at Frankfort he acquired an unrivalled knowledge of German politics. He was often used for important missions, as in 1852, when he was sent to Vienna. He was entrusted with the negotiations by which the duke of Augustenburg was persuaded to assent to the arrangements by which he resigned his claims to Schleswig and Holstein. The period he spent at Frankfort, however, was of most importance because of the change it brought about in his own political opinions. When he went to Frankfort he was still under the influence of the extreme Prussian Conservatives, men like the Gerlachs, who regarded the maintenance of the principle of the Christian monarchy against the revolution as the chief duty of the Prussian Government. He was

Diplomatic career.

prepared on this ground for a close alliance with Austria. He found, however, a deliberate intention on the part of Austria to humble Prussia, and to degrade her from the position of an equal Power, and also great jealousy of Prussia among the smaller German princes, many of whom owed their thrones to the Prussian soldiers, who, as in Saxony and Baden, had crushed the insurgents. He therefore came to the conclusion that if Prussia was to regain the position she had lost she must be prepared for the opposition of Austria, and must strengthen herself by alliances with other Powers. The solidarity of Conservative interests appeared to him now a dangerous fiction. At the time of the Crimean war he advocated alliance with Russia, and it was to a great extent owing to his advice that Prussia did not join the western Powers. Afterwards he urged a good understanding with Napoleon, but his advice was met by the insuperable objection of the king to any alliance with a ruler of revolutionary origin.

The change of ministry which followed the establishment of a regency in 1857 made it desirable to appoint a new envoy at Frankfort, and in 1858 Bismarck was appointed ambassador at St Petersburg, where he remained for four years. During this period he acquired some knowledge of Russian and gained the warm regard of the Tsar, as well as of the Dowager-Empress, herself a Prussian princess. During the first two years he had little influence on the Prussian Government; the Liberal ministers distrusted his known opinions on parliamentary government, and the monarchical feeling of the prince regent was offended by Bismarck's avowed readiness for alliance with the Italians and his disregard of the rights of other princes. The failure of the ministry, and the estrangement between the king and the Liberal party, opened to him the way to power. Roon, who was appointed Minister of War in 1861, was an old friend of his, and through him Bismarck was thenceforward kept closely informed of the condition of affairs in Berlin. On several occasions the prospect of entering the ministry was open to him, but nothing came of it, apparently because he required a free hand in foreign affairs, and this the king was not prepared to give him. When an acute crisis arose out of the refusal of parliament, in 1862, to vote the money required for the reorganization of the army, which the king and Roon had carried through, he was summoned to Berlin; but the king was still unable to make up his mind to appoint him, although he felt that Bismarck was the only man who had the courage and capacity for conducting the struggle with parliament. He was, therefore, in June, made ambassador at Paris as a temporary expedient. There he had the opportunity for renewing the good understanding with Napoleon which had been begun in 1857. He also paid a short visit to England, but it does not appear that this had any political results. In September the parliament, by a large majority, threw out the budget, and the king, having nowhere else to turn for help, at Roon's advice summoned Bismarck to Berlin and appointed him minister-president and foreign minister.

Ministry.

Bismarck's duty as minister was to carry on the government against the wishes of the Lower House, so as to enable the king to complete and maintain the reorganized army. The opposition of the House was supported by the country and by a large party at court, including the queen and crown prince. The indignation which his appointment caused was intense; he was known only by the reputation which in his early years he had won as a violent ultra-Conservative, and the apprehensions were increased by his first speech, in which he said that the problems of the time could only be settled by blood and iron. His early fall was predicted, and it was feared that he might bring down the monarchy with him. Standing almost alone he succeeded in the task he had undertaken. For four years he ruled without a budget, taking advantage of an omission in the constitution which did not specify what was to happen in case the Crown and the two Houses could not agree on a budget. The conflict of the ministers and the House assumed at times the form of bitter personal hostility; in 1863 the ministers refused any longer to attend the sittings, and Bismarck challenged Virchow, one of his strongest opponents, to a duel, which, however, did not take place. In 1852 he had fought a duel with pistols against George von Vindre, a political opponent. In June 1863, as soon as parliament had risen, Bismarck published ordinances controlling the liberty of the press, which, though in accordance with the letter, seemed opposed to the intentions of the constitution, and it was on this occasion that the crown prince, hitherto a silent opponent, publicly dissociated himself from the policy of his father's ministers. Bismarck depended for his position solely on the confidence of the king, and the necessity for defending himself against the attempts to destroy this confidence added greatly to the suspiciousness of his nature. He was, however, really indispensable, for his resignation must be followed by a Liberal ministry, parliamentary control over the army, and probably the abdication of the king. Not only, therefore, was he secure in the continuance of the king's support, but he had also the complete control of foreign affairs. Thus he could afford to ignore the criticism of the House, and the king was obliged to acquiesce in the policy of a minister to whom he owed so much.

Foreign policy.

He soon gave to the policy of the monarchy a resolution which had long been wanting. When the emperor of Austria summoned a meeting of the German princes at Frankfort to discuss a reform of the confederation Bismarck insisted that the king of Prussia must not attend. He remained away, and his absence in itself made the congress unavailing. There can be no doubt that from the time he entered on office Bismarck was determined to bring to an issue the long struggle for supremacy in Germany between the house of Hapsburg and the house of Hohenzollern. Before he was able to complete his preparations for this, two unforeseen occurrences completely altered the European situation, and caused the conflict to be postponed for three years. The first was the outbreak of rebellion in Poland. Bismarck, an inheritor of the older Prussian traditions, and recollecting how much of the greatness of Prussia had been gained at the expense of the Poles, offered his help to the Tsar. By this he placed himself in opposition to the universal feeling of Western Europe; no act of his life added so much to the repulsion with which at this time he was regarded as an enemy of liberty and right. He won, however, the gratitude of the Tsar and the support of Russia, which in the next years was to be of vital service to him. Even more serious were the difficulties arising in Denmark. On the death of the king in 1863 Prince Frederic of Augustenburg came forward as claimant to the duchies of Schleswig-Holstein which had hitherto been joined to the crown of Denmark. He was strongly supported by the whole German nation and by many of its princes. Bismarck, however, once more was obliged to oppose the current of national feeling, which imperiously demanded that the German duchies should be rescued from a foreign yoke. Prussia was bound by the treaty of London, which guaranteed the integrity of the Danish monarchy; to have disregarded this would have been to bring about a coalition against Germany similar to that of 1851. Moreover, he held that it would be of no advantage to Prussia to create a new German state; if Denmark

OTTO VON BISMARCK.

(From the Painting by Franz von Lenbach.

were to lose the duchies, he desired that Prussia should acquire them, and to recognize the Augustenburg claims would make this impossible. His resistance to the national desire made him appear a traitor to his country. To check the agitation he turned for help to Austria; and an alliance of the two joint Powers, so lately at variance, was formed. He then falsified all the predictions of the opposition by going to war with Denmark, not, as they had required, in support of Augustenburg, but on the ground that the king of Denmark had violated his promise not to oppress his German subjects. Austria continued to act with Prussia, and, after the defeat of the Danes, at the Peace of Vienna the sovereignty of the duchies was surrendered to the two allies—the first step towards annexation by Prussia. There is no part of Bismarck's diplomatic work which deserves such careful study as these events. Watched as he was by countless enemies at home and abroad, a single false step would have brought ruin and disgrace on himself; the growing national excitement would have burst through all restraint, and again, as fifteen years before, Germany divided and unorganized would have had to capitulate to the orders of foreign Powers.

The Peace of Vienna left him once more free to return to his older policy. For the next eighteen months he was occupied in preparing for war with Austria. For this war he was alone responsible; he undertook it deliberately as the only means of securing Prussian ascendancy in Germany. The actual cause of dispute was the disposition of the conquered duchies, for Austria now wished to put Augustenburg in as duke, a plan to which Bismarck would not assent. In 1865 a provisional arrangement was made by the treaty of Gastein, for Bismarck was not yet ready. He would not risk a war unless he was certain of success, and for this he required the alliance of Italy and French support; both he secured during the next year. In October 1865 he visited Napoleon at Biarritz and Paris. No formal treaty was made, but Napoleon promised to regard favourably an extension of Prussian power in Germany; while Bismarck led the emperor to believe that Prussia would help him in extending the frontier of France. A treaty of alliance with Italy was arranged in the spring of 1866; and Bismarck then with much difficulty overcame the reluctance of the king to embark in a war with his old ally. The results of the war entirely justified his calculations. Prussia, though opposed by all the German states except a few principalities in the north, completely defeated all her enemies, and at the end of a few weeks the whole of Germany lay at her feet.

War with Austria.

The war of 1866 is more than that of 1870 the crisis of modern German history. It finally settled the controversy which had begun more than a hundred years before, and left Prussia the dominant power in Germany. It determined that the unity of Germany should be brought about not by revolutionary means as in 1848, not as in 1849 had been attempted by voluntary agreement of the princes, not by Austria, but by the sword of Prussia. This was the great work of Bismarck's life; he had completed the programme foreshadowed in his early speeches, and finished the work of Frederick the Great. It is also the turning-point in Bismarck's own life. Having secured the dominance of the crown in Prussia and of Prussia in Germany, he could afford to make a reconciliation with the parties which had been his chief opponents, and turn to them for help in building up a new Germany. The settlement of 1866 was peculiarly his work. We must notice, first, how in arranging the terms of peace he opposed the king and the military party who wished to advance on Vienna and annex part of Austrian Silesia; with greater foresight he looked to renewing the old friendship with Austria, and insisted (even with the threat of resignation) that no territory should be demanded. The southern states he treated with equal moderation, and thereby was able to arrange an offensive and defensive alliance with them. On the other hand, in order to secure the complete control of North Germany, which was his immediate object, he required that the whole of Hanover, Hesse Cassel, Hesse Nassau, and the city of Frankfort, as well as the Elbe duchies, should be absorbed in Prussia. He then formed a separate confederation of the North German states, but did not attempt to unite the whole of Germany, partly because of the internal difficulties which this would have produced, partly because it would have brought about a war with France. In the new confederation he became sole responsible minister, with the title *Bundes-Kanzler*; this position he held till 1890, in addition to his former post of premier minister. In 1871 the title was altered to *Reichs-Kanzler*.

Settlement of 1866.

The reconciliation with the Prussian parliament he effected by bringing in a bill of indemnity for the money which had been spent without leave of parliament. The Radicals still continued their opposition, but he thereby made possible the formation of a large party of moderate Liberals, who thenceforward supported him in his new Nationalist policy. He also, in the constitution for the new confederation, introduced a general Diet elected by universal suffrage. This was the chief demand of the revolutionists in 1848; it was one to which in his early life he had been strongly opposed. His experience at Frankfort had diminished his dislike of popular representation, and it was probably to the advice of Lassalle that his adoption of universal suffrage was due. He first publicly proposed it just before the war; by carrying it out, notwithstanding the apprehensions of many Liberal politicians, he placed the new constitution on a firmer base than would otherwise have been possible.

Up to 1866 he had always appeared to be an opponent of the National party in Germany, now he became their leader. His next task was to complete the work which was half-finished, and it was this which brought about the second of the great wars which he undertook.

Bismarck and Napoleon.

The relations with Napoleon form one of the most interesting but obscurest episodes in Bismarck's career. We have seen that he did not share the common prejudice against co-operation with France. He found Napoleon willing to aid Prussia as he had aided Piedmont, and was ready to accept his assistance. There was this difference, that he asked only for neutrality, not armed assistance, and it is improbable that he ever intended to alienate any German territory; he showed himself, however, on more than one occasion ready to discuss plans for extending French territory on the side of Belgium and Switzerland. Napoleon, who had not anticipated the rapid success of Prussia, after the battle of Königgrätz at the request of Austria came forward as mediator, and there were a few days during which it was probable that Prussia would have to meet a French attempt to dictate terms of peace. Bismarck in this crisis by deferring to the emperor in appearance avoided the danger, but he knew that he had been deceived, and the cordial understanding was never renewed. Immediately after an armistice had been arranged, Benedetti, at the orders of the French Government, demanded as recompense a large tract of German territory on the left bank of the Rhine. This Bismarck peremptorily refused, declaring that he would rather have war. Benedetti then made another proposal, submitting a draft treaty by which France was to support Prussia in adding the South German states to the new confederation, and Germany was to support France in the annexation of Luxemburg and Belgium.

Bismarck discussed, but did not conclude the treaty; he kept, however, a copy of the draft in Benedetti's handwriting, and published it in the *Times* in the summer of 1870 so as to injure the credit of Napoleon in England. The failure of the scheme made a contest with France inevitable, at least unless the Germans were willing to forgo the purpose of completing the work of German unity, and during the next four years the two nations were each preparing for the struggle, and each watching to take the other at a disadvantage.

It is necessary, then, to keep in mind the general situation in considering Bismarck's conduct in the months immediately preceding the war of 1870. In 1867 there was a dispute regarding the right to garrison Luxemburg. Bismarck then produced the secret treaties with the southern states, an act which was, as it were, a challenge to France by the whole of Germany. During the next three years the Ultramontane party hoped to bring about an anti-Prussian revolution, and Napoleon was working for an alliance with Austria, where Beust, an old opponent of Bismarck's, was chancellor. Bismarck was doubtless well informed as to the progress of the negotiations, for he had established intimate relations with the Hungarians. The pressure at home for completing the work of German unity was so strong that he could with difficulty resist it, and in 1870 he was much embarrassed by a request from Baden to be admitted to the confederation, which he had to refuse. It is therefore not surprising that he eagerly welcomed the opportunity of gaining the goodwill of Spain, and supported by all the means in his power the offer made by Marshal Prim that Prince Leopold of Hohenzollern should be chosen king of that country. It was only by his urgent and repeated representations that the prince was persuaded against his will to accept. The negotiations were carried out with the greatest secrecy, but as soon as the acceptance was made known the French Government intervened and declared that the project was inadmissible. Bismarck was away at Varzin, but on his instructions the Prussian Foreign Office in answer to inquiries denied all knowledge or responsibility. This was necessary, because it would have caused a bad impression in Germany had he gone to war with France in support of the prince's candidature. The king, by receiving Benedetti at Ems, departed from the policy of reserve Bismarck himself adopted, and Bismarck (who had now gone to Berlin) found himself in a position of such difficulty that he contemplated resignation. The French, however, by changing and extending their demands enabled him to find a cause of war of such a nature that the whole of Germany would be united against French aggression. France asked for a letter of apology, and Benedetti personally requested from the king a promise that he would never allow the candidature to be resumed. Bismarck published the telegram in which this information and the refusal of the king were conveyed, but by omitting part of the telegram made it appear that the request and refusal had both been conveyed in a more abrupt form than had really been the case. But even apart from this, the publication of the French demand, which could not be complied with, must have brought about a war.

It was not till many years later that our knowledge of these events (which is still incomplete) was established; in 1894 the publication of the memoirs of the king of Rumania showed, what had hitherto been denied, that Bismarck had taken a leading part in urging the election of the prince of Hohenzollern. It was in 1892 that the language used by Bismarck himself made it necessary for the German Government to publish the original form of the Ems telegram.

In the campaign of 1870-71 Bismarck accompanied the headquarters of the army, as he had done in 1866. He was present at the battle of Gravelotte and at the surrender of Sedan, and it was on the morning of 2nd September that he had his famous meeting with Napoleon after the surrender of the emperor. He accompanied the king to Paris, and spent many months at Versailles. Here he was occupied chiefly with the arrangements for admitting the southern states to the confederation, and the establishment of the empire. He also underwent much anxiety lest the efforts of Thiers to bring about an interference by the neutral powers might be successful. He had to carry on the negotiations with the French preliminary to the surrender of Paris, and to enforce upon them the German terms of peace.

For Bismarck's political career after 1870 we must refer to the article on GERMANY, for he was thenceforward entirely absorbed in the affairs of his country. The foreign policy he controlled absolutely. *After 1870.* As chancellor he was responsible for the whole internal policy of the empire, and his influence is to be seen in every department of state, especially, however, in the great change of policy after 1878. During the earlier period the estrangement from the Conservatives, which had begun in 1866, became very marked, and brought about a violent quarrel with many of his old friends, which culminated in the celebrated Arnim trial. He incurred much criticism during the struggle with the Roman Catholic Church, and in 1873 he was shot at and slightly wounded by a youth called Kullmann, who professed to be an adherent of the Clerical party. Once before, in 1866, just before the outbreak of war, his life had been attempted by a young man called Cohen, a native of Würtemberg, who wished to save Germany from a fratricidal war. In 1872 he retired from the presidency of the Prussian ministry, but returned after a few months. On several occasions he offered to retire, but the emperor always refused his consent, on the last time with the word "Never." In 1877 he took a long leave of absence for ten months. His health at this time was very bad. In 1878 he presided over the Congress of Berlin. The following years were chiefly occupied, besides foreign affairs, which were always his first care, with important commercial reforms, and he held at this time also the office of Prussian Minister of Trade in addition to his other posts. During this period his relations with the Reichstag were often very unsatisfactory, and at no time did he resort so freely to prosecutions in the law-courts in order to injure his opponents, so that the expression *Bismarck-Beleidigung* was invented. He was engaged at this time in a great struggle with the Social-Democrats, whom he tried to crush by exceptional penal laws. The death of the Emperor William in 1889 made a serious difference in his position. He had been bound to him by a long term of loyal service, which had been rewarded with equal loyalty. For his relations to the Emperor Frederick and William II., and for the events connected with his dismissal from office in March 1890, we must refer to the articles under those names.

After his retirement he resided at Friedrichsruh, near Hamburg, a house on his Lauenburg estates. His criticisms of the Government, given sometimes in conversation, sometimes in the columns of the *Hamburger Nachrichten*, caused an open breach between him and the emperor; and Caprivi, in a circular despatch which was afterwards published, warned all German envoys that no real importance must be attached to what he said. When he visited Vienna for his son's wedding the German ambassador, Prince Reuss, was forbidden to take any notice of him. A reconciliation was effected in 1893. In 1895 his eightieth birthday was celebrated with great enthusiasm: the Reichstag alone, owing to the opposition of the Clericals and the Socialists, refused to vote an address. In 1891 he had been elected a member of the Reichstag,

but he never took his seat. He died at Friedrichsruh, 31st July 1898.

Bismarck was made a count in 1865; in 1871 he received the rank of Fürst (prince). On his retirement the emperor created him duke of Lauenburg, but he never used the title, which is not inherited by his son. In 1866 he received £60,000 as his share of the donation voted by the Reichstag for the victorious generals. With this he purchased the estate of Varzin in Pomerania, which henceforth he used as a country residence in preference to Schönhausen. In 1871 the emperor presented him with a large part of the domains of the duchy of Lauenburg. On his seventieth birthday a large sum of money (£270,000) was raised by public subscription, of which half was devoted to repurchasing the estate of Schönhausen for him, and the rest was used by him to establish a fund for the assistance of schoolmasters. As a young man he was an officer in the landwehr and militia, and in addition to his civil honours he was eventually raised to the rank of general. Among the numerous orders he received we may mention that he was the first Protestant on whom the Pope bestowed the order of Christ; this was done after the cessation of the Kulturkampf and the reference of the dispute with Spain concerning the Caroline Islands to the arbitration of the Pope.

Bismarck's wife died in 1894. He left one daughter and two sons. Herbert, the elder, was wounded at Mars-le-Tour, afterwards entered the Foreign office, acted as private secretary to his father, and then became secretary of state for Foreign affairs and Prussian minister. He conducted many of the negotiations with Great Britain on colonial affairs. He retired at the same time as his father. The second son, William, who was president of the province of Prussia, died in 1901.

Authorities.—The literature on Bismarck's life is very extensive, and it is only possible to enumerate a few of the most important books. The first place belongs to his own works. These include his own memoirs, published after his death, under the title *Gedanken und Erinnerungen;* there is an English translation, *Bismarck: his Reflections and Reminiscences*, Smith, Elder, and Co., 1898. They are incomplete, but contain very valuable discussions on particular points. The speeches are of the greatest importance both for his character and for political history; of the numerous editions that by Horst Kohl, in twelve volumes (Stuttgart, 1893-94), is the best; there is a cheap edition in Reclam's *Universal Bibliothek*. Bismarck was an admirable letter-writer, and numbers of his private letters have been published; a collected edition has been brought out by Horst Kohl. His letters to his wife were published by Prince Herbert Bismarck in 1900. A translation of a small selection of the private letters was published in 1876 by F. Maxse. Of great value for the years 1851-1858 is the correspondence with General L. v. Gerlach, which has been edited by Horst Kohl. A selection of the political letters, in four volumes, has been published under the title *Politische Briefe* (Berlin, 1889-93), but it is badly arranged. Of far greater importance are the collections of despatches and state papers edited by Herr v. Poschinger. These include four volumes entitled *Preussen im Bundestag*, 1851-59 (1882-84), which contain his despatches during the time he was at Frankfort. Next in importance are two works, *Bismarck als Volkswirth* and *Aktenstücke zur Wirthschaftspolitik des Fürsten Bismarck*, which are part of the collection of state papers, *Aktenstücke zur Geschichte der Wirthschaftspolitik in Preussen*. They contain full information on Bismarck's commercial policy, including a number of important state papers. A useful general collection is that by Ludwig Hahn, in five volumes, which includes a selection from letters, speeches, and newspaper articles. These collections have only been possible owing to the extreme generosity which Bismarck showed in permitting the publication of documents; he always professed to have no secrets. A full account of the diplomatic history from 1863 to 1866 is given by Sybel in *Die Begründung des deutschen Reichs* (Munich, 1889-94), written with the help of the Prussian archives. The two last volumes, covering 1866-70, are of less value, as he was not able to use the archives for this period. Poschinger has also edited a series of works in which anecdotes, records of interviews and conversations are recorded; they are, however, of very unequal value. They are *Bismarck und die Parliamentarier*, *Fürst Bismarck und der Bundesrath*, *Die Ansprache des Fürsten Bismarck*, *Neue Tischgespräche*, and *Bismarck und die Diplomaten*. Selections from these have been published in English by Charles Lowe, *The Tabletalk of Prince Bismarck*, and by Sidney Whitman, *Conversations with Bismarck*. There is no satisfactory biography in German; the most ambitious is that by Hans Blum, *Bismarck und seine Zeit* (Munich, 1894). By far the fullest guide to his life is by Horst Kohl, *Bismarck-Regesten* (Leipzig, 1891-92), which contains a record of Bismarck's actions on each day, with references to and extracts from his letters and speeches. Hesekiel's *Das Buch des Grafen Bismarck* is pleasantly written, but is now quite out of date. There is a good translation by K. B. H. Mackenzie (London, 1870). For the works of Moritz Busch, which contain graphic pictures of his daily life, see the article Busch. There are several periodical publications devoted to the collection of documents bearing on Bismarck's life; of these much the most valuable is the *Bismarck-Jahrbuch*, edited by Horst Kohl. Herr v. Poschinger also brought out a *Bismarck Portfeuille*. There are English biographies by Charles Lowe, *Bismarck, a Political Biography* (2 vols. Lond.); revised edition in 1 vol. 1895; and by James Headlam, (Putnam's, 1899). (J. W. He.)

Bismarck Archipelago. See New Guinea and Melanesia.

Bistritz (Hungarian, *Besztercze*), an ancient town (now corporate) of Eastern Hungary, 48 miles N.E. by E. of Kolosvár; capital of the county of Besztercze-Naszód, with 12,081 inhabitants. It is surrounded with the ruins of ancient bastions and towers; but in 1857 a great portion of the old town was burnt down. There are a Lutheran church, a gymnasium, religious houses of the Minorite and Piarist orders, an agricultural school, and hospitals. Its markets are much frequented, and an active trade is carried on with Rumania.

Bitlis, or Betlis. (1) A viláyet of Asiatic Turkey, on the Armenian plateau, situated to the W. and S.W. of Lake Van. It is a high-lying pastoral and agricultural country, with fertile, well-watered plains, rich pastures, and high rugged mountains, completely disforested. The climate is healthy, but the winter, which lasts six to seven months, is severe. There are many mineral springs, and much unworked mineral wealth. Carpets and cotton cloths are made, and gum, yellow-berries, furs, &c., are exported. Population, 400,000 (Moslems, 254,000; Christians, 142,000; Yezidis, 4000). (2) The capital of the viláyet, Armenian *Paghesh*, altitude 4700 feet, picturesquely situated in the deep valley of the Bitlis Chai, on the principal road from the plateau to Mesopotamia. It has chalybeate and sulphur springs, which are much used, and is the seat of an American mission with schools for boys and girls. Bitlis has always been a turbulent city, peopled chiefly by Kúrds and Armenians, and until 1836 it was ruled by a semi-independent Kúrd Bey. On the 25th October 1895 there was a massacre of Armenians which commenced and ended by bugle-call. Population, 38,000 (Moslems, 20,500; Christians, 17,500).

Bitterfeld, a town of Prussia, province of Saxony, 26 miles N. from Leipzig by rail, on the river Mulde. It manufactures drain-pipes, paper-roofing, and machinery, and has saw-mills. Several coal-mines are in the vicinity. The town, which dates from at least the 12th century, was built by Dutch immigrants. Population (1885), 7596; (1895), 10,636; (1900), 11,839.

Biwa, a lake in the province of Omi, Japan. It measures 36 miles in length by 12 in breadth, has an area of 180 square miles, is about 330 feet above sea-level, and has an extreme depth of some 300 feet. There are only a few small islands in the lake, the principal of them being Chikubu-shima at the northern end.

Tradition alleges that Lake Biwa and the mountain of Fuji were produced simultaneously by an earthquake, in 286 B.C. On the west of the lake the mountains Hiei-zan and Hira-yama slope down almost to its margin, and on the east a wide plain extends towards the boundaries of the province of Mino. It is drained by a river flowing out of its southern end, and taking its course into the sea at Osaka. This river bears in succession the names of Seta-gawa, Uji-gawa, and Yodo-gawa. The lake abounds with fish, and the beauty of its scenery is remarkable. Small steamboats ply constantly to the points of chief interest, and around its shores are to be viewed the *Omi-no-hakkei*, or "eight landscapes of Omi"; namely, the lake silvering under an autumn moon as one looks down from Ishi-yama; the snow at eve on Hira-yama; the glow of sunset at Seta; the groves and classic temple of Mii-dera as the evening bell sounds; boats sailing

home from Yabase; cloudless peaks at Awazu; rain at nightfall over Karasaki; and wild geese sweeping down to Katata. The lake is connected with Kyoto by a canal constructed in 1890, and is thus brought into water communication with Osaka.

Bixio, Nino (1821-1873), Italian soldier, was born on 2nd October 1821. While still a boy he was compelled by his parents to embrace a maritime career. After numerous adventures he returned to Italy in 1846, joined the Giovine Italia, and, on 4th November 1847, made himself conspicuous at Genoa by seizing the bridle of Charles Albert's horse and crying, "Pass the Ticino, Sire, and we are all with you." He fought through the campaign of 1848, became captain under Garibaldi at Rome in 1849, taking prisoners an entire French battalion, and gaining the gold medal for military valour. In 1859 he commanded a Garibaldian battalion, and gained the military cross of Savoy. Joining the Marsala expedition in 1860, he turned the day in favour of Garibaldi at Calatafimi, was wounded at Palermo, but recovered in time to besiege Reggio in Calabria (21st August 1860), and, though again wounded, took part in the battle of Volturno, where his leg was broken. Elected deputy in 1861, he endeavoured to reconcile Cavour and Garibaldi. In 1866, at the head of the seventh division, he covered the Italian retreat from Custozza, refusing the Austrian invitation to surrender. Created senator in February 1870, he was in the following September given command of a division during the movement against Rome, took Cività Vecchia, and participated in the general attack upon Rome (20th September 1870). He died of cholera at Achin Bay in Sumatra *en route* for Batavia, whither he had gone in command of a commercial expedition (16th December 1873). (H. W. S.)

Bizet, Georges (properly Alexandre Charles Léopold) (1838-1875), French musical composer, was born at Bougival, near Paris, on the 25th October 1838. He displayed musical ability at an early age, and was sent to the Paris Conservatoire, where he studied under Halévy and speedily distinguished himself, carrying off prizes for organ and fugue, and finally in 1857, after an ineffectual attempt in the previous year, the Grand Prix de Rome. A success of a different kind also befell him at this time. Offenbach, then manager of the Théâtre des Bouffes-Parisiens, had organized a competition for an operetta, in which young Bizet was awarded the first prize in conjunction with Charles Lecocq, the future composer of *La Fille de Mme. Angot*. After the three years spent in Rome, an obligation imposed by the French Government on the winners of the first prize at the Conservatoire, Bizet returned to Paris, where he achieved a reputation as a pianist and accompanist. On the 23rd of September 1863, his first opera, *Les Pêcheurs de Perles*, was brought out at the Théâtre Lyrique, but owing possibly to the somewhat uninteresting nature of the story, the opera did not enjoy a very long run. The qualities displayed by the composer, however, were amply recognized, although the music was stated, by some critics, to exhibit traces of Wagnerian influence. Wagnerism at that period was a sort of spectre that haunted the imagination of many leading members of the musical press. It sufficed for a work to be at all out of the common for the epithet "Wagnerian" to be applied to it. The term, it may be said, was intended to be condemnatory, and it was applied with little understanding as to its real meaning. The score of the *Pêcheurs de Perles* contains several charming numbers; its dreamy melodies are well adapted to fit a story laid in Eastern climes, and the music reveals a decided dramatic temperament. Bizet's second opera, *La Jolie Fille de Perth*, produced at the Théâtre Lyrique on 26th December 1867, was scarcely a step in advance. Founded on Sir Walter Scott's novel, this opera lacks unity of style, and its pages are marred by concessions to the vocalist. One number has survived, the characteristic Bohemian dance which has been interpolated into the fourth act of *Carmen*. In his third opera Bizet returned to an Oriental subject. *Djamileh*, a one-act opera given at the Opéra Comique on 22nd May 1872, is certainly one of his most individual efforts. The music is impregnated with a fascinating Eastern flavour, and the entire work is a veritable artistic gem. Again were accusations of Wagnerism hurled at the composer's head, and *Djamileh* did not achieve the success it undoubtedly deserved. The composer was more fortunate with the incidental music he wrote to Alphonse Daudet's drama *L'Arlésienne*, produced in October 1872. Different numbers from this arranged in the form of suites have often been heard in the concert-room. Rarely have poetry and imagination been so well allied as in these exquisite pages, which seem to reflect the sunny skies of Provence. Bizet's masterpiece, *Carmen*, was brought out at the Opéra Comique on 3rd March 1875. Three months later the genial composer expired after a few hours' illness from a heart affection (3rd June). Before dying he had the satisfaction of knowing that *Carmen* had been accepted for production at Vienna. After the Austrian capital came Brussels, Berlin, and in 1878 London, when *Carmen* was brought out at Her Majesty's Theatre with immense success, Mme. Minnie Hauk impersonating the heroine. The influence exercised by Bizet on dramatic music has been very great, and may be discerned in the realistic works of the young Italian school, as well as in those of his own countrymen. *Carmen* may be said, in a measure, to constitute a fresh point of departure in French operatic music. Although conceived according to the ideas then in vogue at the Opéra Comique theatre, and in its original form containing spoken dialogue, it is essentially modern in spirit, new and bold in its harmonic and instrumental treatment. It clearly foreshadows the present evolution of the French "lyrical drama." (A. He.)

Björneborg (Finnish, *Pori*), a district town of Finland, government of Åbo-Björneborg, on the E. coast of the Gulf of Bothnia, at the mouth of the Kumo. Lat. 51° 8′ N., long. 46° 0′ E. Population, 11,669 in 1897, mostly Swedes. Large vessels cannot enter its roadstead, and stop at Räfsö. The town has shipbuilding wharfs, one large saw-mill, mechanical works, and several tanneries and brickworks, the aggregate returns of which are about 2,000,000 marks. Its foreign trade is considerable, the chief exports being timber, and the main imports flour and metals.

Björnson, Björnstjerne (1832-——), Norwegian poet, novelist, and dramatist, was born on the 8th December 1832, at the farmstead of Björgen, in Kvikne, in Österdalen, a very remote district of Norway. In 1837 his father, who had been priest of Kvikne, was transferred to the parish of Nœsset, in Romsdalen; in this romantic place the childhood of Björnson was spent. In 1841 he was sent to school at the neighbouring town of Molde. At the age of 17 he was sent to Christiania to study for the University; his instinct for poetry was already awakened, and indeed he had written verses from his eleventh year. He took his degree at the University of Christiania in 1852, and began to work as a journalist, especially as a dramatic critic. His progress was, however, slow. It was not until 1856 that in *Thrond*, the earliest of his short stories, he began to develop his real talent. In 1857 appeared *Synnöve Solbakken*, the first of Björnson's peasant-novels; in 1858 this was followed by *Arne*, in 1860 by *A Happy Boy*, and in 1868 by *The Fisher Maiden*. These

are the most important specimens of his "bonde-fortællinger" or peasant-tales—a section of his literary work which has made a profound impression in his own country, and has made him popular throughout the world. These novels were full of freshness and beauty combined with remarkable realism. Two of these tales, *Arne* and *Synnöve Solbakken*, are nearly perfect, and offer perhaps finer examples of the pure peasant-story than are to be found elsewhere in literature. Björnson was anxious "to create a new saga in the light of the peasant," as he put it, and he thought this should be done, not merely in prose fiction, but in national dramas or "folke-stykker." The earliest of these was *Between the Battles*, written in 1855, but not produced until 1857. It was followed by *Lame Hulda* in 1859, and *King Sverre* in 1861. All these efforts, however, were far excelled by the splendid trilogy of *Sigurd the Bastard*, which Björnson issued in 1862. This raised him to the front rank among the younger poets of Europe. His *Sigurd the Crusader* should be added to the category of these heroic plays, although it was not printed until 1872. At the close of 1857 Björnson had been appointed director of the theatre at Bergen, a post which he held, with much journalistic work, for two years, when he returned to the capital. From 1860 to 1863 he travelled widely throughout Europe. Early in 1865 he undertook the management of the Christiania theatre, and brought out his popular comedy of *The Newly Married* and his romantic tragedy of *Mary Stuart in Scotland*. Although Björnson has introduced, into his novels and plays, songs of extraordinary beauty, he has never been a very copious writer of verse; both his principal contributions to this art were collected in the year 1870, when he published his *Poems and Songs* and the spirited romance called *Arnljot Gelline;* the latter volume contains the magnificent ode called "Bergliot," Björnson's finest contribution to lyrical poetry. It has been remarked that between 1864 and 1874, in the very prime of life, Björnson displayed a slackening of the intellectual forces very remarkable in a man of his energy; he was indeed during these years mainly occupied with politics and with his business as a theatrical manager. This was the period of Björnson's most fiery propaganda as a Radical agitator. In 1871 he began to supplement his journalistic work in this direction by delivering lectures over the length and breadth of the northern countries. He possesses to a surprising degree the arts of the orator, combined with a magnificent physical prestige. From 1873 to 1876 Björnson was absent from Norway, and in the peace of voluntary exile he recovered his imaginative powers. His new departure as a dramatic author began with *The Editor* in 1874 and *A Bankruptcy* in 1875, social dramas of an extremely modern and realistic cast, the second of which has continued to be, in many countries, the piece of Björnson's which has longest kept the stage. The poet was now settled at the estate of Aulestad, in Gausdal; this house, a fine example of old Norwegian domestic architecture, has been his home since 1874 to the present day. In 1877 he published another novel, *Magnhild*, — an imperfect production, in which Björnson's ideas on social questions were seen to be in a state of fermentation,—and the polemical play called *The King*. Another story, *Captain Mansana*, an episode of the war of Italian independence, belongs to 1878. Extremely anxious to obtain a full success on the stage, Björnson concentrated his powers on the drama called *Leonarda*, which appeared in 1879. This was an appeal for religious toleration, and it raised a violent controversy. This was not allayed by a satirical play, *The New System*, which was brought out a few weeks later. Although these plays of Björnson's second period were greatly discussed, none of them (except *A Bankruptcy*) pleased on the boards. He was greatly disappointed and for some years again preserved silence as a dramatist. When once more he produced a social drama, *A Gauntlet*, in 1883, he was unable to persuade any manager to stage it at all. This was, nevertheless, one of the most skilfully composed "problem-plays" of modern times. In the autumn of the same year, Björnson published a mystical or symbolic drama (*Over Ævne, Beyond our Powers*), which was a new departure in his work and deals with the abnormal features of religious excitement with extraordinary power; this was not acted until 1899, when it achieved a great success. Björnson, convinced that the theatre was practically closed to him, turned back to the novel, and published in 1884 *Flags are Flying in Town and Port*, the first really long book he had written. In 1889 he printed another novel as lengthy, and still more remarkable, *In God's Way*, which is one of the works by which he is most widely known outside his native country. The same year saw the publication of a comedy, *Geography and Love*, which was acted, and continues to be played, with success. A number of short stories, of a more or less didactic character, dealing with startling points of emotional experience, were collected in 1894; among them those which produced the greatest sensation were *Dust*, *Mother's Hands*, and *Absalon's Hair*. Björnson's latest writings have been a political tragedy called *Paul Lange and Tora Parsberg*, a second part of *Beyond our Powers*, and a drama, *Laboremus*. In 1899, at the opening of the National Theatre, Björnson, whose popularity in Norway is unbounded, received an ovation, and his saga-drama of *Sigurd the Crusader* was put on the boards with great magnificence. A subject which interested him greatly, and on which he has occupied his indefatigable pen, is the question of the "bonde-maal," the adopting of a national language for Norway distinct from the "dansk-norsk" (Dano-Norwegian), in which her literature has hitherto been written. Björnson's strong and sometimes rather narrow patriotism has not blinded him to the fatal folly of such a proposal, and his lectures and pamphlets against the "maalstrœv" in its extreme form have done more than anything else to save the language in this dangerous moment.

BJÖRNSTJERNE BJÖRNSON.
(*From a photograph by Otto, Paris.*)

Black, William (1841-1898), British novelist, was born at Glasgow in 1841. His early ambition was to be a painter, but he made no way, and soon had recourse to journalism for a living. He was at first employed in newspaper offices in Glasgow, but obtained a post on the *Morning Star* in London, and at once proved himself a descriptive writer of exceptional vivacity. During the war between Prussia and Austria in 1866 he represented the *Morning Star* at the front, and was taken prisoner. This paper shortly afterwards failed, and Black joined the editorial staff of the *Daily News*. He also

edited the *Examiner*, at a time when that periodical was already moribund. After his first success in fiction, he gave up journalism, and devoted himself entirely to the production of novels. For nearly thirty years he was industriously successful in retaining the popular favour. He died at Brighton, 10th December 1898, without having experienced any of that reaction of the public taste which so often follows upon conspicuous successes in fiction. Black's first novel, *James Merle*, published in 1864, was a complete failure; his second, *Love and Marriage* (1868), attracted but very slight attention. But in 1871 *A Daughter of Heth* suddenly raised him to the height of popularity, and he followed up this success by a string of favourites. Among the best of his books are *The Strange Adventures of a Phaeton*, 1872; *A Princess of Thule*, 1873; *Madcap Violet*, 1876; *Macleod of Dare*, 1878; *White Wings*, 1880; *Sunrise*, 1880; *Shandon Bells*, 1883; *White Heather*, 1885; *Donald Ross of Heimra*, 1891; *Highland Cousins*, 1894; and *Wild Eelin*, 1898. Black was a thoroughgoing sportsman, particularly fond of fishing and yachting, and his best stories are those which are laid amid the breezy mountains of his native land, or upon the deck of a yacht at sea off its wild coast. His descriptions of such scenery are simple and picturesque. He was a word-painter rather than a student of human nature. His women are stronger than his men, and among them are many wayward and lovable creatures; but subtlety of intuition plays no part in his characterization. Black also contributed a life of Oliver Goldsmith to the *English Men of Letters* series. (A. WA.)

Blackburn, a municipal (extended 1879), county (1888), and parliamentary borough of Lancashire, England, on the Brook, 24 miles N.N.W. of Manchester, 210 miles by rail N.N.W. of London. In 1877 the municipal and parliamentary boroughs became co-extensive, and in 1892 their area was constituted the township of Blackburn, and distributed into 14 wards, under a mayor, 14 aldermen, and 42 councillors. Besides the parish church, there are 70 churches and chapels. Of recent institution are a fish market (1874); municipal offices (1880); a chamber of commerce (1887); a free library (1873, extended 1893); additions to the infirmary in 1884, 1896, and 1897; a municipal technical school, opened in 1891 and extended in 1894, attended (1901) by 1800 students; new and enlarged buildings for the grammar school (1884); a theatre rebuilt in 1886; and the Queen's Park (1887). The cotton industry employs thousands of operatives, the iron trade is also very considerable, and many are engaged in the making of machines; but the woollen manufacture has become practically extinct. There are two daily newspapers. Its area covers 6974 acres. Population (1881), 104,014; (1891), 120,064; (1901), 127,527.

Blackburn, Colin, BARON (1813-1896), British judge, was born in Selkirkshire in 1813, and educated at Eton and at Trinity College, Cambridge, where he took very high mathematical honours in 1835. He was called to the bar in 1838, and went the northern circuit. His progress was at first slow, and he employed himself in reporting and editing along with Mr Ellis eight volumes of the highly-esteemed Ellis and Blackburn reports. His deficiency in all the more brilliant qualities of the advocate almost confined his practice to commercial cases, in which he obtained considerable employment in his circuit; but he continued to belong to the outside bar, and was so little known to the legal world that his promotion to a puisne judgeship in the Court of Queen's Bench in 1859 was at first ascribed to Lord Campbell's partiality for his countrymen, but Lord Lyndhurst, Lord Wensleydale, and Lord Cranworth came forward to defend the appointment. Blackburn himself is said to have thought that a county court judgeship was about to be offered him, which he had resolved to decline. He soon proved himself one of the soundest lawyers on the bench, and when he was promoted to the Court of Appeal was considered the highest authority on common law. In 1876 he was made a Lord of Appeal and a life peer. Both in this capacity and as judge of the Queen's Bench he delivered many judgments of the highest importance, and no decisions have been received with greater respect. In 1886 he was appointed a member of the commission charged to prepare a digest of the criminal law, but retired on account of indisposition in the following year. He died on 8th January 1896. He was the author of a valuable work on the *Law of Sales*.

Black Hills, an isolated group of mountains in the western part of South Dakota and Eastern Wyoming, U.S.A., rising three to four thousand feet above their base, the highest peak, Harney, having an altitude above the sea of 7216 feet. The mass has an elliptical shape, its longer axis trending nearly north-west and south-east. The hills are structural in their origin, being formed by a short, broad, anticlinal fold, which is flat or nearly so on its summit. From this fold the stratified beds have in large part been removed, the more recent having been entirely eroded from the elevated mass. The edges of these are now found encircling the mountains, and forming a series of fairly continuous rims of hogbacks. The Carboniferous and older stratified beds still cover the west half of the hills, while from the eastern half they have been removed, exposing the granite. The hills were formerly within the range of the Sioux Indians, but rich gold placers were discovered, and in 1875 the Indians were removed. Subsequently low-grade quartz mines were found and developed, and at present furnish a notable part of the gold supply of the country.

Blackie, John Stuart (1809-1895), Scottish scholar and man of letters, was born in Glasgow, 28th July 1809. He was educated at the New Academy, and afterwards at the Marischal College, in Aberdeen, where his father had established himself as banking agent. After attending classes at Edinburgh University, Blackie spent two years at Aberdeen University as a student of theology; but the two succeeding years, which he spent abroad, extinguished his wish to enter the Church, and he somewhat unwillingly gave himself up, at his father's desire, to the study of law. By the time he was admitted a member of the Faculty of Advocates he had acquired a strong love of the classics and a taste for letters in general. A translation of *Faust*, which he published in 1834, met with considerable success. After a year or two of desultory literary work he was (in May 1839) appointed to the newly-instituted Latin chair in the Marischal College, Aberdeen. Difficulties arose in the way of his installation, owing to the action of the Presbytery on his refusing to sign unreservedly the Confession of Faith; but these were eventually overcome, and he took up his duties as professor in November 1841. In the following year he married. From the first his professorial lectures were conspicuous for the unconventional enthusiasm with which he endeavoured to revivify the study of the classics; and his growing reputation, added to the attention excited by a translation of Æschylus which he published in 1850, led to his appointment in 1852 to the professorship of Greek at Edinburgh University, a post which he continued to hold for thirty years. He was somewhat too erratic in his methods to be a great teacher, but his lectures were a triumph of personality. "Greek as a living language"

was a favourite theme of his, especially in his later years; and before his death he endowed a travelling scholarship to enable students to learn Greek at Athens. Scottish nationality was another source of enthusiasm with him; and in this connexion he displayed real sympathy with Highland home life and the grievances of the crofters. The foundation of the Celtic chair at Edinburgh University was mainly due to his efforts. In spite of the many calls upon his time he produced a considerable amount of literary work, usually on classical or Scottish subjects, including some poems and songs of no mean order. His life to its close was full of activity, and invariably gave the impression of being resolutely happy. He died in Edinburgh on 2nd March 1895. His published works include (besides several volumes of verse) *Horæ Hellenicæ* (1874), *The Language and Literature of the Scottish Highlands* (1876), *Lay Sermons* (1881), *Altavona* (1882), *Life of Burns* (1888), *Scottish Song* (1889), *Essays on Subjects of Moral and Social Interest* (1890), *Christianity and the Ideal of Humanity* (1893). (R. F. S.)

Blackmore, Richard Doddridge (1825-1900), English novelist, was born 9th June 1825 at Longworth, Berks, of which village his father was rector. He was educated at Blundell's School, Tiverton, and Exeter College, Oxford, where he obtained a scholarship. In 1847 he was placed in the second class in *Literæ Humaniores*, and took his degree. Two years later he entered as a student at the Middle Temple, and was called to the Bar in 1852. His first publication was a volume of *Poems by Melanter*, 1854, which showed no particular promise, nor did the succeeding volume *Epullia*, 1855, suggest that Blackmore had the makings of a poet. He was nevertheless enthusiastically sincere in his desire to follow literature as a profession; and when, a few years later, the complete breakdown of his health rendered it clear that he must remove from London, he determined to combine a literary life in the country with a business career as a market-gardener. He acquired land at Teddington, and set earnestly to work, the literary fruits of his new surroundings being a translation of the *Georgics* published in 1862. Verse, however, was clearly not his strong point, and when in 1864 he published his first novel, *Clara Vaughan*, several critics were prompt in recognizing its merit. *Cradock Nowell*, which followed it in 1865, was also praised; but neither story made much way with the general public. In 1869, however, he suddenly sprang into fame. *Lorna Doone*, which was published in that year, was a pioneer in the romantic revival; and appearing at a jaded hour, it was presently recognized as a work of singular charm, vigour, and imagination. Its success could scarcely be repeated, and though Blackmore wrote many other capital stories, of which the best known are, *The Maid of Sker* (1872), *Christowell* (1880), and *Perlycross* (1894), he will always be remembered almost exclusively as the author of *Lorna Doone*. He continued his quiet country life to the last, and died at Teddington, 20th January 1900, in his seventy-fifth year. *Lorna Doone* has faults of construction and exaggeration, but it is from every point of view a fine and picturesque romance. It has the true out-of-door atmosphere, is shot through and through with adventurous spirit, and in its dramatic moments shows both vigour and intensity. The heroine, though she is invested with qualities of faëry which are scarcely human, is an idyllic and haunting figure; and the bluff hero is, both in purpose and achievement, a veritable giant of romance. The story is almost a classic of the West country, and the many pilgrimages that are made annually to the Doone Valley (the actual characteristics of which differ materially from the descriptions given in the novel) are entirely inspired by the buoyant imagination of Richard Blackmore. (A. WA.)

Blackpool, a municipal borough (1876) and seaside resort in the Blackpool parliamentary division of Lancashire, England, 46 miles N. of Liverpool by rail. The town, which is quite modern, contains many churches and chapels of all denominations, a new town hall, public libraries, the Victoria hospital, three piers, theatres, ballrooms, and other places of public amusement, including a tower 518 feet high and a "big wheel." New promenades, consisting of higher and lower walks, have recently been completed at a cost of upwards of £100,000, and the old promenade is in course of being widened and extended at an authorized cost of £350,000. When completed it will be 3 miles long. Area of borough, exclusive of foreshore, 3496 acres; including foreshore, 4244 acres. Population (1881), 14,229; (1891), 23,846; (1901), 47,346, or practically double. The return of inhabited houses shows a similar result, the number for 1891 being 4921, and for 1901, 9945.

Black Sea, The.—The conditions that prevail in the Black Sea are very different from those of the Mediterranean or any other sea. The existence of sulphuretted hydrogen in great quantities below 100 fathoms, the extensive chemical precipitation of calcium carbonate, the stagnant nature of its deep waters, and the absence of deep-sea life are conditions which make it impossible to discuss it along with the physical and biological conditions of the Mediterranean proper. In outline the Black Sea is kidney-shaped and lies almost entirely between the latitudes 41° and 45° N., extending to about 47° N. near Odessa. It is bounded on the N. by the southern coast of Russia; on the W. by Rumania, Turkey, and Bulgaria; on the S. and E. by Asia Minor. The northern boundary is broken at Kertch by a strait entering into the Sea of Azof, and at the junction of the western and southern boundary is the Bosporus, which unites the Black Sea with the Mediterranean through the Sea of Marmora and the Dardanelles. The 100-fathom line is about 10 to 20 miles from the shore except in the north-west corner between Varna and Sebastopol, where it extends 140 miles seawards. The greatest depth is 1030 fathoms[1] near the centre, there being only one basin. The steepest incline outside 100 fathoms is to the south-east of the Crimea and at Amastra; the incline to the greater depths is also steep off the Caucasus and between Trebizond and Batum.

The depths of the Black Sea are lifeless, higher organic life not being known to exist below 100 fathoms. Fossiliferous remains of *Dreissena*, *Cardium*, and other molluscs have, however, been dredged up, which help to show that conditions formerly existed in the Black Sea similar to those that exist at the present day in the Caspian Sea. According to Andrusof, when the union of the Black Sea with the Mediterranean through the Bosporus took place, salt water rushed into it along the bottom of the Bosporus and killed the fauna of the less saline waters. This gave rise to a production of sulphuretted hydrogen which is found in the deposits, as well as in the deeper waters.

Observations in temperature and salinity have only been taken during summer. During summer the surface salinity of the Black Sea is from 1·70 to 2·00 per cent. down to 50 fathoms, whereas in the greater depths it attains a salinity of 2·25 per cent. The temperature is rather remarkable, there being an intermediate cold layer between 25 and 50 fathoms. This is due to the sinking of the cold surface water (which in winter reaches freezing-point) on to the top of the denser more saline water of the greater depths. There is thus a minimum circulation in the greater depths causing there uniformity of temperature, an absence of the circulation of oxygen by other means than diffusion, and a protection of the sulphuretted hydrogen from the oxidation which takes place in homologous situations in the open ocean. The temperature down to 25 fathoms is from 78·3° to 46·2° F., and in the cold layer,

[1] 1227 Russian fathoms.

between 25 and 50 fathoms, is from 46·2° to 43·5° F., rising again in greater depths to 48·2° F.

The *Sea of Marmora* may be looked upon as an arm of the Ægean Sea and thus part of the Mediterranean proper. Its salinity is comparable to that of the eastern basin of the Mediterranean, which is greater than that of the Black Sea, viz. 4 per cent. Similar currents exist in the Bosporus to those of the Strait of Gibraltar. Water of less salinity flows outwards from the Black Sea as an upper current, and water of greater salinity from the Sea of Marmora flows into the Black Sea as an under-current. This under-current flows towards Cape Tarhangut, where it divides into a left and right branch. The left branch is appreciably noticed near Odessa and the north-west corner; the right branch sweeps past the Crimea, strikes the Caucasian shore (where it comes to the surface running across, but not into, the south-east corner of the Black Sea), and finally disperses flowing westwards along the northern coast of Asia Minor between Cape Jason and Sinope. This current causes a warmer climate where it strikes. So marked is this current that it has to be taken into account in the navigation of the Black Sea.

The *Sea of Azof* is exceedingly shallow, being only about 6 fathoms in its deepest part, and it is largely influenced by the river Don. Its water is considerably fresher than the Black Sea, varying from 1·55 to 0·68 per cent. It freezes more readily and is not affected by the Mediterranean current.

Little is known of the fauna and flora of the Black Sea, although plankton, nekton, and benthos exist down to 100 fathoms. It appears to be related to that of the Mediterranean. The debris of these animals and plants, falling to the greater depths, helps to keep up the supply of sulphuretted hydrogen, probably with the aid of anaerobic bacteria. The deposits contain remains of pelagic and shore diatoms, foraminifera, and other protozoa, sponge spicules, fish bones, &c. The formation of sulphuretted hydrogen in the depths is accompanied by two processes; a continual sinking of fine deposit of calcium carbonate and the formation of ferrous sulphide, which depends on the accumulation of deposits capable of changing it to pyrites. Probably also free sulphur will be found to exist in the deposits. Laminated ooze has been taken; when dried it appears in white and yellow layers, the white being mostly calcium carbonate. The lamination of the ooze may be due to the seasonal fluctuations of deposits brought down by great rivers, such as the Danube, which brings down 228 times as much sediment in full as in low water. Part of the sulphuretted hydrogen forms ferrous sulphide at the bottom, which occurs in all deposits, especially in gray ooze, and fills the cells of coscinodiscus and the pipe-like shells of rhizosolenia, and the inside of diatoms. The conditions both in the Dardanelles and the Bosporus were examined very carefully in the year 1872 by Captain (afterwards Admiral Sir) William Wharton of H.M.S. *Shearwater*, and his results were published in an interesting report to the Admiralty of that date.

It is remarkable that the comparatively fresh water of the Black Sea persists without sensible mixture through the Sea of Marmora and into the Dardanelles. The depth in the two channels is only from 30 to 50 fathoms, and the dimensions of the strait are too small to make the phenomenon of any importance for the supply of the Mediterranean. Were the exit of the Black Sea a channel with sufficient fall to bring the surface of the Sea of Marmora below the level of the highest part of its bottom, so that no return current could take place, the waters of the Black Sea would be fresh. (J. Y. B.)

Blackstone, a town of Worcester county, Massachusetts, U.S.A., situated in the southern part of the state, has an area of 17 square miles, bordering on the Connecticut line. The principal village bears the same name, and is on the Blackstone river, and the New York, New Haven, and Hartford railway. It is at an altitude of 200 feet, and is regularly laid out. Population of the town (1880), 4907; (1900), 5721.

Blaenavon, a town, urban district, railway station, and parish in the northern parliamentary division of Monmouthshire, England, on the river Avon Lwyd or Torvaen. There are very extensive iron, steel, and coal works, with blast furnaces and rolling mills in the district. Population of urban district (area, 4105 acres) (1901), 10,869.

Blagodat, a mountain of Russia, government of Perm, on the eastern slope of the Ural Mountains, 13 miles from the main range, and near to Kushvinsk ironworks. Altitude about 1270 feet. It contains the largest deposits of magnetic iron hitherto known in the world, and, with the Vysokaya, Magnitnaya and Kachkanar mountains of the Urals, belongs to the same type as the "Iron Mountain" in Missouri and Taberg in Sweden. Its western slope consists of various augitic rocks, while on its top and southern slope large deposits of magnetic iron (occasionally crystalline) are found. The ore is extracted to the amount of from 400,000 to 540,000 metric quintals, and is worked at the Goro-Blagodat ironworks.

Blagovyeschensk, a town of East Siberia, chief town of the Amur province, on the left bank of the Amur, near its confluence with the Zeya, 50° 15′ N., 127° 38′ E.; altitude about 500 feet. The Chinese village Sakhalin is opposite it, and the town of Aihun is 20 miles below on the left bank of the Amur. Founded in 1858, the town has progressed since, and had in 1897, 32,606 inhabitants. There are several steam flour-mills and one ironworks. It is now a centre for tea exported to Russia, and cattle brought from Transbaikalia and Mongolia, *viâ* Merghen, for the Amur, as well as for all sorts of provisions, &c., shipped to the lower Amur. It has gymnasia for boys and girls, a seminarium, and 7 other schools, and is the seat of the bishop of Amur and Kamchatka.

Blaine, James Gillespie (1830-1893), American statesman, was born in West Brownsville, Pa., 31st January 1830, of sturdy Scottish-Irish stock on his father's side. With many early evidences of literary capacity and political aptitude, he graduated at Washington College, Pennsylvania, in 1847, and spent a few years in teaching. Settling in Augusta, Maine, in 1854, he became editor of the *Kennebec Journal*, and subsequently of the *Portland Advertiser*. But his editorial work was speedily abandoned for a more active public career. He was elected to the Legislature in 1858, serving four years, the last two as Speaker. At the same time he became chairman of the Republican State Committee, and for twenty years personally directed every campaign of his party. In 1862 he was elected to Congress, continuing in the House fourteen years, followed by four years in the Senate. He was chosen Speaker in 1869 and served three terms. The House was the fit arena for his political and parliamentary ability. He was a ready and powerful debater, full of resource, and dexterous in controversy. The tempestuous politics of the war and reconstruction period suited his aggressive nature and constructive talent. The measures for the rehabilitation of the States that had engaged in rebellion occupied the chief attention of Congress for several years, and Mr Blaine bore a leading part in framing and discussing them. The primary question related to the basis of representation upon which they should be restored to their full rank in the political system. A powerful section contended that the basis should be the body of legal voters, on the ground that the South could not then secure an increment of political power on account of the emancipated blacks unless they were admitted to political rights. Mr Blaine, on the other hand, contended that representation should be based on population instead of voters, as being fairer to the North, where the ratio of voters varied widely, and he insisted that it should be safeguarded by security for impartial suffrage. This view prevailed, and the fourteenth amendment to the constitution was substantially Mr Blaine's proposition. In the same spirit he opposed a scheme of military governments for the Southern States, unless associated with a plan by which, upon the acceptance of prescribed conditions, they could release themselves from military rule and resume civil government. He was the first in Congress to oppose the claim, which gained momentary and widespread favour in 1867, that the public debt, pledged in coin, should be paid in greenbacks. The protection of naturalized citizens who, on return to

their native land, were subject to prosecution on charges of disloyalty, enlisted his active interest and support, and the agitation in which he was conspicuous led to the treaty of 1870 between the United States and Great Britain, which placed adopted and native citizens on the same footing.

As the presidential election of 1876 approached, Mr Blaine was clearly the popular favourite of his party. In the Republican National Convention he missed by only twenty-eight votes nomination for President, being finally beaten by a combination of all the other candidates. Thereupon, through a vacancy, he entered the Senate, where his activity was unabated. Currency legislation was specially prominent. Blaine, who had previously opposed greenback inflation, now resisted depreciated silver coinage. He was the earnest champion of the advancement of American shipping, and advocating liberal subsidies, insisted that the policy of protection should be applied on the sea as well as on land. The National Convention of 1880, divided between the two nearly equal forces of Blaine and Grant, struggled through thirty-six ballots, when the friends of Blaine succeeded in nominating General Garfield. In the new Administration Blaine became Secretary of State, but, through the assassination of the President, held the office only a few months. His brief service was distinguished by several notable steps. In order to promote the friendly understanding and co-operation of the nations on the American continent he projected a Pan-American Congress, which, after being arranged for, was frustrated by his retirement. He also sought to secure a modification of the Clayton-Bulwer treaty, and in an extended correspondence with the British Government strongly asserted the policy of an exclusive American control of any isthmian canal.

With undiminished hold on the imagination and devotion of his followers he was nominated for President in 1884. After a heated canvass, in which he made a series of brilliant speeches, he was beaten by a narrow margin in New York. Refusing to be a candidate in 1888, he became Secretary of State under President Harrison, and resumed his work which had been interrupted nearly eight years before. The Pan-American Congress, then projected, now met in Washington, and Blaine, as its master spirit, presided over and guided its deliberations through its session of five months. Its most important conclusions were for reciprocity in trade, a continental railway, and compulsory arbitration in international complications. Shaping the tariff legislation for this policy, Blaine negotiated a large number of reciprocity treaties which augmented the commerce of his country. He upheld American rights in Samoa, pursued vigorous diplomacy with Italy over the New Orleans lynchings, held a firm attitude through the Chilian complications and the Barrundia affair, and carried on with Great Britain a resolute controversy over the seal fisheries of Bering Sea,—a difference afterwards settled by arbitration. He resigned on the eve of the National Convention of 1892, wherein his name was ineffectually used, and died at Washington, D.C., on 27th January 1893. During his later years of leisure he wrote *Twenty Years in Congress*, a brilliant historical work in two volumes. Of singularly alert faculties, with remarkable knowledge of the men and history of his country, and an extraordinary memory, his masterful talent for politics and statecraft, together with his captivating manner and engaging personality, gave him, for nearly two decades, an unrivalled hold upon the fealty and affection of his party. (C. E. S.)

Blair, Francis Preston (1821-1875), American soldier and politician, was born in Lexington, Kentucky, and died in St Louis, Missouri, 8th July 1875. He was educated at Princeton College, and, in 1843, began the practice of law in St Louis. In succession he served in the Mexican war, was a Democratic editor, and a member of the Missouri legislature. He was elected as a Republican to the national House of Representatives in 1856, 1860, 1862. Vigorous measures on his part were instrumental in preventing Missouri from joining the Confederacy. He became colonel of volunteers in 1861, rose to the rank of major-general, and performed important military services. He strenuously opposed the congressional plan of reconstruction, and in 1868 was the Democratic candidate for the vice-presidency. To fill an unexpired term, he was United States Senator from Missouri, 1871-73.

Blairgowrie, a police burgh of Perthshire, Scotland, finely situated on the Ericht, at the terminus of a branch of the Caledonian railway, 20 miles N.E. of Perth. The town is entirely modern, and owes its progress to the water-power supplied by the Ericht for linen and jute factories. There are also sawmills and a large factory for bee appliances. Strawberries, raspberries, and other fruit are largely grown in the neighbourhood. Among the public buildings are the town hall and the mechanics' institute. A public park was presented to the town in 1892. Population (1881), 4537; (1891), 3714; (1901), 3377.

Blanc, Jean Joseph Charles Louis, generally known as Louis Blanc (1811-1882), French politician and historian, was born on 29th October 1811 at Madrid, where his father held the post of inspector-general of finance under Joseph Bonaparte. Failing to receive aid from Pozzo di Borgo, his mother's uncle, Louis Blanc studied law in Paris and became a contributor to various journals. In 1839 appeared his *L'Organisation du travail*. The principles laid down in this famous essay form the key to Louis Blanc's whole political career. He attributes all the evils that afflict society to the pressure of competition, whereby the weaker are driven to the wall. He demanded the equalization of wages, and the merging of personal interests in the common good—"à chacun selon ses besoins, de chacun selon ses facultés." This was to be effected by the establishment of "social workshops," a sort of combined co-operative society and trade-union, where the workmen in each trade were to unite their efforts for their common benefit. On the outbreak of the Revolution of 1848 Louis Blanc became Minister of Labour, and presided over the "Commission du gouvernement pour les travailleurs," which served only to air a great variety of theories. He was generally held responsible for the establishment of national workshops, which were really due to the Minister of Public Works, Marie, and were, on the confession both of Lamartine and of the director of the workshops, Émile Thomas, intended to counteract Blanc's influence. Nevertheless, the failure of this attempt to provide for thousands of idle or incompetent workmen, for whom no real work could be found, undermined Blanc's position; and after the abortive Socialist movement of 15th May, the triumph of the Moderates obliged him, after suffering personal violence, to flee, first to Belgium, and thence to London. Ten years later he published (in English) a defence of his share in the Revolution under the title of *1848: Historical Revelations*. As far back as 1839 Louis Blanc had vehemently opposed the idea of a Napoleonic restoration, predicting that it would be "despotism without glory," "the Empire without the Emperor." He therefore remained in exile till the fall of the Second Empire in 1870. In the following February he was elected a

member of the National Assembly, and protested passionately against the peace-proposals. Though a member of the extreme Left, he was too clear-minded to sympathize with the Commune, but exerted his influence in vain on the side of moderation. In 1878 he advocated the abolition of the Presidency and the Senate, with unlimited right of association and freedom of the press. His last important act was to obtain an amnesty for the Communists. He died at Cannes on 6th December 1882, and on 12th December received a public funeral in Père-Lachaise. As a historian Louis Blanc obtained most success with his *Histoire de dix ans, 1830-1840* (1841-44). During his stay in England he utilized the collection of French revolutionary tracts at the British Museum, as the basis of the greater part of his *Histoire de la Révolution Française* (1847-62). He possessed a picturesque and vivid style, and considerable power of research; but the fervour with which he expressed his convictions, while placing him in the first rank of orators, too often degraded his historical writings into political pamphlets. His most important works, besides those already mentioned, are *Lettres sur l'Angleterre* (1866-67), *Dix années de l'histoire de l'Angleterre* (1879-81), and *Questions d'aujourd'hui et de demain* (1873-84). (H. Sy.)

Blanc, Le, chief town of arrondissement, department of Indre, France, 27 miles W.S.W. of Chateauroux, on the railway from Paris to Agen, and on the Creuse, which divides it into two parts, an upper and a lower town. It has manufactures of cloth, agricultural implements, and tools, wool- and hemp-spinning and tanning, and trade in horses. The town (anciently *Fines*, later *Oblincum*, and in the 15th century *Naillac*, from the baronial family who then held possession of it) was a frontier fortress of the province of Berry. It is well built, and has the remains of three ancient castles and the church of St. Genitour, parts of which date from the 12th century. Population (1881), 4614; (1896), 4971, comm., 6253.

Blandford, or Blandford Forum, a municipal borough, market town, and railway station, in the Northern parliamentary division of Dorsetshire, England, on the Stour, 16 miles N.E. of Dorchester. The town is an ancient one, and has a town hall, cottage hospital, a grammar school (founded 1521 at Milton Abbas, transferred to Blandford 1775), and Blue Coat school (1729). There are other educational charities. Antiquarian remains are found in the district, and the Chalk abounds in fossils. Lord Portman has recently built a fine new mansion on the high ground in place of the old "Bryanston" near the river. Area, 145 acres; population (1881), 3753; (1901), 3649.

Blankenberghe, a seaport town of Belgium, in the province of West Flanders, on the North Sea, 9½ miles N.N.W. of Bruges, with which it is connected by rail. A canal from this town unites, a little to the west of Bruges, with the Bruges-Ostend canal. The popularity of the place as a bathing resort is growing, and it now receives about 30,000 visitors annually. A dyke, forming a handsome promenade, a mile long, has been constructed along the dunes, and there are a casino, large hotels, and villas. Population (comm.) (1890), 4116.

Blankenburg, a town and health resort of Germany, duchy of Brunswick, at the N. foot of the Harz Mountains, 12 miles by rail S.W. from Halberstadt. It has been in large part rebuilt since a fire in 1836, and possesses a castle, with various collections, a museum of antiquities, an old town hall, and churches. There are pine-needle baths and a hospital for nervous diseases. Gardening is a speciality. Population (1885), 6010; (1895), 9289; (1901), 10,173.

Blanqui, Louis Auguste (1805-1881), French publicist, was born on 8th February 1805 at Puget-Théniers, where his father, Jean Dominique Blanqui, was at that time sub-prefect. He studied both law and medicine, but found his real vocation in politics, and at once constituted himself a champion of the most advanced opinions. He took an active part in the Revolution of July 1830, and continuing to maintain the doctrine of republicanism during the reign of Louis Philippe, was condemned to repeated terms of imprisonment. Implicated in the armed outbreak of the *Société des Saisons*, of which he was a leading spirit, he was in the following year, 1840, condemned to death, a sentence that was afterwards commuted to imprisonment for life. He was released by the Revolution of 1848, only to resume his attacks on existing institutions. The Revolution, he declared, was a mere change of name. The violence of the *Société républicaine centrale*, which was founded by Blanqui to demand a modification of the government, brought him into conflict with the more moderate Republicans, and in 1849 he was condemned to ten years' imprisonment. In 1865, while serving a further term of imprisonment under the Empire, he contrived to escape, and henceforth continued his propaganda against the Government from abroad, until the general amnesty of 1869 enabled him to return to France. Blanqui's leaning towards violent measures was illustrated in 1870 by two unsuccessful armed demonstrations: one at the funeral of Victor Noir on 12th January; the other on 14th August, when he led an attempt to seize some guns at a barrack. Upon the fall of the Empire, through the Revolution of 4th September, Blanqui established the club and journal *La patrie en danger*. He was one of the band that for a moment seized the reins of power on 31st October, and for his share in that outbreak he was again condemned to death on 10th March of the following year. A few days afterwards the insurrection which established the Commune broke out, and Blanqui was elected a member of the insurgent government, but his detention in prison prevented him from taking an active part. Nevertheless he was in 1872 condemned along with the other members of the Commune to transportation; but on account of his broken health this sentence was commuted to one of imprisonment. In 1879 he was elected a deputy for Bordeaux; although the election was pronounced invalid, Blanqui was set at liberty, and at once resumed his work of agitation. At the end of 1880, after a speech at a revolutionary meeting in Paris, he was struck down by apoplexy, and expired on 1st January 1881. Blanqui's uncompromising communism, and his determination to enforce it by violence, necessarily brought him into conflict with every French Government, and half his life was spent in prison. Besides his innumerable contributions to journalism, he published an astronomical work entitled *L'Éternité par les astres* (1872), and after his death his writings on economic and social questions were collected under the title of *Critique sociale* (1885) (H. Sy.)

Blantyre, a parish in Lanarkshire, Scotland, S.E. of Glasgow, containing High Blantyre, Low Blantyre, Stonefield, and several villages, besides stations. High Blantyre had a population of 7836 in 1891. Low Blantyre (1505) has a weaving factory, successor to one in which David Livingstone, born in Blantyre Works village, worked as a boy. Stonefield (5581) has a purely mining population. Coal and limestone are worked in the parish. The population of Blantyre parish in 1901 was 14,151.

Blantyre (*Africa*). See British Central Africa.

Blasting. See Mining.

Blavatsky, Helena Paulovna (1831-1891), Russian theosophist, was born at Ekaterinoslav, Russia, 31st July (O.S.) 1831. She is stated to have been the daughter of Peter Hahn, a Russian officer. An unruly girl, she sought emancipation from family ties by marrying in her 17th year (7th July 1848) Nicephore Blavatsky, a Russian official in Caucasia, from whom she was separated after a few months of stormy conjugal life. In later days, when seeking to invest herself with a halo of virginity, she described the marriage as a nominal one, and her bridegroom as "a plumeless raven nearer seventy than sixty." If this statement were true, M. Blavatsky, who was reported as still living in 1895, would then have been considerably over 110 years of age. During the twenty years that followed the separation from her husband, Mme. Blavatsky travelled and probably gained experience as a spiritualistic medium in large cities, among which it is believed that she visited Paris, Cairo, New Orleans, Tokio, and Calcutta. The period 1848-58 was alluded to subsequently as the veiled period of her life, and she spoke vaguely of a seven years' sojourn in "Little and Great Tibet" or preferably of a "Himalayan retreat." In 1858 she revisited Russia, where she created a considerable sensation as a spiritualistic medium. Early in the 'seventies she acquired prominence among the spiritualists of the United States, and was mixed up in the Eddy Brothers and Katie King frauds. Her leisure was occupied with the study of occult and cabalistic literature, to which was soon to be added that of the sacred writings of India, though these had to be approached through the medium of translations. In 1875 she conceived the plan of combining the spiritualistic "control" with the Buddhistic legends about Tibetan sages or wonder-working adepts. Henceforth she determined to exclude all control save that of two Tibetan adepts or "mahatmas," called respectively Koot Hoomi and Morya. The mahatmas exhibited their "astral bodies" to her, "precipitated" messages which reached her from the confines of Tibet in an instant of time, supplied her with sound doctrine, and incited her to perform tricks for the conversion of sceptics. At New York, in October 1875, with the aid of Colonel Olcott, she definitely launched the "Theosophical Society," which was formed out of a group of disillusioned spiritualists, and had for its avowed objects to put down spiritualism, to convert the materialists, and to prove the existence of the Tibetan brothers. The Brahmanic and Buddhistic literatures supplied the society with a technical vocabulary, and its doctrines were a curious amalgam of Egyptian, cabalistic, occultist, Indian, and modern spiritualistic ideas and formulas. The two leading text-books, *Isis Unveiled* (1877), and *The Secret Doctrine* (1888), both compiled by Madame Blavatsky, are a mosaic of unacknowledged quotations from well-known works, as Mackenzie's *Masonic Cyclopædia*, King's *Gnostics*, Zeller's *Plato*, the works on magic by Dunlop, Salverte, Ennemoser, and Des Mousseaux, but above all from the mystical writings of Eliphas Levi. She took great pains with *A Glossary of Theosophical Terms* (1890-92), compiled for the benefit of the "flap-doodles," as in moments of candour she called her disciples. But the appearance of Home's *Lights and Shadows of Spiritualism* (1877) had a prejudicial effect upon the propaganda, and Heliona P. Blavatsky (as she began to style herself) sought temporary obscurity in India. Thence she contributed some clever papers, "From the Caves and Jungles of Hindostan," to the *Russky Vyestnik*. Defeated in her object of obtaining employment in the Russian secret service, she resumed her efforts to gain converts to theosophy. For this purpose the exhibition of "physical phenomena" was found necessary. The jugglery which she practised was cleverly conceived, but carelessly executed, and on three distinct occasions the elaborate system of trickery to which she resorted was exposed in the most conclusive manner. Nevertheless, Madame Blavatsky's extraordinary cleverness, volubility, energy, and will power enabled her to maintain her ground, and when she died on 8th May 1891 (White Lotus Day), at the Theosophical headquarters in Avenue Road, Regent's Park, London, she was the acknowledged head of a community numbering not far short of 100,000, with journals in London, Paris, New York, and Madras. Much information respecting her will be found in Solovyoff's *Modern Priestess of Isis*, translated by Walter Leaf (1895), in Arthur Lillie's *Madame Blavatsky and her Theosophy* (1895), and in the report made to the Society for Psychical Research by the Cambridge graduate despatched to investigate her doings in India. In personal appearance the "old one," as Madame was familiarly called by her following, has been described as globular in shape, with a dull gray complexion, a far from attractive physiognomy, and eyes like discoloured turquoises. Yet she certainly fascinated those who came in contact with her, even those of her colleagues whom her "fibs" and indiscretions kept in a continual state of uneasiness. (T. Se.)

Blavet, a river of France in the departments of Côtes du Nord and Morbihan. It rises in the W. of the former department, at an altitude of 1000 feet, some 3 miles S.W. of Bourbriac. Flowing generally S. by E. to Goarec, it forms, about midway in its course to that place, the "perte of the Blavet," the "Toul-Goulic" of the Bretons. This is a deep defile, whose bed is a chaotic mass of gigantic rocks, amongst which the stream first dashes wildly and then disappears underneath for a distance of 300 to 400 yards. Its first important affluent, the Sulon, joins it a little above Goarec on the left, and at this town the Nantes and Brest Canal, carried along the valley of its affluent the Doré, in whose basin are several reservoirs, joins it on the right. From Goarec to Pontivy the Blavet is incorporated with the canal, but at the latter town the canal leaves it, and the Blavet, itself canalized, flows S. by W. and then S.W. for 37 miles to Hennebont, where maritime navigation begins. Here it widens into an estuary, and at its outfall, 9 miles lower, opposite Port Louis, has a width of over a mile. At Lorient, 2 miles above Port Louis, it is joined on the right bank by its chief tributary the Scorff, forming the port of Lorient. The Scorff rises in the Côtes du Nord, on the borders of Morbihan, flows generally S., and at Pont Scorff, 6 miles N.N.W. of Lorient, becomes navigable. Its total length is about 47 miles. The Blavet has a length of about 87 miles, and a drainage basin of 646,000 acres. The traffic on the Blavet between Pontivy and Hennebont employed in 1899, 3233 boats, carrying 148,706 tons of merchandise, chiefly combustible minerals, metallurgical products, building materials, wood, and manure.

Blaydon, a town in the Chester-le-Street parliamentary division of Durham, England, on the Tyne, 5 miles W. of Gateshead by rail. There are parish churches and Methodist chapels. The chief industries are coal-mining, iron-founding, pipe, fire-brick, chemical manure, and bottle manufactures. Area of urban district, 9339 acres; population (1881), 10,687; (1901), 19,617.

Bleiberg ("Lead Mountain"), a commune composed of five villages at the foot of the Dobratsch, 9 miles W. of Villach, in Carinthia, Austria, one of the richest lead-mining centres in Europe. The ores comprise silver-free galena, sulphate of zinc, and calamine. In 1891 the total yield was 33,922 metric centals of lead ore, and 25,536 m.c. of zinc ore. In addition to the mining and smelting works

there are factories for the production of wire cable. Population (1900), 3435.

Blida, a town of Algeria, 32 miles by rail S.W. of the city of Algiers, capital of a canton in the department of Algiers, situated at the foot of the first slopes of the Atlas mountains. It carries on an important flour trade, but its principal commerce is in oranges, surrounded as it is with orangeries numbering from 50,000 to 60,000 trees. Its population, 15,255 in 1872, increased to 23,685 in 1890, and in 1900 numbered 27,772, of whom 6991 were French.

Blind, Mathilde (1841-1896), author, was born at Mannheim on 21st March 1841. Her father was a banker named Cohen, but she took the name of Blind in consequence of her mother's marriage to Karl Blind, one of the leaders of the Baden insurrection in 1848-49. The family was compelled to take refuge in England, and in course of time Mathilde Blind devoted herself to literature and to endeavours for the elevation of her sex. As a writer of verse she produced some remarkable work, such as "The Prophecy of St Oran," "The Heather on Fire," "The Ascent of Man," and other minor poems. She wrote biographies of George Eliot and Madame Roland, and translated Strauss's *The Old Faith and the New*, and the *Memoirs of Marie Bashkirtseff*. She died in 1896, bequeathing her property to Newnham College, Cambridge. Her collected poetical works have been republished.

Bloemfontein, a town of British South Africa, capital of the Orange River Colony, and formerly of the Orange Free State. It was founded by the early Boer trekkers about 1836 on a southern affluent of the Vaal, on the open veldt amid a few low detached kopjes at an altitude of 4518 feet above the sea, about 120 miles from the Cape frontier, 750 from Cape Town, and 450 from Port Elizabeth. Of its normal population of 10,000 (1901), fully 7000 are whites (Dutch and English), and 3000 blacks (Basutos and Bechuanas, commonly called "Kaffirs"). The town is regularly laid out with streets running at right angles and flanked by several fine buildings, mostly of stone quarried in the vicinity. Amongst them are the government offices and the former Raadzaal (Parliament House), now used for general municipal purposes. It is well supplied with electric light and good water, and is a great railway centre with lines converging from Cape Town, Port Elizabeth, and Pretoria. Owing to its dry, salubrious climate it has become a sort of South African sanatorium, recommended especially for pulmonary affections. During the Boer war Bloemfontein was occupied without resistance by Lord Roberts, soon after the surrender of Kronje at Paardeberg (27th-28th February 1900).

Bloomfield, a township of Essex county, New Jersey, U.S.A., situated in the north-eastern part of the state, on the Erie and the Delaware, Lackawanna and Western railways, at an altitude of 130 feet; founded toward the close of the 17th century, under the name of Watsesson. Population (1880), 5748; (1900), 9668.

Bloomington, capital of M'Lean county, Illinois, U.S.A., situated in 40° 30′ N. lat. and 89° 00′ W. long., in the central part of the state, at an altitude of 785 feet. It is a railway centre, being on the Chicago and Alton, the Cleveland, Chicago, Cincinnati and St. Louis, the Illinois Central, and the Lake Erie and Western railways. It is the seat of Illinois Wesleyan University, with a faculty numbering 34, and with 300 students, one-third of whom are women. Population (1880), 17,180; (1900), 23,286.

Bloomington, a city of Indiana, U.S.A., capital of Munroe county, S.W. of the centre of the state, on the Chicago, Indiana, and Louisville railway. It is the seat of the state university, which in 1900 had a faculty numbering 77, and students numbering 1137. Population (1890), 4018; (1900), 6460.

Bloomsburg, a chartered town of Pennsylvania, U.S.A., capital of Columbia county, on the north branch of the Susquehanna river, and on the Delaware, Lackawanna, and Western, and the Philadelphia and Reading railways. Its industries are connected chiefly with iron manufacture. Population (1890), 4635; (1900), 6170.

Blue Island, a village of Cook county, Illinois, U.S.A., in the north-eastern part of the state, adjoining Chicago, of which it is a suburb. Population (1890), 3329; (1900), 6114.

Bluff Harbour. See INVERCARGILL.

Blumenthal, Leonhard von (1810-1900), Prussian field-marshal, son of Captain Louis von Blumenthal (d. 1813), was born at Schwedt, on the Oder, on 30th July 1810. Educated at the military schools of Culm and Berlin, he entered the Guards landwehr regiment as 2nd lieutenant in 1827. After serving in the Rhine provinces he joined the topographical division of the general staff in 1846. As lieutenant of the 31st foot he took part, in 1848, in the suppression of the Berlin riots, and in 1849 was promoted captain on the General Staff. The same year he served on the staff of General von Bonin in the Schleswig-Holstein campaign, and so distinguished himself, particularly at Fredericia, that he was appointed chief of the staff of the Schleswig-Holstein army. In 1850 he was general staff officer of the mobile division under von Tietzen in Hesse Cassel. He was sent on a mission to England in that year (4th class of Red Eagle) and on several subsequent occasions. He became a major in 1853, was appointed personal adjutant to Prince Frederick Charles in 1859, and promoted in 1860 to be colonel of the 31st regiment, and later of the 71st regiment. He was chief of the staff of the 3rd army corps when, on the outbreak of the Danish war of 1864, he was nominated chief of the general staff of the army against Denmark, and displayed so much ability, particularly at Missunde, Düppel, and the passage to Alsen island, that he was promoted to be major-general and given the Order of Merit. In the Austrian war of 1866 Blumenthal was chief of the General Staff of the second army under the Prussian crown prince, and led it with a swiftness of decision and directness of aim which enabled it to strike home on the heights of Culm, and to decide the fortunes of the day at Königgrätz (lieut.-general, the oak-leaf of the Order of Merit, and knight commander of Hohenzollern). In the years of peace which followed he commanded the 14th army division at Düsseldorf, and his conduct of the manœuvres arranged with the 13th division under General von Groeben earned the highest praise from military critics. In the Franco-German war of 1870-71, as chief of the staff of the third army, Blumenthal's knowledge and skill were invaluable. His co-operation with Moltke was masterly. Before orders had been given for the decisive flank march which ended at Sedan, he had grasped the position of Bazaine at Metz and had made all his preparations. No general order was ever given for the battle of Sedan, but Moltke knew that the third and fourth armies would close the iron ring in the nick of time. In 1871 Blumenthal represented Germany at the Chobham manœuvres, and was given the command of the 4th army corps at Magdeburg. He was made a field-marshal in 1888, and died at Quillendorf, 21st December 1900. He married in 1852 Delicia Anna von Vyner (*née* Calthorpe), and left two sons and three daughters. Field-Marshal Blumenthal had the

reputation of being one of the first strategists of the time. If in 1866 it was Moltke's mind that calculated the issue of the campaign, it was Blumenthal's vigour which defeated all obstacles before the goal. Like Moltke he was a man of sterling simplicity of character. Short and thick-set in figure, with large head and kindly features, his appearance was rather that of a professor than of a soldier; but his eyes were full of fire and energy. He was affectionately known for many years as "der alte Blumenthal."

Bluntschli, Johann Kaspar (1808-1881), Swiss jurist, was born at Zürich, 7th March 1808. Having studied law at Berlin and Rome, he was appointed professor of jurisprudence in the newly-founded University of Zürich in 1833. In the troubles which agitated the state he mainly sided with the Conservative party, which he led in the Great Council from 1837, and after the revolution of September 1839 he became a member of the Government. An important modification in his ideas was effected by his becoming acquainted with the philosophy of that remarkable, but little-known man, Frederick Rohmer, of whom he said, shortly before his death, "I have gained renown as a jurist, but my greatest desert is to have comprehended Rohmer." This more liberal direction of mind made Bluntschli's participation in the Government uneasy to him, and he resigned; but so high was the estimation of his eminence as a jurist that the task of compiling a civil code was unanimously entrusted to him. After the counter-revolution and overthrow of the Sonderbund (1847), Bluntschli removed to Munich, where he was professor both of private and of state law from 1848 to 1861. He produced there the *Allgemeines Staatsrecht*, and the *Lehre vom modernen Staat*, which gave him a European reputation, as well as numerous minor works, and conducted a legal review from 1855 to 1858. His removal to Heidelberg in 1861 was mainly occasioned by the unpopularity of his advocacy of German unity in opposition to the "particularism" then prevailing at Munich. "I felt," he says, "that I was merely tolerated." In his new state, Baden, he soon had to encounter active antagonism from his endeavours to keep it neutral during the Austro-Prussian war of 1866; the course of events, however, speedily decided the question in Bluntschli's favour, and, though frequently annoyed by intestine troubles in the University, upon which his memoirs throw a curious light, he held his position unchallenged until his sudden death, at Carlsruhe, on 21st October 1881. While at Heidelberg he produced several books which have taken rank as classics of jurisprudence, especially *Geschichte des allgemeinen Staatsrechts* (1864); *Das moderne Kriegsrecht* (1866); *Das moderne Völkerrecht* (1868); *Das Beuterecht in Krieg* (1878). The *Staatsrecht* has been translated into Japanese. The most remarkable external incidents of his life during this period were his active participation in the Protestantenverein, a society formed to combat reactionary and Ultramontane ideas in theology; and his important contribution towards the settlement of the *Alabama* difficulty by a seasonable pamphlet. His highly interesting autobiography was published in 1884. His library was acquired by the Johns Hopkins University at Baltimore. (R. G.)

Bobbili, a town of British India, in the Vizagapatam district of Madras, situated in 18° 34′ N. lat. and 83° 25′ E. long., 70 miles N. of Vizagapatam town. Population (1891), 14,468. It is the residence of a raja of old family, whose estate covers an area of 227 square miles; estimated income, £40,000; permanent land revenue, £9000. The present raja is a highly-educated man who has visited England. He is a K.C.I.E. and member of the Madras legislative council. He maintains a high school (270 pupils in 1896-97), and also a printing-press.

Bober, a river of Germany, rising at an altitude of 2438 feet in the Riesengebirge, S.W. of Landeshut. It threads the valley of Hirschberg, reaches the lowlands at Löwenberg, flows past Bunzlau and Sagan, and enters the Oder from the left at Krossen (118 feet altitude), after a N.N.W. course of 158 miles. In summer it is often a mere shallow stream, but after the melting of the snows becomes a devastating torrent.

Bobrinets, a town of South Russia, in the government and 120 miles N.N.W. of Kherson, near the railway from Nikolaiev to Kieff. It has tobacco factories and several steam flour-mills. Population, 14,352.

Bobruisk, a first-class fortress and district town of Russia, government and 108 miles by rail S.E. of Minsk, on the right bank of the Berezina river, and on the railway from Libau and Wilno to Ekaterinoslav. It has important ironworks and steam flour-mills, and carries on an important trade in corn and timber shipped to Libau. Population (1897), 35,177 (58,256 with military).

Bochnia, the chief town of a district of the same name in the Austrian crown-land of Galicia. Population of district (1890), 100,653, mostly Polish and Catholic; (1900), 105,375. Population of town (1890), 8849, of whom 2133 were Jews; (1900), 10,049. In addition to the salt-mines (with an annual yield of about 15,000 tons) and deposits of gypsum, there are a number of steam-mills and factories for the manufacture of tin wares; while a considerable trade is done in corn, salt, and eggs.

Bocholt, a town of Prussia, province of Westphalia, 12 miles by rail N. from Wesel, and near the frontier of Holland. It is a seat of the cotton industry. Population (1885), 10,567; (1895), 16,273; (1900), 21,241.

Bochum, a town of Prussia, province of Westphalia, 11 miles by rail W. from Dortmund. It is a centre of the iron and steel industries, producing principally cast steel, cast iron, iron pipes, wire and wire ropes, and lamps, with tin and zinc works, coal-mining, factories for carpets, calcium carbide, and paper-roofing, brickworks, and breweries. There are a mining and a metallurgical school. Population (1885), 40,767; (1895), 53,842; (1900), 65,554.

Bockenheim. See FRANKFORT-ON-MAIN.

Böcklin, Arnold (1827-1901), Swiss painter, was born at Bâle, 16th October 1827. His father, Christian Frederick Böcklin, born at Bâle, 16th July 1802, was descended from an old family of Schaffhausen, and engaged in the silk trade. His mother, Ursula Lippe, was a native of the same city. In 1846 he began his studies at the Düsseldorf Academy under Schirmer, who recognized in him a student of exceptional promise, and sent him to Antwerp and Brussels, where he copied the works of Flemish and Dutch masters. Böcklin then went to Paris, worked at the Louvre, and painted several landscapes; his "Landscape and Ruin" reveals at the same time a strong feeling for nature and a dramatic conception of scenery. After serving his time in the army he set out for Rome in March 1850, and the sight of the Eternal City was a fresh stimulus to his mind. So, too, was the influence of Italian nature and that of the dead pagan world. At Rome he married (20th June 1853) Angela Rosa Lorenza Pascucci. In 1856 he returned to Munich, and remained there four years. He then exhibited the "Great Park," one of his earliest works, in which he treated ancient mythology with the stamp of individuality, which was the basis of his reputation. Of this period, too, are his "Nymph and Satyr," "Heroic

Landscape" (Diana Hunting), both of 1858, and "Sappho," 1859. These works, which were much discussed, together with Lenbach's recommendation, gained him his appointment as professor at the Weimar Academy. He held the office for two years, painting the "Venus and Love," a "Portrait of Lenbach," and a "Saint Catherine." He was again at Rome from 1862 to 1866, and there gave his fancy and his taste for violent colour free play in his "Portrait of Mme. Böcklin," now in the Bâle Gallery, in "An Anchorite in the Wilderness," 1863; a "Roman Tavern," and "Villa on the Sea-shore," 1864; this last, one of his best pictures. He returned to Bâle in 1866 to finish his frescoes in the gallery, and to paint, besides several portraits, "The Magdalene with Christ," 1868; "Anacreon's Muse," 1869; and "A Castle and Warriors," 1871. His "Portrait of Himself," with Death playing a violin, 1873, was painted after his return again to Munich, where he exhibited his famous "Battle of the Centaurs" (in the Bâle gallery); "Landscape with Moorish Horsemen" (in the Lucerne gallery); and "A Farm," 1875. From 1876 to 1885 Böcklin was working at Florence, and painted a "Pietà," "Ulysses and Calypso," "Prometheus," and the "Sacred Grove." From 1886 to 1892 he settled at Zürich. Of this period are the "Naiads at Play," "A Sea Idyll," and "War." After 1892 Böcklin resided at San Domenico, near Florence. An exhibition of his collected works was opened at Bâle from 20th September to 24th October 1897. He died on the 16th of January 1901. His life has been written by Henri Mendelssohn.

F. Hermann. *Gazette des Beaux Arts.* Paris, 1893.—Max Lehrs. *Arnold Böcklin, Ein Leitfaden zum Verständniss seiner Kunst.* Munich, 1897.—W. Ritter. *Arnold Böcklin.* Gand, 1895.—Katalog, der. *Böcklin, Jubiläums Ausstellung.* Basel, 1897. (H. Fr.)

Bodenbach (Czech, *Podmokly*), a town in the government-district of Tetschen in Bohemia, Austria, near the Saxon frontier, situated on the left bank of the Elbe, opposite Tetschen, with which town it is connected by a chain bridge and two railway bridges. There is an Austrian and a Saxon custom-house; and the town has an important transit trade in addition to considerable manufactures (cotton and woollen goods, earthenware and crockery, chemicals, chicory, chocolate, sweetmeats and preserves, and beer). Population (1890), 7574, almost exclusively German; (1900), 10,782.

Bodenstedt, Friedrich Martin von (1819-1892), German author, was born at Peine, in the kingdom of Hanover, 22nd April 1819. Although a prolific and meritorious writer, Bodenstedt is more than most authors, as regards his European celebrity, "the man of one book." His career, as it proved, was determined by his engagement in 1841 as tutor in the family of Prince Galitzin at Moscow, where he gained a thorough acquaintance with Russian. This led to his appointment in 1844 as the head of a public educational establishment at Tiflis, Transcaucasia. Thus residing in close proximity to Persia, he became acquainted with a modern Persian poet, Mirza Schaffy, and this intercourse inspired him with the volume of little poems in the Oriental taste published after his return to Europe (1851) as a translation from the *Divan* of his friend, but really original. The success of this work can only be compared with that of FitzGerald's *Omar Khayyám*, produced in somewhat similar circumstances, but differed from it in being immediate. The *Divan* has gone through innumerable editions in Germany, and has been translated into almost all literary languages. Nor is this celebrity undeserved, for although Bodenstedt does not attain the poetical elevation of FitzGerald, his view of life is wider, more cheerful, and more sane, while the execution is a model of grace and elegance. The rich stores of knowledge which Bodenstedt brought back from the East were turned to account in two important books, *The Peoples of the Caucasus and their Struggles against the Russians* (1848) and *A Thousand and One Days in the East* (1850). For some time after his return Bodenstedt continued to work up Slavonic subjects, producing translations of Pushkin, Lermontoff, Turgenieff, and of the poets of the Ukraines, and writing a tragedy on the false Demetrius, and an epic, *Ada, the Lesghian Maid*, on a Circassian theme. Finding, probably, this vein exhausted, he exchanged, in 1858, the Slavonic professorship he had obtained at Munich for one of Early English literature, and published (1858-60) a valuable work on the English dramatists contemporary with Shakespeare, with copious translations. In 1862 he produced a standard translation of Shakespeare's sonnets, and between 1866 and 1872 published a complete version of the plays, with the help of many coadjutors. In 1867 he undertook the direction of the Meiningen Dramatic Company of Actors, and was ennobled by the duke. After 1873 he lived successively at Altona, Berlin, and Wiesbaden, where he died on the 19th of April 1892. His later works consist of an autobiography (1888), successful translations from Hafiz and Omar Khayyám, and lyrics and dramas which added little to his reputation. (R. G.)

Bodmin, a market town, municipal borough, and county town in the Bodmin parliamentary division (since 1885) of Cornwall, England, 30 miles by rail W. by N. of Plymouth. The ancient church of St Petrock has been restored and the county lunatic asylum extended, public rooms and a public library have been erected. Bodmin also contains H.M. civil and naval prisons, the headquarters of the county constabulary, the depot of the Duke of Cornwall's Light Infantry, and the District Probate Registry. Area, 2797 acres; population (1881), 5061; (1901), 5353.

Boehm, Sir Joseph Edgar, Bart. (1834-1890), British sculptor, was born of Hungarian parentage on 4th July 1834 at Vienna, where his father was director of the Imperial Mint. After studying the plastic art in Italy and at Paris, he worked for a few years as a medallist in his native city. After a further period of study in England, he was so successful as an exhibitor at the Exhibition of 1862, that he determined to abandon the execution of coins and medals, and to give his mind to portrait busts and statuettes, chiefly equestrian. The colossal statue of Queen Victoria, executed in marble (1869) for Windsor Castle, and the monument of the duke of Kent in St George's Chapel, were his earliest great works, and so entirely to the taste of his royal patrons, that he rose rapidly in favour with the court. He was made A.R.A. in 1878, and produced soon afterwards the fine statue of Carlyle on the Thames Embankment at Chelsea. In 1881 he was appointed sculptor in ordinary to the Queen, and in the ensuing year became full Academician. On the death of Dean Stanley, Boehm was commissioned to execute his sarcophagus in Westminster Abbey, and his achievement, a recumbent statue, has been pronounced to be one of the finest pieces of portrait sculpture of modern times. He executed the equestrian statue of the duke of Wellington at Hyde Park Corner, and designed the jubilee (1887) coinage. He died suddenly in his studio at South Kensington on 12th December 1890.

Boghaz Keui, a small village in Asia Minor, N.W. of Yuzgat in the Angora viláyet, remarkable for the ruins and rock-sculptures in its vicinity. The ruins are those of "a ruling city of the Oriental type,

unaffected by, and earlier than, Greek influence"; and they have generally been identified with *Pteria*, a place taken by Cræsus after he had crossed the Halys (Herodotus, i. 76).

The city walls, the acropolis, and the palace are of great archæological interest. Excavations made on the site by M. Chantre led to the discovery of a number of tablets with cuneiform inscriptions, some in a primitive Cappadocian dialect which has not yet been read, and of small objects of interest. The rock-sculptures, Yasili Kaya, 1¼ miles east of the city, belong to a distinct style of art which has been called "Hittite," but many traces of Assyrian influence survive. It seems probable "that the cult of the great earth-mother (Cybele) and her son (Attis) supplies the motive of these reliefs, and that it was dominant in the city below them." Another view is that the sculptures commemorate an historical event. At Euyuk, about 12 miles north of Boghaz Keui, is a gateway flanked by sphinxes and a series of remarkable sculptures which, like those at Yasili Kaya, represent, according to Professor Ramsay, "scenes and figures in the ritual of a religion which can be traced over the greater part of Asia Minor, modified by local circumstances." Here also M. Chantre made interesting discoveries.

HUMANN and PUCHSTEIN. *Reisen in Kleinasien und Nordsyrien.* —CHANTRE. *Mission en Cappadocie*, 1893-94; *Recherches archéologiques.*—PERROT and CHIPIEZ. *Histoire de l'Art en Phrygie.*—HOGARTH in Murray's *Handbook to Asia Minor.* (C. W. W.)

Bognor, a seaside resort in the Chichester parliamentary division of Sussex, England, 7 miles S.E. of Chichester, and 28 W. of Brighton by rail. Besides the parish church, there are a Roman Catholic priory and church, and Congregational, Wesleyan, and Methodist chapels; also a theatre, assembly rooms, and numerous convalescent homes, including establishments belonging to the Merchant Taylors' Company, the Ragged School Union, East London Hospital for Children, and the Surrey Women's Jubilee Memorial Committee. A pier pavilion and a promenade are other features. Area of urban district, 885 acres; population (1881), 3290; (1901), 6180.

Bogorodsk, a district town of Central Russia, in the government and 27 miles by rail E.N.E. of Moscow, near the railway to Nijni, with which it is connected by a branch line. It is built on the bank of the Klyazma river, and has several woollen and silk mills. Population, 11,210.

Bogotá, or SANTA FÉ DE BOGOTÁ, the chief town of the department of Cundinamarca, Colombia, South America, and the capital of the republic, situated on a high tableland 8985 feet above sea-level, on the San Francisco river at its junction with the Rio de Bogotá. From Barranquilla it is distant, by the nearest traffic route, 683½ miles, communication being by rail to Facatativa 24 miles, from Facatativa to La Dorada by mules 45 miles, from La Dorada to Honda by rail 22 miles, and from Honda to Barranquilla, by steamers on the Magdalena river, 592½ miles. There is also communication with the Magdalena by an American express service of waggons drawn by horses. A railway is projected to Zupaquira. Within recent years the city has greatly extended, and occupies an area of about 2½ miles in length by 1½ in breadth. The streets, though narrow, are well laid out and well kept, and lighted by electricity. There is an excellent water-supply, besides a telephone service and other modern conveniences. A special feature are the fine squares in the French fashion adorned with fountains. In the Plaza Bolivar is a statue of Liberty by Tenerain, a pupil of Canova, and in the Plaza Santander a statue of General Santander by Costa of Florence. Among the public buildings are the palace of San Carlos occupied by the president of the republic, and the palaces of Santo Domingo and San Francisco occupied by Government offices. The university has a high reputation, and the city, on account of its appreciation of art and letters, has acquired the surname of the "Athens of South America." The population is about 125,000.

Bogra, or BAGURA, a town and district of British India, in the Rajshahi division of Bengal. The town is situated on the right bank of the river Karatoya. Population (1881), 6179; (1891), 6584. It possesses a high school, two printing-presses, and a public library.

The district of BOGRA lies west of the main channel of the Brahmaputra. It contains an area of 1452 square miles. Population (1881), 734,751; (1891), 817,494, showing an increase of 11 per cent.; average density, 563 persons per square mile. Classified according to religion, Hindus numbered 154,296; Mahommedans, 661,100; Christians, 15, of whom 7 were Europeans; "others," 2083. In 1901 the population (on a reduced area) was 849,955, showing a further increase of 11 per cent. Land revenue and rates (1897-98) were Rs.5,35,327; the number of police was 230; the number of boys at school (1896-97) was 15,484, being 26·6 per cent. of the male population of school-going age; the registered death-rate (1897) was 30 per thousand. The former production of indigo is extinct, and the industry of silk-spinning is decaying. There is no town with as many as 10,000 inhabitants, trade being conducted at riverside marts. Nor are there any metalled roads. The Northern Bengal railway runs through a corner of the district for 39 miles, on its way north to Darjiling.

Boguslav, a town of Western Russia, government and 69 miles S.E. of Kieff. It dates from the 12th century, and has a population of 13,000. Machinery works, woollen cloth mills, and distilleries are its leading industries.

Bohain, a town in the arrondissement of Saint Quentin, department of Aisne, France, 30 miles in direct line N. by W. of Laon, on the railway from St. Quentin to Lille. The Torrents Canal affords communication with the Scheldt. Local industry is mainly associated with the production of woollen fabrics, including French cashmeres, gauzes, and various fancy stuffs. Population (1881), 6380; (1901), 6899.

Bohemia (German, *Böhmen*; Bohemian or Czech, *Čechy*), a kingdom and crown-land of the Austro-Hungarian monarchy, of which it constitutes the most northern part. Population (1869), 5,106,069 (of which it was estimated that there were 20 Germans to every 32 Slavs); (1880), 5,560,819; (1890), 5,843,094, which is equivalent to 293 inhabitants per square mile; (1900), 6,318,280. The density of population is greatest in the northern or industrial districts. The proportion of females to males in 1891 was 1071 to 1000: 62·38 per cent. were Czech and 36·94 German, 96 per cent. Roman Catholic, 2·17 per cent. Protestant, and 1·6 per cent. Jews. Next to Galicia, Bohemia has the largest population of any Austrian crown-land, and about 24·45 per cent. of the entire population of Austria. In 1896 the marriage-rate was 8·31; the birth-rate 37·29, or, excluding still-births, 36·04; and the death-rate 24·31 per 1000. Of the births 14·41 per cent. were illegitimate, an increasing ratio. Bohemia sends 110 members to the Reichsrath, or central parliament in Vienna, 18 of whom are returned by the new universal suffrage curia; 65 are Czech and 45 German, including the large landed proprietors of both nationalities. Education is provided for by two universities, one German and the other Czech (4178 students in 1897), two polytechnics (1227 students), an academy of fine art, a mining academy, 4 theological seminaries, 56 gymnasia, 22 real-gymnasia, 311 intermediate and 5149 elementary schools (the proportion of Czech and German being as 3 to 2), with an average attendance of 98·5 per cent. of all children,

together with about 860 other state, municipal, and private educational establishments, mostly technical. The proportion of illiterates, the lowest in Austria, sank from 8·15 per cent. in 1880 to 5·8 per cent. in 1890. In 1898 there was a total of 618 periodicals (384 Czech, 220 German, 2 English, and 12 polyglot).

Despite its great industrial development, about 45·25 per cent. of the population is still engaged in agriculture and forestry, 39·65 being occupied in mining and other industries and in trade. Bohemia produces 64·20 per cent. of the whole Austrian beetroot crop (Moravia coming next with 30 per cent.), in addition to the largest crops of wheat, rye, barley, oats, and potatoes, and considerable quantities of other agricultural produce. Nearly 49 per cent. in value of the entire yield of the Austrian mines falls to Bohemia, whose principal products are lignite, coal, iron ore, together with smaller quantities of gold, silver, and other metals, several of which are only mined in this crown-land. Its wealth of coal (40 million metric centals coal and 169 million m.c. lignite in 1897), together with the improvements in the refining process, have made it the chief centre of the iron industry, in which it has now begun to compete with Germany. Sugar-refining is of growing importance, as is also the manufacture of railway rolling-stock, while the old staple industries show a marked advance. In 1890 it possessed 35 per cent. of all the factories in Austria, 38 per cent. of the entire motive power, and 41 per cent. of the factory hands—figures which show that it holds the first place for industrial enterprise on the largest scale. Between 1870 and 1890 there has been an increase in the number of horned cattle, 2,022,305 (+420,290); pigs, 514,367 (+286,187); horses, 215,729 (+25,392); and goats, 334,417 (+140,144); and a reduction in the number of sheep, 423,602 (−682,688). Bohemia is the most favoured portion of the monarchy in the matter of communications, possessing (in 1897) 5228 kilometres of railway, 30 per cent. of the total length in Austria; 28,156 kilometres of roads, and 1160 kilometres of navigable rivers and canals, which (*viâ* the Elbe) afford it cheap access to the sea. In 1895 2,535,000 tons of goods were forwarded in both directions on the Elbe by 21,200 vessels, of which nearly 3000 were steamers. There are 1347 post and 718 telegraph offices, with 7351 kilometres of line and 20,227 kilometres of wire.

Political Importance.—As the situation in Bohemia is the pivot upon which Austrian domestic politics turns, and has turned for a generation past, it may be well to recall some of the principal factors in the problem. The national movement among the Czech people, revived in 1848, has made immense progress since the Czech representatives abandoned their policy of parliamentary abstention in 1879. During the term of office of Count Taaffe (1879-93) they secured in detail a series of important concessions—the language ordinances of 1880 and 1886, which ultimately established Czech predominance in the public service, the founding of a Czech university (1882) and of numerous Czech gymnasia, together with the State support for the Czech Academy of Science at Prague, &c. They at the same time so consolidated their position in the Czech provinces and the Reichsrath that the Government found itself constantly obliged to purchase their support by fresh concessions. After the failure of Count Taaffe's effort to overcome the nationality deadlock by a heroic electoral reform nearly equivalent to universal suffrage, and the breakdown of the German-Polish-Clerical coalition that followed his fall, the Czechs won their greatest triumph in the issue by the Badeni ministry of the notorious *language ordinances* of April 1896. These ordinances, which rendered a thorough knowledge of the Czech and German languages obligatory upon all officials in Bohemia and Moravia, did not merely gratify Czech national sentiment, but were of considerable material advantage to that nationality, inasmuch as they almost created a monopoly for the bilingual Czech claimants. The grant of the German demand for administrative separation of the German and Czech districts of Bohemia and Moravia, with the official use of German in the former and of Czech in the latter, would not only have constituted a hindrance to ultimate autonomy, but would have increased the competition and diminished the number of appointments open to Czech official aspirants. This last concession to their opponents was regarded by the Germans as evidence that the centralistic constitution was in serious danger, and that the Czechs and their allies were within measurable distance of realizing their aims. These were, first, the restoration to the provincial diets of the right of electing the Reichsrath or central parliament (a privilege abolished in 1873), and, ultimately, a purely federal constitution. A compromise between the nationalities has hitherto proved impossible. The struggle, accompanied at times by violence involving destruction of life and property and repeated suspensions of constitutional rights, had at one time nearly destroyed the Austrian parliamentary system and even threatened the integrity of the dual monarchy. The withdrawal of the last of the series of language ordinances (September 1899) only replaced German obstruction by that of the Czechs, which upset the ministry and again rendered parliamentary government impossible. The truce brought about by the Körber ministry in 1901 permitted the passage through the Reichsrath of an important economic scheme, comprising a large extension of railways and canals, and seemed to furnish the basis of an eventual political compromise.

The remarkable growth of Czech influence has been promoted by the rapid increase of the Czech population in the towns, whither they are attracted by higher wages. This increase is coincident with and one of the consequences of the development of industry on a large scale in Austria, which is the work of the past quarter of a century. The establishment of factories created a demand for hands, which the German population alone was unable to supply. Indeed, where a German proletariat existed, it was at a disadvantage in the competition with the Czechs and Poles owing to its higher standard of living. Moreover, the cheaper and more docile Slav labourers are less attached to their native place than are the Germans, and they marry at an earlier age—two circumstances that still continue to promote their relative increase in the industrial centres. This tendency has been welcomed by the State and the Church for different reasons. Apparently in view of the rooted discontent of the German population with the position of a minority in a country where they had been accustomed to rule, the State has consistently and successfully strengthened the Slav element as a precaution against a possible *Germania irredenta* agitation, so that now the Czechs are all-powerful in the administration of Bohemia and Moravia, including the German districts on the frontier. The Germans occupy a broad belt of the western and northern border adjoining Bavaria and Saxony, while the Czechs are settled in the centre and the southern districts of Bohemia. There are several grounds for the action of the Roman Catholic Church in the same direction. The clergy, as well as the reactionary nobles, regard the nationality struggle as a useful means of diverting attention from their own privileges. Like the large manufacturers, the priests find the Slavs more docile to their teachings and more tolerant of their pretensions. Moreover, the bulk of the priests are themselves of the Slav

race. While the Austrian episcopacy is in an exceptionally favourable pecuniary position, the minor clergy are badly paid. The profession has therefore little attraction for the well-to-do middle classes. The consequence is that it is largely recruited among the Slav peasantry, so that the priests even of the German districts of Bohemia and Moravia are predominantly Czech. Such a priest, filled with a sense of his own dignity and authority, enters his sacred office not merely with an unenlightened racial *Chauvinism*, but with an almost personal grudge against the better educated leaders of the German element, and indeed against the less deferential German part of his flock altogether. The irritation produced by this attitude of the Catholic clergy accounts for a good deal in the movement in favour of wholesale conversion to Protestantism, which has made most progress in Bohemia. The motive of the promoters of the "Emancipation from Rome" movement, however, is to make German Austria more palatable to Protestant Germany in view of future eventualities. The Pan-Germanic movement finds encouragement and support among an important section of the German manufacturers of Bohemia on other than national grounds. These argue that Austrian industry has now reached a stage at which it can compete successfully with that of Germany. The latter, it is true, has had the start, but Austrian industry has the advantage in the matter of good taste, a point in which Germany is deficient. Moreover, Austria has numerous undeveloped resources, which, if properly utilized, would place it on a level with its rival. The most pressing requirement of the Austrian manufacturers is fresh markets and liberty for their expanding energies, and this, it is urged, would be at once provided by some form of amalgamation with the German empire. Other sections of the industrial community hold, however, that Austrian industry is not yet strong enough to dispense with the high protectionist tariff that now excludes German products. The recent aggravation of the nationality conflict has done less damage to trade in the Czech provinces than might have been expected, the prevailing system of credit having opposed practically insurmountable difficulties in the way of the threatened boycott of political opponents.

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Böhmisch-Leipa (Czech, *Česká Lípa*), the chief town of a district in North Bohemia, on the Polzen, a tributary of the Elbe. It has a considerable industry, including the works of the Bohemian Northern railway, textile and calico-printing factories, and the manufacture of pianos, glass, dextrine and starch, sweetmeats and preserves, sugar, stores, the preparation of furs and skins, brewing and corn-milling. Population (1890), 10,406; (1900), 10,674; chiefly German and Catholic.

Böhmisch-Trübau (Czech, *Třebová Česká*), an old town in the government-district of Landskron, in North-East Bohemia, Austria, near the Moravian frontier. It has considerable textile industry (linen spinning and weaving), brewing and the preparation of malt, and trade in flax, which is extensively cultivated in the district. The inhabitants (4982 in 1890, 6040 in 1900) are Czech.

Boilers.—In the article STEAM-ENGINE (*Encyclopædia Britannica*, vol. xxii.) the general principles underlying the design and use of all steam boilers are stated, and several kinds of boilers are illustrated. The examples given still fairly agree with the present practice of the types described, but during the last few years some changes have taken place in matters of detail, and several new designs have come into use. It is with these that this article is intended to deal.

Land Boilers.—The boilers most generally used in large mills and manufactories at the present time are the "Lancashire" and its modification the "Galloway." Cross-sections of these are illustrated in the *Encyclopædia Britannica*, vol. xxii. p. 497. They are usually from 26 to 30 feet long, with diameters from 6 feet 6 inches to 8 feet. The working pressure is in some cases as high as 200 lb per square inch, but is usually about 60 lb per square inch in the older boilers, 100 to 120 lb in those supplying steam to compound engines, 150 lb to 170 lb where the engines are triple expansion, and 200 lb where they are quadruple. The furnace flues are now generally made in sections from 3 feet to 3 feet 6 inches long, each from one plate, the seam being sometimes riveted but more usually welded. The rings are flanged outwards at the ends, and are connected together by "Adamson" joints (Fig. 1). It will be seen that these joints do not expose any rivets or double thickness of plate to the action of the fire, and they serve also as strengthening rings to prevent collapse of the furnace. In such boilers the long flues beyond the fire-bridge form combustion-chambers in which the furnace gases may be completely burned. The amount of heat-absorbing surface provided in proportion to the grate surface is not so large as in some types of tubular boilers; and, although they are regarded as fairly economical, they do not give such good results as are obtained with some more complicated forms. The space occupied by them, and their weight in proportion to the power developed, are both large; but their design is one which affords great facilities for easy inspection and cleaning of all the vital parts. The great amount of water they contain, and the large area of the water-level, provide a considerable reservoir of energy for fluctuations of power or of firing, and a reserve of water for variations of the feed supply. These reasons lead to their employment in situations where the feed-water is impure or very skilled attention is not available, and where in addition space and weight are not very important considerations.

"Lancashire."

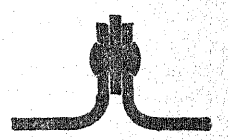


FIG. 1.—"Adamson" Joint.

In some large works water-tube boilers are used. Two types of these boilers will be described.

"Babcock and Wilcox."

The "Babcock and Wilcox" boiler, illustrated in Fig. 2, consists of a horizontal cylinder forming a steam-chest, having dished ends and two specially constructed cross-boxes riveted to the bottom. Under the cylinder is placed a sloping nest of tubes, under the upper end of which is the fire. The sides and back of the boiler are enclosed in brickwork up to the height of the centre of the horizontal cylinder. Suitable brickwork baffles are arranged between the tubes themselves, and between the nest of tubes and the cylinder, to ensure a proper circulation of the products of combustion. The nest of tubes consists of several separate elements, each of which is formed by a front and back header made of wrought steel of sinuous form connected by a number of tubes. The upper ends of the front headers are connected by short tubes to the front cross-box of the horizontal cylinder, the lower ends being closed. The upper ends of the back headers are connected by longer pipes to the back cross-box, and their lower ends by short pipes to a horizontal mud drum to which a blow-off cock and pipe are attached. The headers are furnished with holes on two opposite sides; those on one side form the means of connexion between the headers and tubes, and the others allow access for fixing the tubes in position and cleaning. The outer holes are oval, and closed by special fittings shown

in Fig. 3, the watertightness of the joints being secured by the outer cover-plates. The holes being oval, the inside fitting can be placed in position from outside, and it is so made as to cover the opening and prevent any great outrush of steam or water should the bolt break. Any desired working pressure can be provided for in these boilers; in some special cases it rises as high as

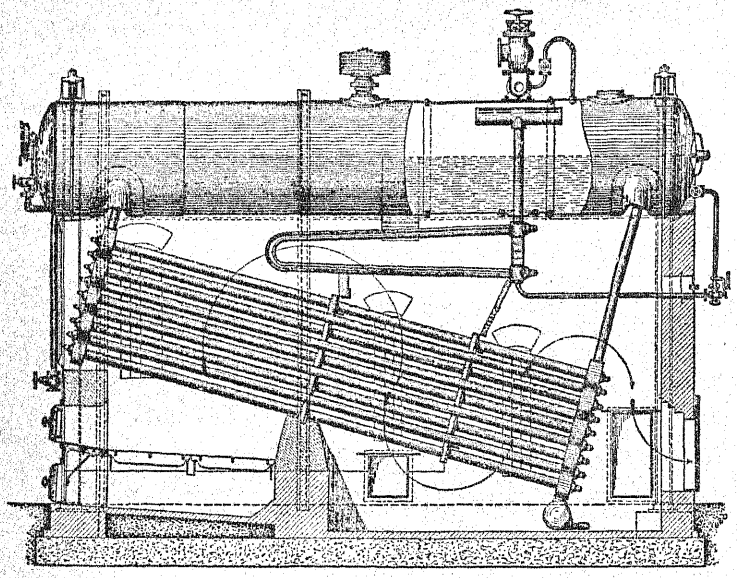


Fig. 2.—Babcock and Wilcox Water-tube Boiler fitted with Superheaters.

500 lb per square inch. Like all water-tube boilers, they require to be frequently cleaned if impure feed-water is used; but the straightness of their tubes enables their condition to be ascertained at any time when the boiler is out of use, and any accumulation of scale to be removed. The superheaters which are sometimes fitted consist of two cross-boxes or headers placed transversely under the cylindrical drum and connected by numerous ⊂-shaped tubes. The steam is taken by an internal pipe passing through the bottom of the drum into the upper cross-box, then through the ⊂ tubes into the lower box, and thence to the steam-pipe. When steam is being raised the superheater is flooded with water, which is drained out through a blow-off pipe before communication is opened with the steam-pipe.

Another type of water-tube boiler in use for stationary purposes is the "Stirling," illustrated in Fig. 4. This boiler usually consists of five horizontal drums, of which the three upper ones form the steam space and the two lower contain the water. In some cases only one lower chamber is used. The lower drums are connected to each other at about the middle of their height by horizontal tubes, and to the upper drums by numerous nearly vertical tubes which form the major portion of the heating surfaces. The central upper drum is at a slightly higher level than the others, and communicates with that nearest the back of the boiler by a set of curved tubes entirely above the water-level, and with the front drum by two sets—the upper one being above, and the lower entirely below, the water-level. The whole boiler is enclosed in brickwork, into which the supporting columns and girders are built. Brickwork baffles compel the furnace gases to take specified courses among the tubes. It will be seen that the space between the boiler front and the tubes forms a large combustion-chamber, into which all the furnace gases must pass before they enter the spaces between the tubes; another chamber is formed between the first and second sets of tubes. The feed-water enters the back upper drum, and must all pass down the third set of tubes into the lower drum before it reaches the other parts of the boiler. Thus the coldest water is always where the temperature of the furnace gases is lowest; and as the current through the lower drum is slight, the solid matters separated from the feed-water while its temperature is being raised have an opportunity of settling to the bottom of this drum, where the heating is not great, and where therefore their presence will not be injurious.

"Stirling."

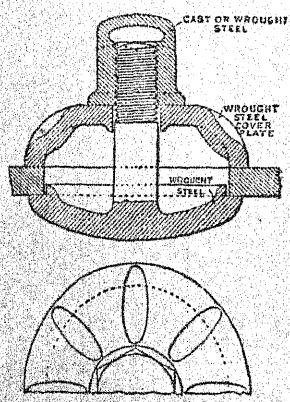


Fig. 3.—Handhole Fittings.

Locomotive Boilers.—At the present time locomotive boilers do not differ very much from the type illustrated in the *Encyclopædia Britannica*, vol. xxii. p. 498, except that they are considerably larger and arranged for a higher working pressure than formerly. A pressure of 200 lb per square inch is common on the North-Eastern and London and North-Western Railways, while 230 lb per square inch is being used in some instances on the Continent and in America. One of the largest of recent engines, made for the Lancashire and Yorkshire Railway Company (illustrated in the *Engineer* for 17th March 1899), has a working pressure of 175 lb per square inch, a grate surface of 26 square feet, and a total heating surface of 2052 square feet. There are 239 tubes, 2 inches in outside diameter and 15 feet long. The shell of the boiler is 4 feet 9 inches in diameter. The fire-box is of copper, and the stays of bronze set at the usual pitch of $4'' \times 4''$. The rest of the boiler, including the tubes, is of steel. In some of the large boilers, especially on the London and South-Western Railway, water-tubes have been fitted. These are usually about $2\frac{3}{4}$ inches in diameter, and are inclined across the fire-box to facilitate the circulation of the water. They are expanded into and beaded over the side plates of the fire-box, and the outer plates of the shell are provided with stays passing through the tubes. They considerably increase the heating surface, and are regarded as very efficient. Experience shows that they stand well.

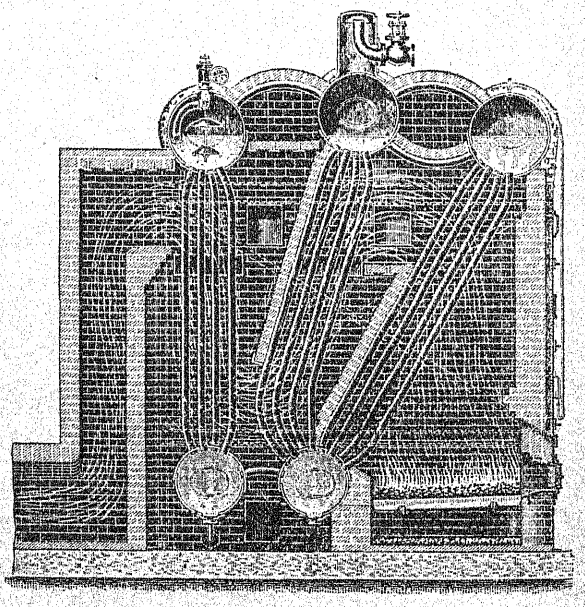


Fig. 4.—Stirling Boiler.

Marine Boilers.—For marine work the varied conditions to be fulfilled in different classes of vessels have led to the employment of several different types of boilers. In merchant vessels, except in a few passenger steamers making short runs, ordinary cylindrical return-tube boilers are always used, while in war vessels and in a few passenger vessels of high speed engaged in cross-Channel services various forms of water-tube boilers are found. The great difference in the weights of these types forms the principal

reason for the adoption of the water-tube system in war vessels. According to the particulars given by Sir A. J. Durston and Mr H. J. Oram, R.N., in a paper read before the Institution of Civil Engineers in 1899, ordinary cylindrical boilers and boiler-room fittings weigh 130 lb per indicated h.p. The similar weights of the Belleville water-tube boilers fitted in similar vessels only amount

Fig. 5. Morison Type

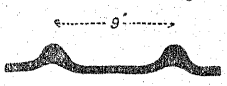


Fig. 8. Purves Type

Fig. 6. Fox Type

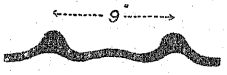


Fig. 9. Brown's Arched & Ribbed Type

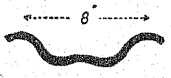


Fig. 7. Derghton Type

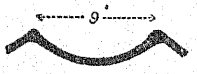


Fig. 10. Brown's Cambered Section

to 100 lb, while the weights of various types of small tube water-tube boilers and their fittings as supplied to cruisers amount to 55 lb, and as adopted in torpedo-boat destroyers are less than 40 lb per indicated h.p.

The sketches of the ordinary cylindrical marine boiler, both single and double ended, given in the *Ency. Brit.* vol. xxii. p. 499, still fairly represent existing practice; but, mainly owing to the improvements in the manufacture of steel plates, some modifications in detail have become common. Circular steel boiler-plates can now be procured up to 11½ feet in diameter, of thicknesses ranging from ¾ inch to 1⅜ inches; and rectangular plates of the same thicknesses are made of all widths up to 11 feet and of such length as will keep their weight from exceeding 7 tons. As a result, many single-ended boilers have only one plate in their length, and double-ended boilers only two; in this way some of the circular seams of rivets in the shell are avoided. Boilers are also made of larger size and for higher steam-pressures than formerly. Pressures up to 260 lb per square inch have been used at sea with ordinary cylindrical boilers in some few instances, and several boilers with a diameter of 17 feet are now successfully working at a pressure of 210 lbs. The furnaces used in the smaller sizes are often of the plain cylindrical type, of thicknesses up to ⅝ inch; but for large furnaces some of the corrugated or ribbed types are generally adopted. Sketches of the sections of these are given in Figs. 5-10. The first three are made from plates originally rolled of a uniform thickness, the differences being only in regard to the shapes of the corrugations; while in the second three the plates are rolled with ribs or thickened portions at distances of 9 inches. In the more recent boilers steam-chests or domes are not used, sufficient steam space being provided in the cylindrical shell.

Cylindrical.

This type of boiler contains a considerable quantity of water in proportion to the heating surfaces. The thickness of the plates, and the numerous stays required to support the flat portions, render it heavy in proportion to the evaporative power; but experience shows it to be durable, and not very expensive in upkeep. The provision of combustion-chambers, which the furnace gases must traverse, and the change of direction which they must take before entering the tubes, give an opportunity for the gases to be burned before they are cooled below the ignition-point; and this form of boiler is therefore fairly economical under ordinary conditions. To these qualities of economy and durability is due its almost universal adoption in merchant steamers, where questions of weight and compactness are not so important as in war vessels. The boilers are generally worked with chimney or "natural" draught; but forced draught is not uncommon, the Howden system being that usually adopted. In this the ashpits are closed, and the air for combustion is supplied to the fire partly through the grate-bars and partly through openings in the furnace front above the fire, having previously passed through a regenerative apparatus where it absorbs heat from the smoke, &c., leaving the ordinary boiler-tubes.

In all recent war vessels, both of the British and foreign navies, the boilers fitted are exclusively of the water-tube type. These may be divided into two distinct classes:—(1) those in which large tubes ranging from 4½ inches to 1¾ inch in diameter are used; and (2) the "Express" boilers, in which the tubes are from 1 inch to 1¼ inch diameter. The former are adopted in the larger ships, the latter in the smaller vessels which do not keep the sea for long periods, and in which the conditions of durability are not so important as to outweigh the requirement of extremely high power with a minimum of weight.

"Belleville."

The large-tube type hitherto generally used is the "Belleville" boiler (which, however, has been adversely criticized, and was reported against by the Admiralty Boiler Committee in 1901). Two views of this boiler are shown in Fig. 11. It is composed of two parts, the boiler proper and the "economizer." Each of these consists of several sets of elements placed side by side; those of the boiler proper are situated immediately over the fire, and those of the economizer in the uptake above the boiler, the intervening space being designed to act as a combustion-chamber. Each element is constructed of a number of straight tubes connected at their ends by means of screwed joints to junction-boxes which are made of malleable cast iron. These are arranged vertically over one another, and, except in the case of the upper and lower ones at the front of the boiler, each connects the upper end of one tube with the lower

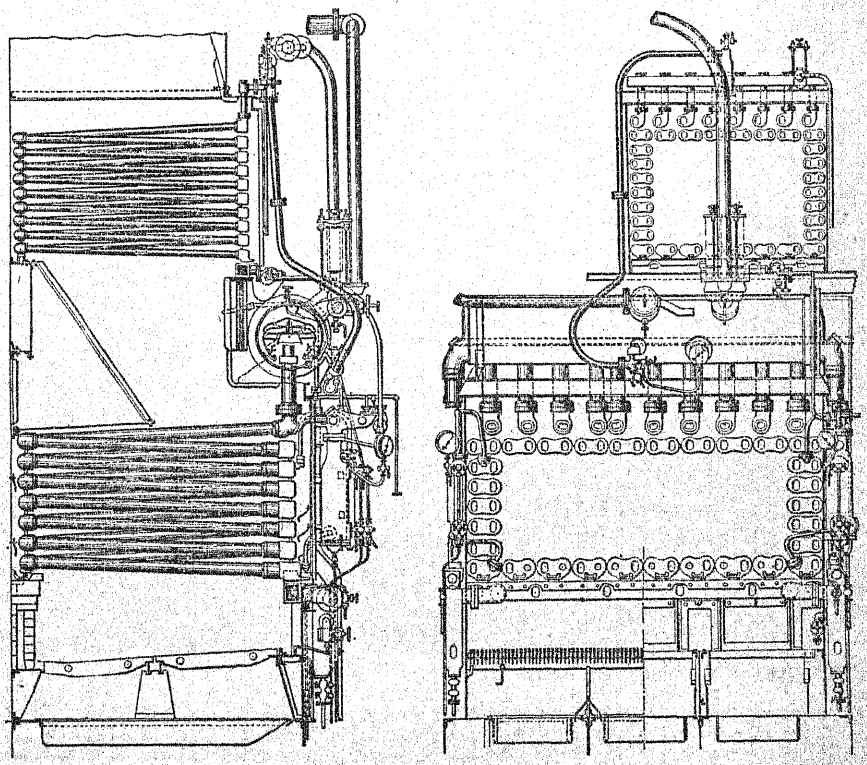


Fig. 11.—Belleville Boiler.

end of the next tube of the element. The boxes at the back of the boiler are all close-ended, but those at the front are provided with a small oval hole, opposite to each tube end, closed by an internal door with bolt and cross-bar; the purpose of these openings is to permit the inside of the tubes to be examined and cleaned. The lower front box of each element of the boiler proper is connected to a horizontal cross-tube of square section, called a "feed-collector," which extends the whole width of the boiler. When the boiler is not in use, any element can be readily disconnected and a spare one inserted. The lower part of the steam-chest is connected to the feed-collector by vertical pipes at each end of the boiler, and prolongations of these pipes below the level of the feed-collector form closed pockets for the collection of sediment. The tubes are usually made of seamless steel, although lap-welded tubes have sometimes been used. They are generally about $4\frac{1}{2}$ inches in external diameter; the two lower rows are $\frac{3}{8}$ inch thick, the next two rows $\frac{5}{16}$ inch, and the remainder about $\frac{1}{8}$ inch. The construction of the economizer is similar to that of the boiler proper, but the tubes are shorter and smaller, being generally about $2\frac{3}{4}$ inches in diameter. The lower boxes of the economizer elements are connected to a horizontal feed-pipe which is kept supplied with water by a feed-pumping engine, and the upper boxes are connected to another horizontal pipe from which the heated feed-water is taken into the steam-chest. Both the boiler proper and the economizer are enclosed in a casing which is formed of two thicknesses of thin iron separated by non-conducting material and lined with fire-brick at the part between the fire-bar level and the lower rows of tubes. Along the front of the boiler, above the level of the firing-doors, there is a small tube having several nozzles directed across the fire-grate, and supplied with compressed air at a pressure of about 10 lb per square inch. In this way not only is additional air supplied, but the gases issuing from the fire are stirred up and mixed, their combustion being thereby facilitated before they pass into the spaces between the tubes. A similar air-tube is provided for the space between the boiler proper and the economizer, and further combustion of the furnace gases is found to take place in this chamber. Any water suspended in the steam is separated in a special separator fitted in the main steam-pipe, and the steam is further dried by passing through a reducing-valve which ensures a steady pressure on the engine side of the valve, notwithstanding fluctuations in the boiler. The boiler pressure is usually maintained at about 50 lb per square inch in excess of that at which the engines are working, the excess forming a reservoir of energy to provide for irregular firing or feeding.

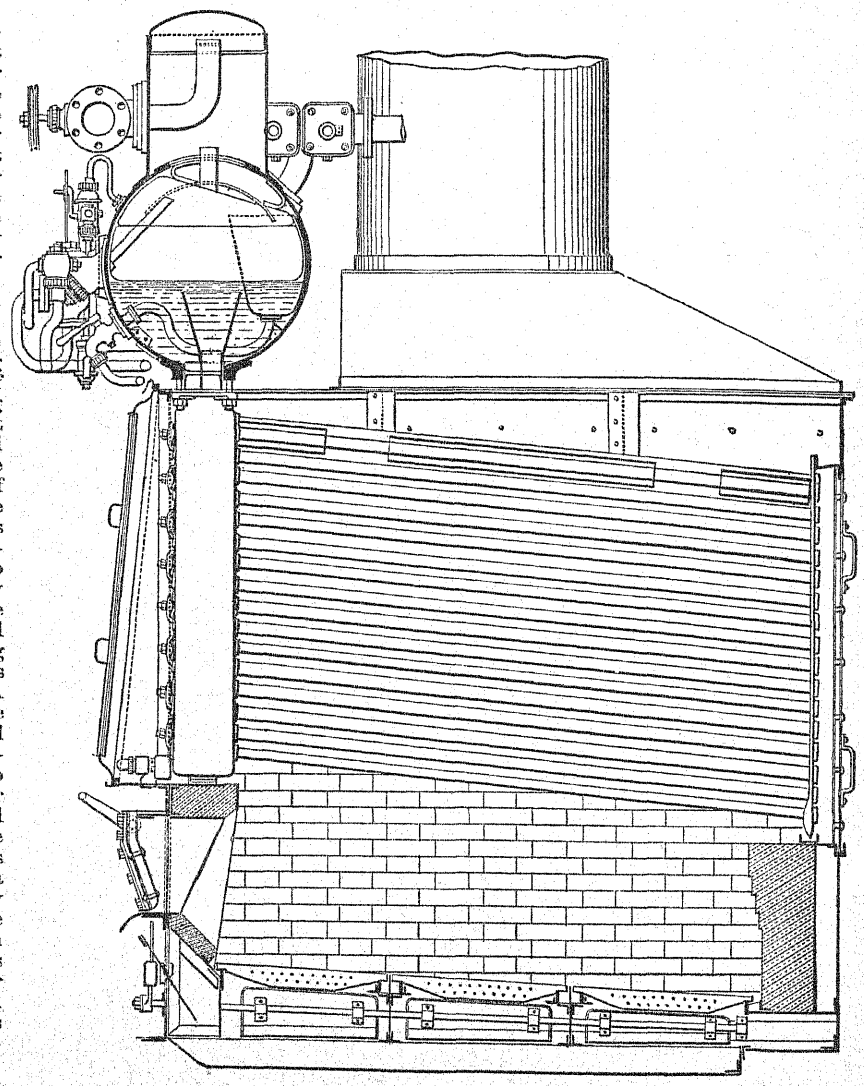


Fig. 12.—Niclausse Boiler—transverse section.

Another type of large-tube boiler which has been used in the British and in other navies is the "Niclausse," shown in Fig. 12.

"Niclausse."

It is also in use on land in several electric-light installations. It consists of a horizontal steam-chest under which is placed a number of elements arranged side by side over the fire, the whole being enclosed in an iron casing lined with fire-brick where it is exposed to the direct action of the fire. Each element consists of a header of rectangular cross-section, fitted with two rows of inclined close-ended tubes, which slope downwards towards the back of the boiler with an inclination of 6° to the horizontal. The headers are usually of malleable cast iron with diaphragms cast in them, but sometimes steel has been employed, the bottoms being closed by a riveted steel plate, and the diaphragms also made of the same material. The headers are bolted to socket-pieces which are riveted to the bottom of the steam-chest, so that any element may be easily removed. The tube-holes are accurately bored, at an angle to suit the inclination of the tube, through the front and back of the headers and through the diaphragm, those in the header walls being slightly conical. The tubes themselves, which are formed of seamless steel, are of peculiar construction. The lower or back ends are reduced in diameter and screwed and fitted with cap-nuts which entirely close them. The front ends are thickened by being upset, and the parts where they are to fit into the header walls and in the diaphragm are carefully turned to gauge. The upper and lower parts of the tubes between these fitting portions are then cut away, the side portions only being retained, and the end is termed a "lanterne." A small water-circulating tube of thin sheet steel, fitted inside each generating tube, is open at the lower end, and at the other is secured to a smaller "lanterne," which, however, only extends from the front of the header to the diaphragm. This smaller "lanterne" closes the front end of the generating tube, and the whole arrangement is such that when the tubes are in place only the small inner circulating tubes communicate with the front space between the front of the header and the diaphragm, while the annular space in the generating tubes around the water-circulating tubes communicates only with the space between the diaphragm and the back of the header. The steam, therefore, formed in the tubes escapes from them into this back space, through which it rises into the steam-chest, whilst the space in the front of the header always contains a down-current of water supplying the inner circulating tubes. The tubes are maintained in position by cross-bars, each secured by one stud-bolt screwed into the header wall, and each serving to fix two tubes. The products of combustion ascend directly from the fire amongst the tubes, and the combustion is rendered more complete by the introduction of jets of high-pressure air immediately over the fire, as in the "Belleville" boiler.

The "Dürr" boiler, in use in several vessels in the German navy, and in 1901 fitted for trial in two vessels of the British navy, in some respects resembles the "Niclausse." The separate headers of the latter, however, are replaced by one large water-chamber, and instead of the tubes being secured

"Dürr."

by a "lanterne" to two plates, they are fitted by conical joints to the inner plate only, the holes in the outer plate being closed by small round doors. The tubes are closed at the lower end, and circulation is provided for by a diaphragm in the water-chamber, and inner water-tubes as in the "Niclausse" boiler.

"Lagrafel-D'Allest."

The "Lagrafel-D'Allest" boilers also have large tubes. They are necessarily arranged in pairs having one combustion-chamber common to both. Each of a pair consists of a nearly horizontal cylindrical steam-chest, connected at the ends with large flat water-chambers, between which the numerous water-tubes are fitted above the fire-level. The nests of tubes, except at the upper portion, do not extend the whole width of each of the pairs of boilers, but a space is left on the inner side of each to form a combustion-chamber. The grate-bars are placed below the tubes, and a fire-bridge is formed at the inner side of each fire, separating the grate from the combustion-chamber. On the outer side of the fires the iron casing of the boiler is protected by fire-brick lining. The spaces between the tubes of the lower row, and also of the upper horizontal row, are closed by suitably-shaped tiles, and iron plates are fitted to cover the upper portion of the spaces between the outside vertical rows of tubes. The products of combustion are therefore compelled to pass over the fire, under the lower horizontal row of tubes, over the fire-bridge into the combustion-chamber, thence returning in an opposite direction across all the tubes, and finally leaving the nest of tubes at its lowest part. The course of the gases thus bears a marked resemblance to that obtaining in the ordinary return-tube type of boiler.

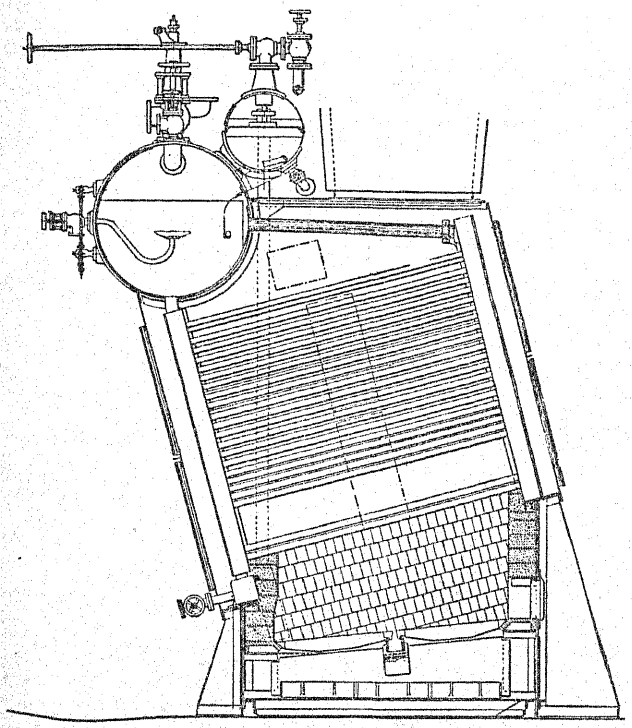


FIG. 13.—Babcock and Wilcox Marine Boiler—longitudinal section.

"Babcock and Wilcox."

The "Babcock and Wilcox" marine boiler is in use in the American and British navies and also in several yachts and merchant steamers. A recent example is shown in Fig. 13. It consists of a horizontal cylindrical steam-chest placed transversely over a group of elements beneath which is the fire. Each element consists of a front and back header connected by numerous water-tubes which have a considerable inclination to facilitate the circulation in the boiler. The upper ends of the back headers are situated immediately under the steam-chest, and are connected to it by short nipples; by a similar means they are connected at the bottom to a pipe of square section which extends across the width of the boiler. Additional connexions are made by nearly vertical tubes between this cross-pipe and the bottom of the steam-chest, and also between the pipe and the feed-purifier. The front headers are connected at their upper ends, by means of long horizontal tubes, with the steam-chest, the bottom ends being closed. The headers are made of wrought steel, and except the outer pairs, which are flat on the outer portions, they are sinuous on both sides, the sinuosities fitting into one another. The tubes are 1¾ inch outside diameter, and are arranged in groups of two, three, or four to nearly all of the sinuosities of the header, the purpose of this arrangement being to give opportunities for the furnace gases to become well mixed together, and to ensure their contact with the heating surfaces. Access for securing the tubes in the headers is provided by a hole formed on the other side of the header opposite each of the tubes, where they are grouped in threes or fours, and by one larger hole opposite each group of two tubes. The larger holes are oval, and are closed by fittings similar to those used in the land boiler (Fig. 3). The smaller holes are conical, with the larger diameter on the inside, and are closed by special conical fittings; the conical portion and bolt are one forging, and the nut is close-ended. In case of the breakage of the bolt, the fitting would be retained in place by the steam-pressure. The feed-purifier is a small horizontal cylinder placed above and in front of the steam-chest, and connected to it by a pipe which provides an uninterrupted communication between the upper parts of the two chests, so that when in use the upper part of the purifier is always fully charged with steam. The lower half of the small chest is divided into several compartments by means of diaphragm plates. The feed-water is led into the chest in the upper part at the middle of the length, and falls over a dished plate through the steam in the form of a cascade. Its temperature is thus raised nearly to the boiling-point, and most of the impurities are separated out in a solid form and deposited in the various chambers through which the water flows. The purified feed-water passes from the end divisions down the vertical pipes into the square-sectioned cross-pipe, whence it is carried into the general circulation of the boiler.

The other boilers to be described are the types, sometimes called "Express" boilers, which are largely used in torpedo-boats, torpedo-boat destroyers, and in small cruisers, where the most important requirement is very high power with a very small weight of boiler. They all consist of a horizontal steam-chest in the upper part, connected by numerous small tubes of from 1 inch to 1¼ inch outside diameter to two or three smaller horizontal chambers placed near the fire-level. The tubes are always made of seamless steel, and are usually galvanized on the outside by an electrical process.

"Normand."

In the "Normand" boiler (Fig. 14) both the upper and lower chambers are considerably longer than the fire-grate, and are connected by large pipes at each end of the boiler, outside the action of the fire, which serve as downcasts and facilitate the circulation of water. The heating-tubes are all bent to the forms shown in the cross-section; the outer rows usually enter the steam-chest at about the water-line, and the others lower down. The two inner rows on each side, for a part of the length of the fire-grate, touch one another along nearly all their length, and are separated only at their ends where they have to enter the horizontal chambers through separate holes. Arranged thus they form "water-walls." The two outer rows on each side are similarly arranged along the whole length of the boiler, and protect its outer casing from the action of the fire. These water-walls direct the flow of the products of combustion amongst all the heating-tubes. The ends of the casing, between the tubes and the fire-grate, are protected by fire-brick linings.

"Yarrow."

In the "Yarrow" boiler, which is shown in cross-section in Fig. 15, the tubes are all straight, and there are no water-walls. The products of combustion pass across all the tubes the whole length of the boiler. The outer casings are made of double thickness, with an air-space between them. Outside circulating pipes, similar to those in the "Normand" boiler, are occasionally fitted, but it is often found that there is sufficient circulation without them. In the larger boilers the inner rows of tubes are slightly larger than the others, and are arranged with wider spaces between them, and the lower chambers are made with riveted plates, access to examine the tube ends being obtained through manholes in the ends. In smaller boilers the lower parts of the chambers are portable, being bolted to the tube-plates.

"Blechynden."

The "Blechynden" boiler bears considerable resemblance to the "Yarrow" boiler, but the heating-tubes, instead of being straight, are all slightly curved. The object is to enable any of them to be drawn out or replaced without disturbing the remainder, the curvature permitting them to be led through several small holes in the upper part of the steam-chest which are closed by ordinary doors. In the earlier type the outer rows of tubes form water-walls at their lower part to protect the outer casings; but their upper portions, not being in contact, permit the furnace gases to pass between them. In the more recent form there are no water-walls, but a baffle is fitted between the tubes to ensure that the products of combustion take a definite course amongst them. Each lower chamber is connected to the upper

chamber by four down-pipes placed outside the casing. These are of comparatively small diameter, and are designed principally as part of the framework. There are also two larger outside circulating pipes at one end of the boiler.

The "Reed" boiler resembles the "Normand" in some respects, but the tubes are longer and more curved, and there are no water-walls, the products of combustion passing between all the tubes as in the "Yarrow" boiler. The tubes, instead of being expanded into the plates of the chambers, are fitted at each end with specially designed screw and nut connexions, which enable them to be quickly taken out and replaced in case of need. The tubes are somewhat reduced in diameter at their lower ends, enabling the lower connexions to be smaller than the upper, and thus permitting smaller lower chambers to be used. Access to the lower tube connexions is obtained by means of numerous doors arranged along the lower chambers. Outside circulating pipes are provided at each end as in the "Normand" boiler.

"Reed."

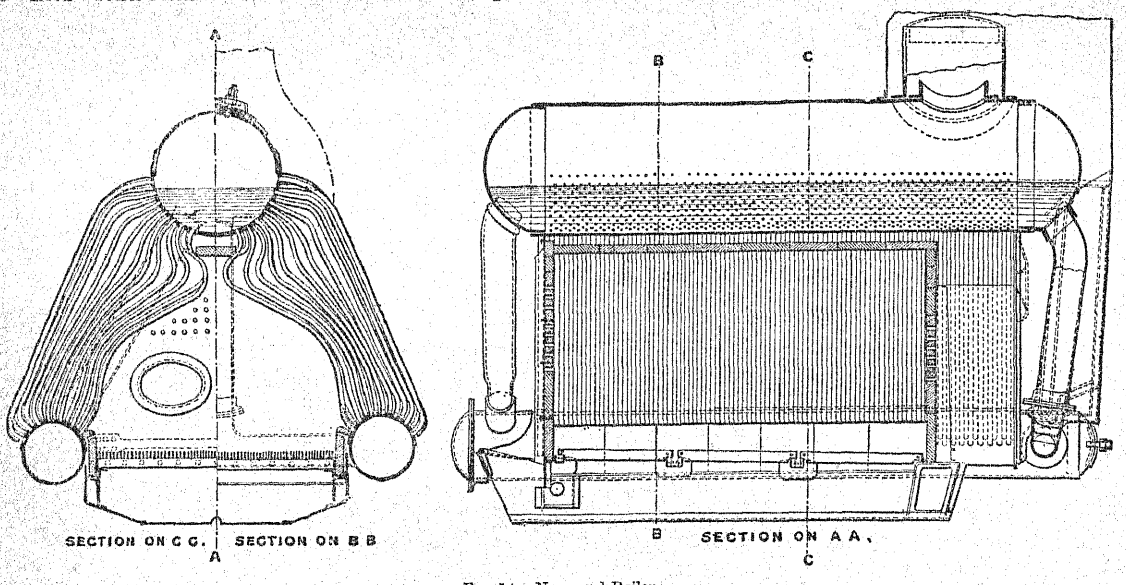


FIG. 14.—Normand Boiler.

Mr J. I. Thornycroft has introduced two types of water-tube boiler, both of which have been largely used. One, generally known as the "Speedy" boiler, has only one fire-grate; the other, known as the "Daring" boiler, has two. In both types there is one large steam and water upper cylinder; while the "Speedy" boiler has two, and the "Daring" boiler three, lower chambers, which in each case are connected to the upper chamber by outside circulating tubes as well as by the numerous small heating-tubes. The rows of tubes nearest the fire form water-walls, except near their lower ends, while the other rows form water-walls except near their upper ends; the intervening spaces act as flues through which the furnace gases must pass on their way from the fire to the chimney. The peculiar feature of these boilers is that all the heating-tubes discharge into the steam-space *above* the water-line, whereas in all the other boilers they enter below the water-level.

"Thornycroft."

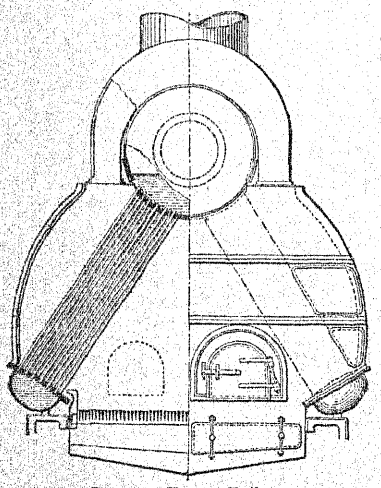


FIG. 15.—Yarrow Boiler.

All the small-tube boilers described are worked with strong forced draught when full power is desired, the air-pressure employed sometimes exceeding 4 inches of water-column. Owing to the rapidity with which the products of combustion are hurried amongst the tubes, where no further combustion can take place, if some of the gases are not completely burned, only part of their heat can be given up; for instance, in a "Yarrow" boiler working at full power, the time taken for the products of combustion to pass across all the tubes is less than one quarter of a second. It follows that at very high rates of working these boilers cannot be economical in coal consumption, and it is only their extreme lightness in proportion to the power they yield that determines their suitability for the special purposes for which they are employed. (J. T. Mi.)

Boise, capital of Ada county and of the state, Idaho, U.S.A., in the valley of Boise river, in 43° 37′ N. lat. and 116° 12′ W. long. Its houses are in great part heated by water brought in pipes from hot springs situated about 2 miles from the town. Here terminates a branch of the Oregon short line railway from Nampa. Boise is a supply-point for miners in the neighbouring mountains. Population (1880), 1899; (1900), 5957.

Bois-le-Duc, 'S Hertogenbosch or 'S Bosch, the capital of the province of North Brabant, Holland, 28 miles S.S.E. of Utrecht, at the confluence of the Dommel and Aa. It is the market of the fertile Meiery district, and does considerable trade with Dordrecht and Rotterdam, Nimeguen and Arnheim, Maestricht and Liége. The industrial features include cigar factories. A new station was built in 1894. In the same year the seminary for teachers ceased to exist. In the provincial museum are interesting Roman and German antiquities. Population, 30,517.

Boissier, Marie Louis Gaston (1823-——), French classical critic, and secretary of the French Academy, was born at Nîmes on the 15th August 1823. The Roman monuments of the place of his birth very early attracted his attention, and drew him insensibly to the study of ancient history. He made epigraphy his particular theme, and, while still a youth, became a teacher of rhetoric in his native town. In 1846 M. Gaston Boissier was appointed professor of that science at Angoulême, where he lived and worked for ten years without further ambition. A travelling inspector of the university, however, passing through Angoulême, happened to hear him lecture, and M. Boissier was called to Paris to be professor at the Lycée Charlemagne. It was only in mature years that he began to be an author. The Académie des Inscriptions offered, in 1859, a prize for an essay on Terentius Varro. M. Gaston Boissier was induced

to compete, and he composed a monograph which was instantly recognized as a masterpiece, not only of learning, but of grace. In 1861 he received the responsible appointment of professor of Latin oratory at the Collège de France, and he became a pillar of the *Revue des Deux Mondes*. In 1866 he published what remains the most popular of his works, *Cicéron et ses Amis*, which has enjoyed a success such as rarely falls to the lot of a work of erudition and research. In studying the manners of ancient Rome M. Gaston Boissier had learned to recreate its society, and to reproduce its characteristics with the most exquisite vivacity. His next work of importance was *L'Opposition sous les Césars*, in which he drew a remarkable picture of the political decadence of Rome under the early successors of Augustus, and showed by an examination of the state of feeling in the successive strata of Roman society how low the sentiment of republican liberty had sunk. In 1875 M. Boissier published *La religion Romaine d'Auguste aux Antonins*, in which he analysed the elements which produced the great religious movement of antiquity that preceded the acceptance of Christianity. Through so many solid contributions to literature, M. Boissier had by this time drawn to himself the universal respect of scholars and men of letters, nor did he lack admirers in the polite world. He was manifestly destined for the French Academy, and on the death of Patin, in 1876, he was appropriately elected to fill the vacant place. He was received on the 21st of December 1876 by M. Ernest Legouvé, and his reply—his *discours de réception*—is a finished essay on the study of ancient society in the literatures of Greece and Rome. In 1880 M. Gaston Boissier published *Promenades archéologiques: Rome et Pompei*, of which a second series appeared in 1886. In 1895, on the death of Camille Doucet, he was elected to succeed him as perpetual secretary to the French Academy. M. Boissier is a representative example of the French talent for lucidity and elegance applied with entire seriousness to weighty matters of literature. He is a scholar of the highest attainments, but his learning seems cast about his shoulders with the elegance and decorum of a toga about those of a Roman senator. M. Boissier has not written very much, and he has never strayed from his single theme, the reconstruction of the elements of Roman society.

Boito, Arrigo (1842- ——), Italian poet and musical composer, was born at Padua on the 24th February 1842. He studied music at the Milan Conservatoire, but even in those early days he devoted as much of his time to literature as to music, forecasting the divided allegiance which was to be the chief characteristic of his life's history. While at the Conservatoire he wrote and composed, in collaboration with Franco Faccio, a cantata, *Le Sorelle d'Italia*, which was performed with success but has never been published. On completing his studies Boito travelled for some years, and after his return to Italy settled down in Milan, dividing his time between journalism and music. In 1866 he fought under Garibaldi, and in 1868 conducted the first performance of his opera *Mefistofele* at the Scala Theatre, Milan. The work failed completely, and was withdrawn after a second performance. It was revived in 1875 at Bologna in a much altered and abbreviated form, when its success was beyond question. It was performed in London in 1880 with success, but in spite of frequent revivals has never succeeded in firmly establishing itself in popular favour. Boito treats the Faust legend in a wider spirit than Gounod, but, in spite of many isolated beauties, his opera lacks cohesion and dramatic interest. Since writing *Mefistofele* Boito has produced no musical work of any importance, although he was said to be at work in 1901 upon an opera on the subject of Nero, the libretto of which has already been published. His energies have been chiefly devoted to the composition of libretti, of which the principal are *Otello* and *Falstaff*, set to music by Verdi; *La Gioconda*, set by Ponchielli; *Amleto*, set by Faccio; and *Ero e Leandre*, set by Bottesini and Mancinelli. These works display a rare knowledge of the requirements of dramatic poetry, together with uncommon literary value. Boito has also published a book of poems and a novel, *L'Alfier Meno*. The degree of Doctor of Music was conferred upon him in 1893 by the University of Cambridge.

Bokhara, or BUKHARA, a khanate of Central Asia, now in a state of vassalage to Russia. It occupies a broad strip of land on the right bank of the middle Amu-daria, between 37° and 41° N., 62° and 72° E., and is limited by the Russian Turkestan provinces of Amu-daria, Samarkand, and Fergana in the N.E., the Russian Pamir in the E., Afghanistan in the S., and the Russian Transcaspian territory and Khiva in the W. Its south-eastern frontier on the Pamirs is quite undetermined except where it touches the Russian dominions, there being a mountainous unpopulated territory which is visited alternatively by nearly quite independent Kirghiz and by Afghan patrols. With the khanates of Karateghin and Darvaz, as also those of Roshan and Shugnan, the area would be about 95,650 square miles; without the two latter, which have fallen under Afghan influence, about 75,600 square miles.

Bokhara may be divided into three parts. The western part, crossed now by the railway, is a plain, watered by the Zeraïshan and by countless irrigation canals drawn from it. It has in the east the Karnak-chul prairie, covered with grass in early summer only, and in the north an intrusion of the Kara-kum sand desert. Land suitable for culture is only found in oases, where it is covered with irrigation canals, but these oases are very fertile. The cotton and mulberry trees are cultivated, as also all sorts of corn, including rice, and the vine. The middle portion is occupied by high plains, about 4000 feet in altitude, sloping from the Tian Shan, and intersected by numerous rivers (Surkhan, Kafirnagan, Waksh, and many smaller ones) flowing towards the Amu. This region, very fertile in the valleys and enjoying a cooler and damper climate than the lower plains, is densely populated, and agriculture and cattle-breeding are carried on extensively. Here are the towns of Karshi, Kitab, Shaar, Chirakchi, and Guzar. As to the eastern portion, it is covered with high mountains and plateaus.

The Hissar range, which separates the Zeraïshan from the large tributaries of the Amu—the Surkhan, Kafirnagan, and Vaksh (Surkhab)—is generally represented as running west to east, and ending in the west by the group Hazret-sultan; but it may perhaps be continued in reality to the south-west, ending in the Haja Mahmud mountains. In the east it is continued by the Alai mountains. Its length is about 200 miles, and its passes, lying from 1000 to 3000 feet below the surrounding peaks, are at altitudes of from 12,000 to 14,000 feet. The highest peaks are at the headwaters of the Yagnob (Great and Small Barzenghi, Rostovtseff's pass), where large glaciers are found. Numerous spurs run from it to the south and south-west, and there seems to exist a parallel range, Zigdi. Granites, gneisses, diabases, various porphyries, as also mica, clay, and silica, slates, limestones, conglomerates, and sandstones, enter into its composition. Numbers of rivers pierce or flow in wild gorges between its spurs. Its southern foot-hills, covered with loess, make the fertile valleys of Hissar and the Vaksh. The climate is so dry, and the rains are so scarce, that an absence of forests and Alpine meadows is characteristic of the ridge; but when great rain comes during the melting of the snow in the mountains, the devastations of the torrents are terrible. The main glaciers (12) are on the north slope, at the sources of the Yagnob and the Namrut; but none of them creeps below the 10,000 to 12,000 feet level. The passes across this ridge are extremely difficult.

The Peter the Great range, or Periokh-tau, in Karateghin, south of the valley of the Vaksh, runs west-south-west to east-north-east for about 130 miles, and is still higher. It is pierced in its south-west part by the Obi-khingou. From the meridian of Garm it rises above the snow-line, attaining at least 18,000 feet in the Sary-kandal peak, and 20,000 feet farther east where it joins the snow-clad Darvaz range, and where the group Sandal, adorned

with several glaciers, rises to 24,000 or 25,000 feet. Only three passes, very difficult, are known through it.

The bekdom of Darvaz, vassal to Bokhara, is situated on both sides of the Panj, near its sharp bend westwards, and is limited in the south by the Badakshan (Pamir), and on the west by Baljeran and Kulab, both belonging to Bokhara. It is covered with high mountains, and only in the lower parts of the valleys is agriculture possible. The population, about 35,000, consists chiefly of Moslem Tajiks (Galcha), and its chief town is at Kala-i-khum on the Panj, at an altitude of 4370 feet. Finally, the Roshan, another bekdom vassal to Bokhara, is on the Pamir. Its population (also Tajiks) is estimated at 5000 families, and its chief town is Kala-i-Vamar, at the junction of the Murghab with the Panj.

The chief river of the khanate is the Amu, which waters its eastern portion, and flows along its south-west border, attaining at the spot where it is spanned by the railway bridge the width of 1½ mile; it is navigated from the mouth of the Surkhan, and steamboats ply on it up to Kerki. Of its tributaries, the Zerafshan, the water of which is largely utilized for irrigation (43 main canals, having an aggregate length of 660 miles, are drawn from it), is lost in the sands 20 miles before reaching the Amu. Of the other right-bank tributaries of the Amu—the Surkhan, Kafirnagan, Vaksh, Aksu, &c.—only the first-named is navigated to some extent. Finally, the Kashka-daria, which flows westwards out of the glaciers of Hazret-sultan, supplies the Shahri-sabs (properly Shaar-sabiz) oasis with water, but is lost in the desert to the west of Karshi.

The climate of Bokhara is extreme. In the lowlands a very hot summer is followed by a short but cold winter, during which a frost of −20° Fahr. may set in, and the Amu may freeze for a couple of weeks. In the highlands this hot and dry summer is followed by four months of winter; and, finally, in the regions above the 8000-feet level, one sees a great development of snow-fields and glaciers; the passes are buried under snow, and the short summer is rainy. The lowlands are sometimes visited by terrible sandstorms from the west, which exhaust men and kill the cotton trees. Malaria is widely spread, and in some years, after a wet spring, takes a malignant character.

The population is estimated at from 2,000,000 to perhaps 2,500,000. About 300,000 live on the lower Zerafshan, 500,000 in the Shaar-sabiz and its neighbourhood; 200,000 in the Hissar region, and about 500,000 on the Amu. Another 500,000 may be scattered in the highlands. The population is of both Turkish and Iranian origin. The dominant nationality are the Uzbegs, who are fanatic Moslem Sunnites, despise work and their Iranian subjects, and maintain their old division into tribes or kins. The Turkomans (chiefly Ersaris) and the Kirghiz are also of Turkish origin; while the Sarts, who constitute the bulk of the population in towns, are a mixture of Turks with Iranians. The great bulk of the population in the country is composed of Iranian Tajiks, who are Sunnites by name and Shiites in reality. Afghans, Persians, Jews, Arabs, Armenians, &c., must be added to the above. Nearly 20 per cent. of the population are nomads and about 15 per cent. half-nomads.

On the irrigated lowlands rice, wheat, and other corn are grown, sufficient to be exported to the highlands, and only a small quantity is imported from Russian Turkestan. Cotton is widely grown and exported (500,000 cwts.). The silkworm culture is, however, of late years in decay. Cattle-breeding is widely spread in Hissar and the highlands generally. Cotton, silks, woollen cloth, and felt are largely fabricated, also boots, saddles, hardware, pottery, and various oils. Salt, as also some iron and copper, and small quantities of gold are extracted. The internal and the external trade are both very animated. The exports to Russia (raw cotton, raw silk, lamb-skins, carpets, &c.) attain the value of £1,200,000, and the imports of manufactured goods, sugar, &c., attain £1,000,000. The imports from India (cottons, tea, shawls, indigo) reach £550,000, and from Persia about £50,000, while the exports are £50,000 and £200,000 respectively. There are very few roads in Bokhara, the goods being transported on camels, or on horses and donkeys in the hilly tracts. The main caravan roads radiate from Bokhara to Baljeran, *viâ* Karshi, Guzar, and Hissar; to Balkh; to Meïmene, *viâ* Kerki; and to Samarkand, *viâ* Jam. The Transcaspian railway crosses the khanate on a length of 268 miles.

The emir of Bokhara is an autocratic ruler who governs according to the laws of the *Shariat* (common law). His troops consist of a regular army and a militia, to which the general militia (*lazawat*) must be added in time of war. There are 14,000 infantry, 14,000 cavalry, and 20 guns. The chief towns of the khanate are:—Bokhara, Karshi (about 35,000 inhabitants), and Charjui.

(P. A. K.)

Bokhara (*Bokhara-i-sherif*), capital of the above khanate, is situated on the left bank of the Zerafshan, on the irrigation canal Shahri-rud, in a fertile plain dotted with villages. It is 8 miles from the Bokhara station of the Transcaspian railway, 155 miles by rail W. of Samarkand, 39° 47′ N. lat. and 64° 27′ E. long.; alt. 640 feet. The city is surrounded by a stone wall 28 feet high and 8 miles long, having 131 half-circular towers and 11 gates of little value as a defence. It was begun in 830, destroyed by Chenghiz-khan, and rebuilt subsequently. The water-supply is very unhealthy. The city has no less than 360 mosques and as many streets, nearly 40 caravan-serais, and 50 market-places. Nearly 10,000 pupils receive education in its 103 medresses; primary schools (*mektebs*) are kept at most mosques. Of its numerous squares the Raghistan is the principal. It has on one side the citadel erected on an artificially made eminence about 40 feet high, surrounded by a wall one mile long, and containing the palace of the emir, the houses of the chief functionaries, the prison, and the water-cisterns. The houses are mostly one-storeyed and built in unburned bricks. Some of the medresses and mosques are of a very fine architecture. Of the former the most notable is the Mir-arab-i-Zariryan, with its beautiful lecture-halls; the chief mosque of the emir is the Méjidi-kalyan, or Kok-humbez, close by which stands the brick minaret, 203 feet high, from the top of which the state criminals used to be thrown up to 1871.

From a remote antiquity Bokhara was a centre of pagan learning and worship. It retained the same position when it became Mussulman, only having a rival in Samarkand, under Timur. And while other cities, like Balkh, Merv, and Samarkand, lost their educational and religious importance with the fall of their political power, Bokhara has fully retained it up till now. The Bokhara learned Mussulmans took a lively part in the collection of the holy traditions about the prophet, and later in the compilation of the books which systematized his teachings. The mysticism which took hold on Persia in the Middle Ages, also spread at Bokhara, and later, when the Mongol invasions laid waste Samarkand and other Moslem cities, Bokhara, remaining independent, continued to be the seat of learning. It is still the main stronghold of Islam and a centre of Mussulman learning for all the Russian dominions. Its book-market is small, and contains nothing but the current text-books, written, lithographed, or printed in India, Persia, or Kazañ; the medresse libraries, too, some of which were very rich, have been scattered and lost, or confiscated by emirs, or have perished in conflagrations. But there are still treasures of literature concealed in private libraries, and Afghan, Persian, Armenian, and Turkish bibliophiles come continually to Bokhara to buy rare historical, geographical, medical and other books. Besides, owing to the custom existing among learned men to bequeath their libraries to the emir, his library is said to be very rich. As a whole, Bokhara is thus the chief book-market of Central Asia. The population is estimated variously, but is supposed by Russian travellers not to exceed 50,000 or 60,000. For its trade, interior and exterior, Bokhara is the chief city of all Central Asia.

New Bokhara, or *Russian Bokhara*, a Russian town near the railway station, is rapidly growing on a territory conceded by the emir. Population, 2000.

(P. A. K.)

Bolgrad, a town of South Russia, government of Bessarabia, district and 30 miles E. of Izmail. It was founded at the beginning of the 19th century as a colony of Bulgarians. It has now a population of 12,390, gymnasia for boys and for girls, and is a depot for trade in corn.

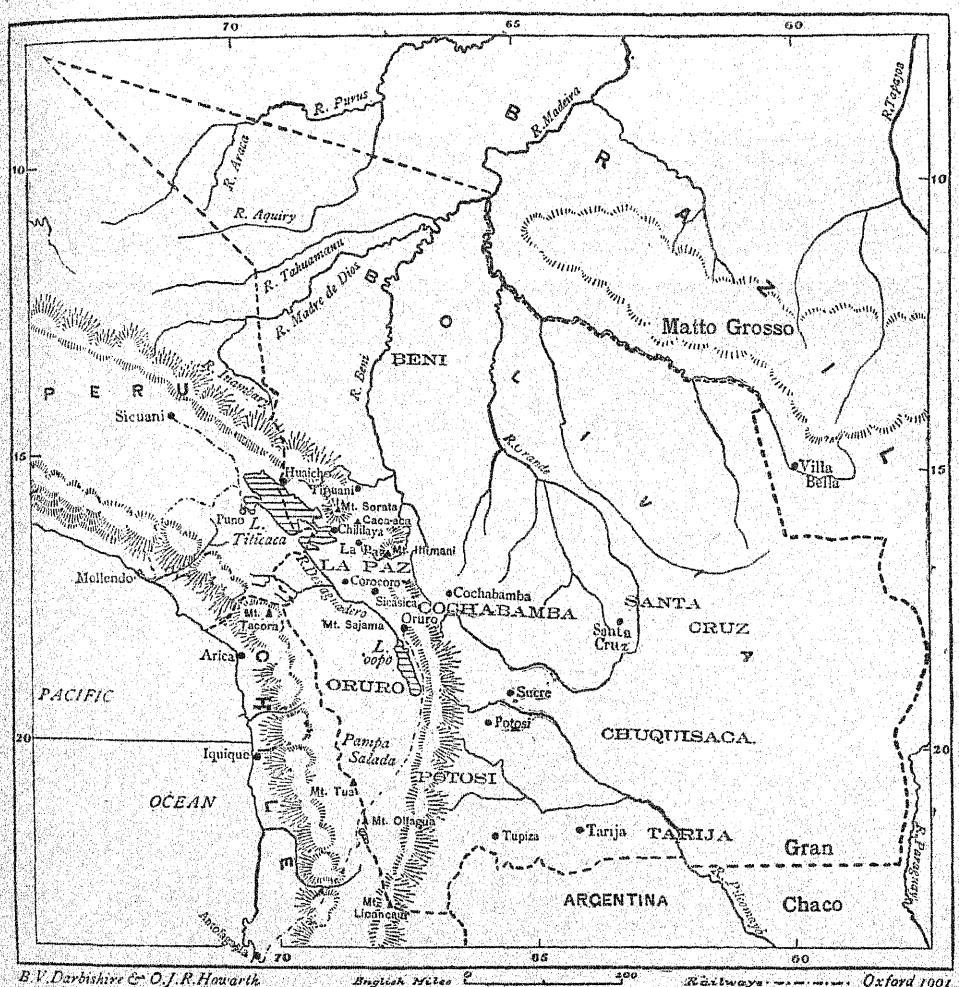
Boli, the chief town of a sanjak of the Kastamúni viláyet in Asia Minor, altitude 2500 feet, situated in a rich plain watered by the Boli Su, a tributary of the Filiyas Chai (*Billaeus*). Three miles east of Boli, at Eski-hissar, are the ruins of *Bithynium*, the birthplace of Antinous, also called *Antinoopolis*, and *Claudiopolis*. At Ilija, south of the town, are warm springs much prized for their medicinal properties. Population, 10,800 (Moslems, 9600; Christians, 1200).

Bolivar, a department of the republic of Colombia, bounded on the N. by the Caribbean Sea, on the S. by the department of Antioquia, on the E. by Magdalena and Santander, and on the W. by Cauca and the Caribbean Sea. Area, 27,000 square miles. Population, 325,000,

mostly white. The capital, Cartagena, has 11,000 inhabitants, and the principal towns include Mompox, Chinu, Sabanalarga, Barranquilla, at the mouth of the Magdalena, Soledad, Magangue, Corozal.

Bolivia, a country of South America extending from 10° to 23° S. lat., and from 58° to 70° W. long., bounded on the N. by Brazil, on the E. by Brazil and Paraguay, on the S. by the Argentine Republic, and on the W. by Chile and Peru. In the course of the war of 1879-83 with Chile, Bolivia lost her maritime provinces, and by the treaty of 4th April 1884 agreed provisionally to a new boundary. According to this treaty, the western frontier of Bolivia, starting from Sapalegui, the point where the Chilian, Argentine, and Bolivian boundaries meet, runs in a straight line to the Licancaur volcano, and thence straight to the southern source of the waters of Lake Ascotan, whence in another straight line it passes lengthwise over the lake and is continued to Ollagua volcano, from which it goes direct to Tua volcano, and joins the recognized eastern boundary of the department of Tarapaca. A preliminary treaty of 10th April 1886 provides rules for the demarcation of the frontier towards Peru. The *de facto* boundary runs from Tacora mountain across the sources of the Maure to Lake Titicaca; crosses the lake from the point of outflow of the Desaguadero to Huaicho on the southern side, runs to the sources of the valley of the San Juan del Oro, passes down the valley and down the Inambary to its confluence with the Madre de Dios, whence it runs in a straight line to the sources of the Yavary in 7° 1′ 17″ S. lat., there uniting with the Brazilian frontier, decided by treaty of 1867. The frontier towards Paraguay is still under dispute. An unratified treaty of 23rd November 1894 places the boundary in a straight line drawn due west across the Gran Chaco from a point on the Paraguay river, three leagues north of Puerto Olimpo, to a point where the principal channel of the Pilcomayo is intersected by the meridian of 61° 28″ W. long.

Boundaries.



Sketch Map of Bolivia.

Mountains.—The mountains of Bolivia may be boldly grouped into two main divisions, the western and the eastern Cordilleras. The western Cordillera consists of two or more parallel and associated ranges, whereof the lowest or Coast Cordillera does not exceed 5000 feet in altitude. Farther inland the mountains are higher till the main western Cordillera, to which some would confine the name Andes, is reached. This is a volcanic range, averaging about 15,000 feet in height, and contains some volcanoes not yet extinct. Mount Sajama is its highest measured peak (21,044 feet, Pissis; 21,559 feet, Reck). The eastern Cordillera or Cordillera Real branches from the western or Cordillera de los Andes about 24° S. lat. and making a bend to the east reunites with that range in 14° 40′ S. lat. Its three chief peaks are Mount Sorata, culminating in two peaks, Ancohuma or Hankuma (21,286 feet, Pentland; 21,710 feet, Conway), and Illampu (200 feet lower than Ancohuma); Caca-aca, wrongly called Huaina Potosi (20,170 feet, Minchin; 20,560 feet, Conway); and Illimani (21,355 feet, Pissis; 21,015, Conway). Between Mount Sorata in the north and Illimani in the south, a distance of about 64 miles, this range is almost continuously snow-clad and bears a number of large glaciers, though south of Caca-aca are several broad depressions below the snow-level. The mean summer snow-line lies at about 17,000 feet. The range is cut through south of Illimani by the valley of the La Paz, and north of Mount Sorata by the Mapiri, both rivers draining portions of the west slope of the range. Across the high part of the range between these valleys are several passes traversed by mule-paths or over which mule-paths could be easily made. Between the two main ranges lies the high plateau, a plain at an average altitude of about 12,500 feet. Various minor hills, called Serrania, rise out of this plain. It also includes Lakes Titicaca and Poopó, and the Rio Desaguadero which connects them. Eastwards the Cordillera Real falls rapidly to a mean level of about 3000 feet, which slopes away to the great central continental plain. The rapidly falling eastern slope is cut up into deep valleys or quebradas, called las Yungas, which are richly forested and include areas of great fertility. In the south the extension of the Argentine railway system to Jujuy has opened up the country, but the Beni district is still shut out from easy eastward communication by the rapids of the Madeira. But an almost level road might easily be cut through the forest from the navigable upper part of the Madre de Dios to the Rio Aquiry, in about 69° W. long., whereby the cataracts would be avoided. The rivers could also be united by a canal.

Climate.—The high plateau is subject to a rainy season which

begins in November or December and continues till April or May. During this time immense quantities of snow fall on the high mountains and violent thunderstorms rage over the Puna. In the winter months, May, June, and July, the weather is of almost unbroken clearness with strong cold winds. In August, September, and October the weather begins to break and showers fall occasionally. The eastern valleys near the mountains share in this succession of seasons to a less marked degree.

Geology.—The best account of the geology of Bolivia is that of Mr David Forbes (*Quarterly Journal of the Geological Society*, February 1861). The mass of the Cordillera Real consists of granite, diorite, and crystalline schists, with Silurian and Devonian rocks farther west. Small basin-shaped Carboniferous deposits appear at intervals farther west from Titicaca to Oruro and in the department of Santa Cruz. The Permian formation comes next to the west, and is largely developed and very rich in mineral deposits. The coast region is formed of deposits belonging to the Upper Oolitic system. The chief region of volcanic activity is the line of the western Cordillera, though a bed of trachytic tuff is found near La Paz, and some andesite has been observed on the flank of Illimani. The high plateau is covered by recent alluvial deposits, 1500 feet thick near La Paz, which mark the site of a great inland sea, whereof Titicaca and Poopó are the disappearing remnants. It is probable that the whole of the high region of Bolivia has risen in recent geological times, and it is perhaps still rising.

Area and Population.—The area of Bolivia (exclusive of the maritime provinces and Atacama) extends to 734,340 square miles. No complete census of the republic has ever been carried out, but the population is officially estimated at 2,313,750. The area and population of the eight departments, and of the two territories of the republic are given as follows:—

Departments and Territories.	Area. Square miles.	Population.	Population, per square mile.
Chuquisaca . .	39,870	250,000	6
La Paz . . .	171,080	573,750	3
Cochabamba . .	21,420	485,900	23
Potosi . . .	52,090	365,500	7
Oruro . . .	21,330	230,600	11
Tarija . . .	34,600	94,900	3
Santa Cruz . .	87,700	210,800	2
Beni	100,550	38,700	...
Madre de Dios, Ter.	13,500	18,600	1
Purus, Ter. . .	192,200	45,000	...
Total . .	734,340	2,313,750	3

Of the population 79,000 are whites and 299,500 of mixed European and Indian blood. The rest of the inhabitants are Indians, most of whom are semi-civilized, the number of uncivilized being estimated at over 240,000. The principal towns of Bolivia are La Paz, the capital, with 62,000 inhabitants; Cochabamba, 29,500; Sucre, 27,000; Potosi, 16,000; Oruro, 15,000; Santa Cruz, 12,000; Tarija, 12,000. Formerly the seat of government passed in rotation to each of four towns; in 1898 a law was passed making Sucre perpetual capital; La Paz protested, claiming the dignity for itself, and, after a brief war and a change of government, prevailed.

Government. According to the constitution established by a National Convention in 1880, Bolivia is a republic, with a representative and democratic form of government. The legislative power resides in a National Congress of two chambers, one of senators, the other of deputies. The Senate consists of sixteen members (two for each department) chosen for six years, of whom one-third retire every two years. Senators must be at least thirty-five years of age, and have an annual income of not less than 800 bolivianos. The Chamber of Deputies contains sixty-nine members chosen for four years, of whom one-half are removable every two years. Deputies must be at least twenty-five years of age, and have an annual income of not less than 400 bolivianos. Both senators and deputies are elected by direct suffrage, but electors must possess real property, or an annual income of not less than 200 bolivianos. Congress meets annually on 6th August for a session of at least sixty days. The executive power is vested in a president chosen for four years by direct and secret popular vote. He is not eligible for the succeeding presidential term. He has power to make treaties, subject to ratification by Congress; he is at the head of the military forces; may convoke Congress for extraordinary sessions; and has rights of patronage both in Church and State. He is assisted by two vice-presidents elected in the same manner and for the same period, and by a cabinet of five ministers appointed by himself as heads of departments of government. These ministries are—foreign affairs and worship, government and fomento, finance and industry, justice and public instruction, war and colonization.

Local Government.—At the head of each of the eight departments into which Bolivia is divided is a prefect appointed by the president and removable at his pleasure. The provinces are governed by sub-prefects, the cantons by justices (*corregidores*), and the country districts by *alcaldes*. The capital of each department has a municipal council; there are administrative boards in the provincial capitals, and cantonal agents in the villages. The duties of the municipal authorities relate to public works, municipal taxation, instruction, police, charity, and other matters. The two territories formed in 1890 are controlled by officials called national delegates.

Justice.—Justice is administered by a supreme court in the capital, by district courts in the departmental capitals, and by inferior tribunals of several grades.

Education.—Primary instruction is gratuitous and obligatory, and is under the care of the municipal authorities. In 1899 there were 692 primary schools, with 1020 teachers and 36,418 pupils. Among these are included about seventy schools for rural Indians taught by parish priests, and about 140 mission schools. The sum spent annually by the municipalities on primary education amounts to 140,000 bolivianos (£12,720). Secondary education is given in eight colleges, four seminaries, one religious college, and four private *lycées*. In 1899 there were 115 secondary teachers and 2321 pupils. At Sucre and La Paz there are schools of arts and trades conducted by the Salesian friars; at Sucre there is, besides, a commercial school, and at La Paz a military college. Higher education is given in six universities, at four of which medical science is taught. In 1898 the number of students was 2221. The theological faculty, including the seminaries, had 110 students in 1899.

Defence.—By laws of 1875 and 1880, every Bolivian citizen fit for service is a soldier, and is required to serve under the colours for two years, but the clergy are exempt, as are also certain others for special reasons. The military force consists of (*a*) troops of the line, numbering, in 1899, 2560, organized in two battalions of infantry, two regiments of cavalry, two regiments of artillery, and garrison troops distributed among the departments; (*b*) the reserves, composed of depot corps, with 30,000 men from twenty to twenty-five years of age; the ordinary and the extraordinary reserve, with 40,000 men from twenty-five to forty years of age; and the territorial guard, with 10,000 men from forty to fifty years of age. The total combatant force thus amounts to 82,560.

Finance.—The public revenues collected within the republic are divided into national, departmental, and municipal. The first and second are applied to the ordinary expenses of government; the third, to those of the municipalities. The national revenue is derived mainly from customs, monopolies, and taxes on the production and export of minerals and of rubber, while the departmental revenues are mainly the proceeds of taxes on land, paid by natives, on inheritances and legacies, on deeds, and on cattle imports and exports. The expenditure passes through the various government ministries. The national and departmental revenues for 1895-99, officially stated in silver bolivianos, are given in the subjoined table converted into sterling at the rate of eleven bolivianos to the £. No corresponding statement of expenditure is accessible.

Years.	Revenue.	
	National.	Departmental.
1895	£374,120	£135,140
1896	430,870	142,320
1897	505,800	154,220
1898	472,180	154,220
1899	539,910	159,510

For 1900 the national revenue and expenditure (at the same rate of exchange) were estimated as follows:—

Sources of Revenue.	Revenue.	Branches of Expenditure.	Expenditure.
Customs . .	£335,420	Legislative . .	£15,000
Spirit monopolies	138,170	Foreign affairs, &c.	57,580
Silver . . .	54,540	Government, &c. .	127,300
Rubber . .	45,450	Finance, &c. .	242,990
Tin, copper, bismuth . .	23,630	Justice, instruction	36,640
Various . .	69,210	War, colonization	241,350
Total . .	£666,420	Total . .	£720,860

For 1900 the total departmental revenue was estimated at £179,540, and the total municipal at £140,960. The internal debt recognized by the State amounted in 1899 to 3,934,250 bolivianos (£356,620). This amount included accumulated deficits, 1,564,226 bolivianos (£142,190), and war loans, 763,390 bolivianos (£69,390). The external debt, which originally amounted to 6,550,830 bolivianos, was due to Chilians as indemnity for their losses in the war of 1879-83. At the end of 1899 the outstanding amount was 881,910 bolivianos (£80,170).

Agriculture.—The most important vegetable product of Bolivia is rubber, which grows abundantly in the region of the upper Tahuamanu river, in the territories of Madre de Dios and Purus, in the department of La Paz, and in the region bordering on the Brazilian state of Matto Grosso. The trees are the property of the State, and any person, citizen or foreigner, may collect the gum without license, but the discoverer of trees may, by applying for a concession, obtain exclusive right to the advantages of his discovery. The total quantity of rubber which passed through the ports of Puerto Perez, Villa Bella, and Puerto Suarez in 1890 was 646,800 lb; in 1895, 1,804,900 lb; and in 1898, 6,943,100 lb. The rubber exported through Mollendo is known as "Mollendo rubber," while that sent eastwards to Brazil becomes "Para rubber." Another product which has risen into importance is coca, from which cocaine is obtained. The annual production of coca is stated to reach 10,120,000 lb, three-fourths of which grows in the province of Yungas, in the department of La Paz. In coca extraction duties the government collects about 250,000 bolivianos (£22,725) annually. Cinchona is exported in small quantities. Coffee, cocoa, and tobacco are cultivated, but are not commercially important. Besides the vicuña, llama, and alpaca, the country contains many cattle, and the cattle imports and exports are considerable. The use of llamas as beasts of burden is much less common than formerly, though flocks of them are still frequently met with on the roads. Donkeys and mules have taken their place. Some of the finest chinchilla skins come from Bolivia.

Minerals.—The country is rich in mineral wealth, much of which is still undeveloped. Gold is found in the gravels of most of the eastern valleys descending from the high part of the Cordillera Real, as well as in the La Paz valley and its upper eastern branches. Auriferous quartz is worked in the Araca valley and elsewhere. The most important gold-mining enterprises are those of two companies in the neighbourhood of La Paz, and one in the province of Cercado in the same department. For the working of the hydraulic mines of Tipuani there are five English and four French companies. Silver-mining in the Oruro district has been greatly developed, and a great quantity of the metal has been extracted from the important mines of Pulacayo (now full of water) and Oruro. Copper is now extensively mined at Corocoro. Tin is worked near Oruro, where large quantities of very rich ore exist, and on the west flank of Caca-aca in the hill called Huaina Potosi. In the tin districts bismuth is produced in increasing quantities. Coal exists on an island in Lake Titicaca, and an attempt is being made to work it. Most of the nitrate fields and guano beds once Bolivian are in areas now held by Chile. The following table presents a view of the metal output during 1895-99. The quantities of gold and silver are stated in troy ounces; those of copper, tin, and bismuth are given in tons, Spanish quintals being taken as equivalent to 101·6 lb av. The quantities of copper are only those obtained at Corocoro.

Years.	Gold.	Silver.	Copper.	Tin.	Bismuth.
	Oz.	Oz.	Tons.	Tons.	Tons.
1895	14,467	21,508,350	2487	1407	142
1896	16,075	21,058,250	3370	1360	131
1897	22,023	21,935,560	2748	2705	181
1898	17,682	10,999,800	3370	3692	272
1899	17,554	10,042,575	...	5192	453

Antimony, borate of lime, lead, and other minerals are produced and exported in small quantities. Apart from the working of mines and the exploitation of rubber, the industries of Bolivia are of little account. The more important of them are distilling, brewing, and the preparation of wines; the weaving of vicuña and alpaca coverlets; the manufacture of sugar, sweets, chocolate, and cigarettes.

Commerce.—The value of the imports and exports in 1895-99 was as follows (conversions being made at the uniform rate of 11 bolivianos to the £):—

Years.	Imports.	Exports.
	£	£
1895	1,263,270	1,901,100
1896	1,177,380	2,004,100
1897	1,132,360	1,998,930
1898	1,081,460	2,495,810
1899	1,167,150	2,487,550

In 1899 the imports consisted almost entirely of articles for personal or domestic use or consumption, such as cotton and woollen goods, food-stuffs and beverages, furniture and hardware, while mineral and agricultural products were exported. The mineral exports reached the value of £1,616,400, the most important having been silver, £909,000 (10,000,000 bolivianos); tin, £454,500; bismuth, £85,450; and copper, £72,720. The agricultural exports amounted to the value of £792,540, the rubber exports alone being valued at £727,200. Of the imports 16 per cent. in value came from Germany, 12 per cent. from Chile, 9 per cent. from Great Britain, from France, and from the United States, and 8 per cent. from Peru. Of the exports, 44 per cent. in value went to Great Britain, 34 per cent. to Germany, 7 per cent. to France, 3 per cent. to Chile, to Peru, and to the United States. Bolivia having no seaport, its trade on the side towards the Pacific passes through the ports of Mollendo, Arica, and Antofagasta, at all of which there are Bolivian customs agencies. On the eastern side large quantities of rubber are exported from Villa Bella and Puerto Suarez, and towards the Argentine Republic there is a growing export trade through Tupiza. Of the imports in 1899, 57 per cent. in value passed through Antofagasta, 19 per cent. through Mollendo, 16 per cent. through Arica, 6 per cent. through Puerto Suarez and Villa Bella together. Of the exports, 61 per cent. passed through Antofagasta, 5 per cent. through Mollendo, 1 per cent. through Arica, 21 per cent. through Puerto Suarez and Villa Bella together, and 3 per cent. through Tupiza.

Routes—Road, River, Rail.—Bolivia is provided with a vast system of natural highways in its lakes and rivers—Lake Titicaca, with an area of 3880 square miles, being connected by the Desaguadero river with Lake Poopó, covering 2800 square miles, while throughout the country the length of rivers navigable for steam launches is estimated at 5600 miles. The national roads which traverse the republic are made and maintained by the government. Those in the upper Andes were, at great expense, constructed by Indian labour, and serve for transport by means of pack animals. The roads which connect the principal cities with neighbouring towns are in general constructed by the municipalities. The nature of the country makes road-making difficult and costly. A reasonably good carriage-road connects the port of Chililaya, on Lake Titicaca, with La Paz, Corocoro, Sicasica, and Oruro. Branch roads run eastward to Cochabamba and Potosi, whilst the last-mentioned towns are connected with Sucre and one another by carriage-roads. The Tacna road has ceased to be an important commercial route. The only railway that actually enters Bolivia is a narrow-gauge line from the Chilian port of Antofagasta to Oruro. It is 574 miles in length, and attains an altitude of 13,580 feet. The northern part of the country is most easily reached from Mollendo by the railway to Puno on Lake Titicaca (325 miles; highest point, 14,666 feet), whence three steamboats ply to the Bolivian port of Chililaya, about 40 miles from La Paz. Other railways have been projected.

Post and Telegraph.—Bolivia joined the Postal Union in 1885. In the country there are 328 post-offices, and, in 1898, 899,080 pieces of mail matter were received, while 747,633 were despatched. The telegraph lines within the republic have a length of 2250 miles, and are served by 35 telegraph and 2 telephone offices. The telegraph lines belonging to the State have a length of 1240 miles.

Banks.—In 1900 there were in Bolivia 4 banks of issue: the National Bank, founded at Sucre in 1871, with a paid-up capital of 3,000,000 bolivianos (or, at the rate of exchange adopted for this article, £272,700); Argandoña's Bank, founded at Sucre in 1893, with a paid-up capital of 2,000,000 bolivianos (£181,800); the Industrial Bank at La Paz (1899), and the Commercial Bank at Oruro (1900), the two last named having each a paid-up capital of 500,000 bolivianos (£45,450). There are also 3 mortgage banks with paid-up capital amounting in all to 285,587 bolivianos (£25,960), and a savings bank, founded in 1900. The bank notes in circulation amount to 6,482,000 bolivianos (all of the National and Argandoña Banks), and, notwithstanding the large production of silver, there is great scarcity of silver coin. The metal not at once exported as bullion is minted and leaves the country as coin. The money coined and put in circulation during 1895-99 amounted to 7,931,760 bolivianos, showing an annual average of 1,586,352 bolivianos.

The boliviano, the unit of account, is of silver, and weighs 25 grams, or 385·8 grains, ·900 fine. The value at par is 5 francs, but in July 1900 its actual value was 1s. 9·9d. (or 43·8 United States cents.). The metric system of weights and measures is prescribed by law, but the old Spanish system is still in use.

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Recent History.—In January 1871 President Melgarejo was deposed and driven from the country by a revolution headed by Colonel Augustin Morales. The latter, becoming president, was himself murdered in November 1872 and was succeeded by Colonel Adolfo Ballivian, who died in 1874. Under this president, Bolivia entered upon a secret agreement with Peru which was destined to have grave consequences for both countries. To understand the reasons that urged Bolivia to take this step it is necessary to go back to the year 1866, when Chile and Bolivia were allied against Spain. A treaty was then concluded between those two republics, by which Bolivia conceded the 24th parallel as the boundary of Chilian territory and agreed that Chile should have a half share of the customs and full facilities for trading on the coast that lay between the 23rd and 24th parallels, Chile at that time being largely interested in the trade of that region. It was also agreed that Chile should be allowed to mine and export the products of this district without tax or hindrance on the part of Bolivia. In 1870, in further consideration of the sum of $10,000, Bolivia granted to an Anglo-Chilian company the right of working certain nitrate deposits north of the 24th parallel. The great wealth which was passing into Chilian hands owing to these compacts created no little discontent in Bolivia, nor was Peru any better pleased with the hold that Chilian capital was establishing in the rich district of Tarapacá. On 6th February 1873 Bolivia entered upon a secret agreement with Peru, the ostensible object of which was the preservation of their territorial integrity and their mutual defence against exterior aggression. There can be no doubt that the aggression contemplated as possible by both countries was a further encroachment on the part of Chile.

Upon the death of Adolfo Ballivian, immediately after the conclusion of this treaty with Peru, Dr Tomas Frias succeeded to the presidency. He signed yet another treaty with Chile, by which the latter agreed to withdraw her claim to half the duties levied in Bolivian ports on condition that all Chilian industries established in Bolivian territory should be free from duty for twenty-five years. This treaty was never ratified, and four years later General Hilarion Daza, who had succeeded Dr Frias as president in 1876, demanded as the price of Bolivia's consent that a tax of 10 cents per quintal should be paid on all nitrates exported from the country, further declaring that, unless this levy was paid, nitrates in the hands of the exporters would be seized by the Bolivian Government. As an answer to these demands, and in order to protect the property of Chilian subjects, the Chilian fleet was sent to blockade the ports of Antofagasta, Cobija, and Tocapilla. On 14th February 1879 the Chilian Colonel Sotomayor occupied Antofagasta, and on 1st March, a fortnight later, the Bolivian Government declared war.

An offer on the part of Peru to act as mediator met with no favour from Chile. The existence of the secret treaty, well known to the Chilian Government, rendered the intervention of Peru more than questionable, and the law passed by the latter in 1875, which practically created a monopoly of the Tarapacá nitrate beds to the serious prejudice of Chilian enterprise, offered no guarantee of her good faith. Chile replied by curtly demanding the annulment of the secret treaty and an assurance of Peruvian neutrality. Both demands being refused, she declared war upon Peru.

The superiority of the Chilians at sea, though checked for some time by the heroic gallantry of the Peruvians, soon enabled them to land a sufficient number of troops to meet the allied forces which had concentrated at Arica and other points in the south. The Bolivian ports were already in Chilian hands, and a sea attack upon Pisagua surprised and routed the troops under the Peruvian General Buendia and opened the way into the southern territory of Peru. General Daza, who should have co-operated with Buendia, turned back, on receiving news of the Peruvian defeat, and led the Bolivian troops to Tacna in a hasty and somewhat disorderly retreat. The fall of San Francisco followed, and Iquique, which was evacuated by the allies without a struggle, was occupied. Severe fighting took place before Tarapacá surrendered, but the end of 1879 saw the Chilians in complete possession of the province.

Meanwhile a double revolution took place in Peru and Bolivia. In the former country General Prado was deposed and Colonel Pierola proclaimed dictator. The Bolivians followed the example of their allies. The troops at Tacna, indignant at the inglorious part they had been condemned to play by the incompetence or cowardice of their president, deprived him of their command and elected Colonel Camacho to lead them. At the same time a revolution in La Paz proclaimed General Narciso Campero president, and he was elected to that post in the following June by the ordinary procedure of the constitution. During 1880 the war was chiefly maintained at sea between Chile and Peru, Bolivia taking little or no part in the struggle. In January of 1881 were fought the battles of Chorillos and Miraflores, attended by heavy slaughter and savage excesses on the part of the Chilian troops. They were followed almost immediately by the surrender of Lima and Callao, which left the Chilians practically masters of Peru. In the interior, however, where the Peruvian Admiral Montero had formed a provisional government, the war still lingered, and in September 1882 a conference took place between the latter and President Campero, at which it was decided that they should hold out for better terms. But the Peruvians wearied of the useless struggle. On 20th October 1883 they concluded a treaty of peace with Chile; the troops at Arequipa, under Admiral Montero, surrendered that town, and Montero himself, coldly received in Bolivia, whither he had fled for refuge, withdrew from the country to Europe. On the 9th of November the Chilian army of occupation was concentrated at Arequipa, while what remained of the Bolivian army lay at Oruro. Negotiations were opened, and on 11th December a peace was signed between Chile and Bolivia. By this treaty Bolivia ceded to Chile the whole of its sea-coast, including the port of Cobija.

On 18th May 1895 a treaty was signed at Santiago between Chile and Bolivia, "with a view to strengthening the bonds of friendship which unite the two countries," and, "in accord with the higher necessity that the future development and commercial prosperity of Bolivia require her free access to the sea." By this treaty Chile declared that if, in consequence of the plebiscite (to take place under the treaty of Ancon with Peru), or by virtue of direct arrangement, she should "acquire dominion and permanent sovereignty over the territories of Tacna and Arica, she undertakes to transfer them to Bolivia in the same form and to the same extent as she may acquire them"; the republic of Bolivia paying as an indemnity for that transfer $5,000,000 silver. If this cession should be effected, Chile should advance her own frontier north of Camerones to Vitor, from the sea up to the frontier which actually separates that district from Bolivia. Chile also pledged herself to use her utmost endeavour, either separately or jointly with Bolivia, to obtain possession of Tacna and Arica. If she failed, she bound herself to cede to Bolivia the roadstead (*caleta*) of Vitor, or another analogous one, and $5,000,000 silver. Supplementary protocols to this treaty stipulated that the port to be ceded must "fully satisfy the present and future requirements" of the commerce of Bolivia.

On 23rd May 1895 further treaties of peace and commerce were signed with Chile, but the provisions with regard to the cession of a seaport to Bolivia still remained unfulfilled. During those ten years of recovery on the part of Bolivia from the effects of the war, the presidency was held by Dr Pacheco, who succeeded Campero, and held office for the full term; by Dr Aniceto Arce, who held it until 1892, and by Dr Mariano Baptista, his successor. In 1896 Dr Severo Alonso became president, and during his tenure of office diplomatic relations were resumed with Great Britain, Señor Aramayo being sent to London as minister plenipotentiary in July 1897. As an outcome of his mission an extradition treaty was concluded with Great Britain in March 1898.

In December an attempt was made to pass a law creating Sucre the perpetual capital of the republic. Until this Sucre had taken its turn with La Paz, Cochabamba, and Oruro. La Paz rose in open revolt. On 17th January of the following year a battle was fought some forty miles from La Paz between the insurgents and the Government forces, in which the latter were defeated with the loss of a colonel and forty-three men. Colonel Pando, the insurgent leader, having gained a strong following, marched upon Oruro, and entered that town on 11th April 1899, after completely defeating the Government troops. Dr Severo Alonso took refuge in Chilian territory; and on 26th October Colonel Pando was elected constitutional president and formed a government.

Peace and prosperity for Bolivia, as well as for the two republics with whose fortunes her own are so closely allied, depend mainly

on the question of her seaboard, in which Chile and Peru are also concerned, being definitely settled and, with it, the question of boundary. In October 1901 Tacna and Arica had not yet been invited to declare by plebiscite their willingness to become Chilian territory. Chile still waited the final settlement of her frontier with Peru, and Bolivia was still without her seaport. The feeling of suspense, engendered by the uncertainty of the situation, had led to some show of impatience on the part of Chile, who seemed disposed to press for the legitimization of her position on what was formerly Bolivian territory before the way had been cleared towards providing Bolivia with a compensating access to the sea. Her impatience was said to be due to the discovery of a secret treaty, made between Bolivia and the Argentine Republic in 1891, constituting an offensive and defensive alliance between these two countries. At the close of 1901 there was no apparent obstacle to a final and peaceful settlement of the claims of Bolivia on the terms originally proposed. (W. Hd.)

Bolkhov, a district town of Russia, government and 35 miles N. of Orel, on the Oka river. It has important trade with Moscow, St Petersburg, and Little Russia, in hemp, ropes, hemp-seed oil, hemp goods, and cattle, and there are several hemp mills and important tanneries. The much-venerated monastery, Optina Pustyñ, is close by. Bolkhov probably existed at the beginning of the 13th century. Population, including suburbs, 26,570.

Bollandists.—The publication of the Bollandist *Acta Sanctorum* was suspended in 1794 during the invasion of the Netherlands by the French (see *Ency. Brit.* ninth ed. vol. iv. p. 18). The continuation of the work was undertaken in 1837, on behalf of the Society of Jesus, by Jo. Bapt. Boone, Joseph. van der Moere, Prosper Coppens, and Joseph. van Hecke, of the Jesuit College of St Michael at Brussels. The programme "De prosecutione operis Bollandiani, quod *Acta Sanctorum* inscribitur" was published on 25th March 1838; and the first volume of the new series (vol. lv. of the whole work) appeared in 1845. It contained the lives of the saints for two days only, 15th and 16th October, and even these only in part. Since then additional volumes, which on the whole fully maintain the standard of scholarship of the earlier series, have appeared at intervals, the latest being vol. lxiv. This was published in 1894; and a considerable part of its bulk is taken up by a critical edition of the *Martyrologium Hieronymianum* by Jo. Bapt. de Rossi and the Abbé L. Duchesne. The scale has increased steadily with the progress of the work: the month of October occupies thirteen volumes, followed by a supplementary volume edited by L. M. Rigollot, a secular priest of the diocese of Langres; and November bids fair to attain to an even greater bulk. In addition to the writers above mentioned, many others have taken part in the work from time to time, including Benj. Bossue, Victor and Remigius de Buck, Ant. Tinnebrock, Edu. Carpentier, Henr. Matagne, Carol. de Smedt, Gulielm. van Hooff, Joseph. de Backer, Franc. van Ortroy, Joseph. van den Gheyn, Hippolytus Delehaye, and Alb. Poncelet. In 1882 de Smedt, the present director, with van Hooff and Backer, began the publication of the *Analecta Bollandiana*, in which were to appear newly discovered lives, documents and fragments, or such as were unknown when the volumes were issued to which they properly belonged: by this means, not only is there provided a means of communication between the editors and the world at large, but a supplementary collection is being formed which can be incorporated in any future revised and enlarged edition of the *Acta Sanctorum*.

A series of lives of the saints in French, known as *Les Petits Bollandistes*, was edited by Mgr Paul Guérin; it is based upon the Bollandist *Acta Sanctorum*, Surius, and other collections of the same kind (7th edition in 17 volumes, 1882). In 1899 the Abbé C. Nauroy of Clichy published the first volume of his *Supplément aux Acta Sanctorum pour les Vies des Saints de l'époque Mérovingienne*. A very full *Table Alphabétique Générale des Saints*, giving references to the volumes of the Bollandist *Acta Sanctorum* so far as then published, is given in de Mas Latrie's *Trésor de Chronologie, d'Histoire et de Géographie*, cols. 665-862, Paris, 1889. (W. E. Co.)

Bologna, capital of the province of Bologna, in the compartment of Emilia, Italy, situated between the rivers Reno and Savena, 23 miles S.E. by E. of Modena by rail. It is the headquarters of the fifth Italian army corps. Since 1880 the city has undergone considerable transformation. New streets have been opened, new public and private buildings constructed, and new public gardens laid out both in the interior and the suburbs. In 1885 the municipal council sanctioned a scheme for the regularization and enlargement of the city, of which the cost to the commune alone was estimated at thirty million lire. This reform was necessitated when Bologna became in 1880 the centre of the railway communications of mid-Italy. The new streets with their colonnades retain the characteristic type of Bolognese buildings. The Giardino Marco Minghetti, near the palatial savings bank, and the monumental stairway in the Piazza Venti Settembre have been completed. In the Piazza Vittorio Emanuele the Palazzo del Podestà and other ancient buildings have been restored. Near Porta Lame a large public slaughterhouse and cattle-market have been constructed at a cost of more than 1,000,000 lire, while the Commercial Exchange, the public baths, and the customs warehouses have been added to the number of public edifices. Monuments to Victor Emmanuel II., Garibaldi, Minghetti, Cavour, Galvani, and Ugo Bassi have been erected in the various public squares. Side by side with the work of reconstruction has proceeded the development of industry, both private and official. Electric engineering works, beet-sugar factories, breweries, ice-works, machine-works, and flax-mills have been established by private enterprise, while the railway companies have installed railway workshops and a pyrotechnical laboratory, and the State a tobacco factory. The gasworks have been municipalized, and the octrois upon necessaries of life abolished. Charitable institutions have been extended by the establishment of a foundling hospital, an infant asylum, evening schools, and female educational institutes. The secondary education of the middle classes has been stimulated by the new Philological Club and the Circolo Cavour. In addition to *educatorii* (designed to amuse and feed the children of poor parents after school hours), summer school colonies have been created, which provide the poorer children with holidays on the mountains or at the seaside. Further, soup kitchens, free hospitals, sanatoria for children, an anti-rabies institute, an institute for the blind, deaf, and dumb, and above all, the Rizzoli Orthopædic Institute, are maintained for the afflicted and the deformed. The famous University has been increased by the addition of a faculty of Agriculture, and Bologna has succeeded in retaining its engineering school, while the academic renown of the occupants of the various chairs has prevented decadence. The number of students is at present 1900. Provision has been made for the erection of new educational buildings of experimental science and for the enlargement of public museums and libraries. Great attention has also been paid to the elementary schools, which were attended in 1880-81 by only 7000 children, but now are frequented by 12,500, or 85 per cent. of the children who come within the scope of the compulsory educational law of 1877. Another 10 per cent. attend private schools and colleges. Small museums and circulating libraries have been attached to nearly all the schools. Similar progress has been made in regard to the school of decorative art and the female

technical school. The school buildings have been enlarged and in some cases renewed on hygienic principles. Educational expenses have increased in proportion. In 1873 they amounted to 170,000 lire per annum, in 1886 to 290,000 lire, and are to-day more than 500,000 lire (£20,000). In respect of æsthetic, industrial, and educational requirements, Bologna still holds a high place among the progressive cities of modern Italy. Population of town (1881) 123,274, (1901) 152,009; of province (1881) 457,474, (1901) 527,642. (E. VI.)

Bologoye, a village of North Russia, half-way on the St Petersburg to Moscow railway. It is an important junction, with lines to Rybinsk and Yaroslavl, and to Pskov and Riga. It is a great depot for the upper Volga region.

Bolton-le-Moors, a municipal (extended 1898) county (1888), and parliamentary borough of Lancashire, England, on the Croal, 11 miles N.W. of Manchester, 200 miles by rail N.W. by N. of London. It has stations on the London and North-Western and the Lancashire and Yorkshire railways, with running powers for the Midland railway. It is governed by a mayor, 24 aldermen, and 72 councillors. Of recent institution are a natural history museum, an art and industrial museum, two hospitals, an orphanage, a new public park (1890), a new theatre, and 5 free lending libraries. There are about 130 cotton mills employing over 15,000 workers. In 1891 there were engaged in the manufacture of cotton and cotton goods 8130 males and 7070 females; in printing, dyeing, and bleaching of cotton and calico, 915 males and 494 females; and 945 males and 148 females as spinning and weaving machine makers. Bolton publishes two daily and two weekly newspapers. Area of municipal and county borough in 1891, 2361 acres; population (1881), 105,414; (1891), 115,002. On the recently extended area the population in 1891 was 146,487; in 1901, 168,746.

Boma. See CONGO FREE STATE.

Bombay Presidency, a province or presidency of British India, under the administration of a governor. Politically it includes the settlement of Aden; geographically it also includes the native state of Baroda, which is in direct political relations with the governor-general. Excluding Aden, it lies roughly between 13° 53′ and 28° 45′ N. lat. and between 66° 40′ and 76° 30′ E. long. Its total area (including native states) is 194,189 square miles; the population in 1891 was 26,960,421. The capital is Bombay city, from which the province takes its name. For the hot weather, the Government moves to the hill station of Mahabaleshwar, and for the rainy season to Poona. Native states occupy more than one-third of the total area of the presidency, with nearly one-third of the population. In some parts, as in the peninsula of Kathiawar, they continuously cover the whole area; in other parts, as in the Southern Maratha country, they are awkwardly interlaced amid British territory.

Population.—The population in 1901, according to the preliminary census returns, was 25,457,553. The following table gives the area and population of the several districts and native states of Bombay according to the census of 1891:—

Area and Population of Bombay Presidency (1891).

Divisions.	Districts.	Area in Square Miles.	Number of Towns and Villages.	Population, Census of 1891.			Density of Population to Square Mile.	Population, Census of 1881.
				Males.	Females.	Total.		
Northern Division	Ahmedabad	3,949	857	473,563	448,149	921,712	233	856,324
	Kaira	1,609	583	460,610	410,979	871,589	542	804,800
	Panch Mahals	1,613	656	162,101	151,316	313,417	194	255,479
	Broach	1,463	405	174,964	166,526	341,490	233	326,930
	Surat	1,662	797	321,625	328,364	649,989	391	614,198
	Thana	3,935	1,891	471,669	433,199	904,868	230	807,367
		14,231	5,189	2,064,532	1,938,533	4,003,065	281	3,665,098
Central Division	Khandesh	10,907	2,828	745,847	715,004	1,460,851	134	1,252,016
	Nasik	5,940	1,647	432,338	411,244	843,582	142	781,206
	Ahmednagar	6,645	1,348	451,825	436,930	888,755	134	750,021
	Poona	5,369	1,191	545,494	522,306	1,067,800	199	901,828
	Sholapur	4,542	716	381,400	369,289	750,689	165	583,411
	Satara	4,987	1,346	613,852	612,137	1,225,989	246	1,062,350
		38,390	9,076	3,170,756	3,066,910	6,237,666	162	5,330,832
Southern Division	Belgaum	4,657	1,076	511,885	501,376	1,013,261	217	865,922
	Dharwar	4,603	1,303	528,071	523,243	1,051,314	228	893,587
	Bijapur	5,668	1,112	398,104	398,235	796,339	140	626,889
	Kolaba	1,872	1,201	255,064	254,520	509,584	272	482,830
	Ratnagiri	3,922	1,310	513,616	592,310	1,105,926	282	997,090
	Kanara	3,910	1,185	234,356	211,995	446,351	114	421,840
		24,632	7,187	2,441,096	2,481,679	4,922,775	200	4,288,158
Sind	Karachi	14,182	783	313,152	251,728	564,880	40	489,496
	Hyderabad	9,033	1,348	500,068	418,578	918,646	102	754,624
	Shikarpur	9,296	1,111	493,872	421,625	915,497	98	820,549
	Thar and Parkar	12,729	212	165,225	132,978	298,203	23	145,810
	Upper Sind Frontier	2,549	296	96,273	78,275	174,548	68	203,344
		47,789	3,750	1,568,590	1,303,184	2,871,774	60	2,413,823
Bombay City and Island		22	1	518,093	303,671	821,764	37,352	773,196
Aden		80	1	30,914	13,165	44,079	551	34,860
Total British Territory		125,144	25,204	9,793,981	9,107,142	18,901,123	151	16,506,967

Native States

Divisions.	Districts	Area in Square Miles.	Number of Towns and Villages.	Population, Census of 1891.			Density of Population to Square Mile.	Population, Census of 1881.
				Males.	Females.	Total.		
Northern Division .	Cutch . . .	6,500	936	278,441	279,974	558,415	86	512,084
	Kathiawar . . .	20,559	4,199	1,416,633	1,335,771	2,752,404	134	2,343,899
	Palanpur . . .	7,775	1,177	335,587	309,939	645,526	83	576,478
	Mahi Kantha . .	9,300	1,867	296,646	284,922	581,568	63	517,485
	Rewa Kantha . .	4,980	3,156	376,146	357,360	733,506	147	549,892
	Cambay . . .	350	88	46,231	43,491	89,722	256	86,074
	Surat Agency . .	1,051	380	92,457	88,751	181,208	172	151,132
	Jawhar . . .	534	107	27,825	25,006	52,831	99	48,556
	Janjira . . .	324	229	39,629	42,151	81,780	252	76,361
	Savantvadi . .	926	227	93,520	99,428	192,948	208	174,433
Central Division .	The Dangs. . .	660	343	17,237	15,683	32,920	50	31,280
	Satara Agency . .	844	143	66,269	65,260	131,529	156	117,318
	Akalkot . . .	498	106	38,615	37,159	75,774	152	58,040
	Surgana . . .	360	57	6,545	5,853	12,398	34	14,205
	Bhor	1,491	473	78,602	77,067	155,669	104	145,876
Southern Division .	Kolhapur . . .	2,816	1,066	467,572	445,559	913,131	324	800,189
	Southern Mahratta Jaghirs . .	2,919	608	320,531	318,739	639,270	219	523,753
	Savanur . . .	70	24	8,330	8,646	16,976	243	14,763
	Jath	979	119	40,576	39,210	79,786	81	55,493
Sind	Khairpur . . .	6,109	149	72,733	59,204	131,937	22	129,153
Total Native States . . .		69,045	15,453	4,120,125	3,939,173	8,059,298	117	6,926,464
Grand Total		194,189	40,657	13,914,106	13,046,315	26,960,421	138	23,432,431

Since 1881 the population increased by 14 per cent. in British territory, and by 16 per cent. in native states. Both these rates are considerably above the rate of increase for India generally. The average density of population ranged from 542 persons per square mile in the Gujarat district of Kaira to 60 in Sind generally, and only 23 in the desert district of Thar and Parkar. Classified according to religion, and excluding native states, Hindus numbered 14,657,179, or 78 per cent. of the total population. Mahommedans numbered 3,501,910, of whom nearly two-thirds were found in Sind, where they formed 77 per cent. of the population as opposed to 8 per cent. for the rest of the province. Jains (with whom Buddhists were included) numbered 241,061, chiefly in Belgaum, Ahmedabad, and Bombay city. Parsis numbered 73,945, of whom nearly two-thirds were in Bombay city and its immediate neighbourhood, and most of the remainder in Surat. Christians numbered 158,765, of whom 28,110 were Europeans and 9464 Eurasians, leaving 121,191 for native converts, chiefly in the Konkan districts of Thana and Kanara. Jews numbered 9639, mostly in the city of Bombay and its neighbourhood. "Others" numbered 214,545, chiefly Bhils in Khandesh and aboriginal tribes in Thar and Parkar. In the native states the proportions were much the same, except that Jains were more numerous than in British territory, forming 4 per cent. of the total population. Native Christians were chiefly found in the two states of Sawantwari and Kolhapur, bordering on Goa. According to the preliminary returns of the census of 1901, the decrease in population was 5·57 per cent. In the British districts of Gujarat, where the famine of 1899-1900 was most severely felt, the rate of decrease was from 12 to 18 per cent., and in some of the native states it was as high as from 30 to 40 per cent.

Agriculture.—Excluding Sind, the total cultivated area in the rest of Bombay in 1897-98 amounted to 23,557,557 acres, of which only 963,454 acres were irrigated, mostly from wells. In Sind, on the other hand, out of a total cultivated area of 3,802,482 acres, no less than 2,917,624 acres were irrigated, almost entirely from government canals. Cotton was grown on 2,238,609 acres in 1897-98, chiefly in the districts of Khandesh, Dharwar, Ahmedabad, and Broach. No crops are grown under European supervision, such as the indigo of Bengal or the tea of Assam.

Industries.—The most important industry of the province is that of cotton, which, besides employing about 270 factories for cleaning and pressing the raw material, supports also about 114 mills for spinning and weaving. In 1897-98 the number of cotton mills was 70 in Bombay city, 40 in the rest of the province, and 4 in native states, total 114, employing about 100,000 persons, of whom 20,000 were women, 12,000 young persons, and 6000 children. The total number of looms was 28,808, and of spindles 2,933,736; and the capital invested was nearly ten crores of rupees (say six millions sterling). The total production was estimated at 324,649,184 lb of yarn, chiefly of counts 20, 10, and 16; and 73,481,564 lb of woven goods, chiefly shirtings, tea-cloths, *dhutis*, and *chadars*. The industry is passing through a period of severe depression, caused partly by the general effects of plague and famine, partly by the loss of almost the entire crop of cotton in the drought of 1899, and partly by the overstocking of the China market. Other large industries include a woollen mill at Bombay, employing 363 hands; three paper-mills at Bombay, Poona, and Surat, employing 415 hands; a brewery at Dapuri, near Poona; two dyeing-works at Bombay, employing 1037 hands; 11 flour-mills at Bombay, employing 648 hands; 15 ironworks in Bombay, one of which employs 1200 hands; and a tannery at Bombay, employing 614 hands.

Railways.—The province is well supplied with railways, all of which, with one exception, concentrate at Bombay city. The exception is the North-Western line, which enters Sind from the Punjab, and finds its natural terminus at Karachi. In 1898 the total length of railway under the Bombay Government open for traffic was 6261 miles, while 246 additional miles were under construction, and 1040 miles had been surveyed. These figures do not include the railway system in Sind.

Irrigation.—With the exception of Sind, the water-supply of the Bombay presidency does not lend itself to the construction of large irrigation works. These are classified as protective, productive, and minor. In 1897-98 the total receipts from three "protective" works in the Deccan and Gujarat amounted to Rs.1,51,103, while the working expenses were Rs.95,785, and the charge for interest was Rs.3,09,149, showing a deficit of Rs.2,53,831 on a capital outlay of Rs.81,56,083. The total receipts from seven "productive" works amounted to Rs.3,52,901, while the working expenses were Rs.2,13,370, and the charge for interest was Rs.4,16,238; showing a deficit of Rs.2,76,707 on a capital outlay of Rs.1,09,10,421. In the case of 26 "minor" works, on which no interest is charged, the total receipts were Rs.1,01,056, and the expenses Rs.88,540, showing a profit of Rs.12,516, or ·2 per cent. on a capital outlay of Rs.61,71,896. The figures for Sind are given under that heading.

Imports and Exports.—The sea-borne trade of the presidency is almost entirely concentrated at Bombay and Karachi, though there is considerable coasting traffic from the ports of Cutch, Kathiawar, and the Konkan. The following table gives the value (in tens of rupees) of the foreign imports and exports of merchandise only for the whole presidency (including Sind) for the six quinquennial years, 1877-78 to 1897-98:—

	Imports.	Exports.
	Rx.	Rx.
1877-78	15,699,638	23,755,287
1882-83	21,330,294	34,055,919
1887-88	29,122,076	37,034,206
1892-93	30,185,600	44,620,635
1897-98	30,754,383	32,074,314

The value (in tens of rupees) of each of the principal articles of import and export in 1897-98 was as follows:—

Imports.—Cotton piece goods, Rx.7,852,245; sugar, Rx.3,278,565; wrought metals, Rx.2,344,775; railway materials, Rx.1,807,397; mineral oils, Rx.1,089,785; machinery, Rx.1,563,477; cotton twist, Rx.978,861; provisions, Rx.866,426; silk goods, Rx.758,896; liquors, Rx.645,571; hardware and cutlery, Rx.639,923; dyeing and tanning materials, Rx.611,025. *Exports.*—Raw cotton, Rx. 7,277,118; cotton

twist, Rx.6,043,332; oil-seeds, Rx.5,273,794; opium, Rx.2,203,607; cotton piece goods, Rx.1,899,858; raw wool, Rx.1,902,718; wheat, Rx.1,303,693; hides, Rx.919,350; other food grains, Rx.697,220.

A significant fact was the decline in trade with the United Kingdom during the ten years ending 1897-98. The imports from the United Kingdom fell by 3 crores of rupees, and their proportion of the total from 73 to 59 per cent. The exports to the United Kingdom fell by 3¾ crores of rupees, and their proportion of the total from 24 to 16 per cent. Under imports, Germany, Russia, Belgium, and Austria each showed a very large increase; while under exports the largest increases were to Germany and Japan. Bombay is still the depot for trade with the Persian Gulf and Zanzibar, but this trade is not increasing. The interprovincial trade of Bombay by railway in 1897-98 was valued at Rs.16,71,27,000 for imports, and Rs.14,85,48,000 for exports.

Administration.—Including Sind, there are 4 divisions or commissionerships, distributed among 24 districts, each under the charge of a collector, with assistants and deputies. Many of the collectors have political duties in connexion with the numerous native states. The total number of civil and revenue judges is 266, and of magistrates of all sorts 648. In 1898, the total strength of the police (excluding Bombay city, Sind, and Aden) was 15,455 officers and men, being one policeman to every 10 square miles of area and to every 1948 of the population. In addition, there were 2121 railway police.

Army.—Since the reorganization of the Indian army in 1894 the Bombay command, under a lieutenant-general, comprises Baluchistan, and parts of Rajputana, Central India, and the Central Provinces, in addition to the Bombay presidency, with headquarters at Poona. It consists of three first-class and five second-class military districts, of which Poona and Bombay alone lie entirely within the presidency. In 1898 the strength of the Bombay command was 14,636 European and 30,103 native troops; total, 44,739. In addition there were 5710 volunteers.

Local Government.—Excluding Bombay city, the number of municipalities in the presidency is 167, with an aggregate population of 2,245,000. The total number of municipal commissioners is 2343, of whom 908 are elected. In 1897-98 the aggregate municipal income (excluding loans) was Rs.47,00,000, of which Rs.34,68,000 was derived from taxation, the incidence of taxation being nearly Rs.2 per head of population. The aggregate expenditure was Rs.67,00,000, of which Rs.27,36,000 was devoted to public health and convenience, Rs.6,35,000 to education, Rs.5,34,000 to plague, and Rs.2,48,000 to public safety. The number of district boards is 23, and of *taluk* or subdivisional boards 205. Almost all of these boards are partly elective. The total number of members is 3538, of whom 1593 are elected. In 1897-98 the aggregate income of all the local boards was Rs.44,94,000, of which Rs.27,34,000 was derived from rates. The aggregate expenditure was Rs.47,65,000, of which Rs.22,55,000 was devoted to public works, Rs.15,59,000 to education, and Rs.3,19,000 to medical.

The following is the net revenue and expenditure of Bombay for 1897-98 (in tens of rupees), distributed under the three heads of imperial, provincial, and local:—Net revenue, imperial, Rx.8,414,539; provincial, Rx.2,931,442; local, Rx.332,748; total, Rx.11,678,729. Net expenditure, imperial, Rx.4,966,446; provincial, Rx.2,876,452; local, Rx.387,738; total, Rx.8,230,636. Of the total revenue, Rx.3,678,082 was derived from land, Rx.2,287,245 from salt, Rx.1,904,348 from customs, and Rx.1,033,637 from excise.

Education.—The following table gives the chief statistics of education in Bombay for the years 1886-87 and 1896-97:—

	1886-87.		1896-97.	
	Schools.	Pupils.	Schools.	Pupils.
Colleges	13	1,633	14	1,824
Secondary Schools	388	38,064	466	36,164
Primary Schools	7,520	434,377	9,572	561,160
Special Schools	75	2,225	50	2,778
Private Institutions	2,927	65,737	2,832	70,779
Total	10,923	542,036	12,934	672,705

If we compare the number of pupils with the estimated population of school-going age (15 per cent. of the total population), the increase in ten years has been from 15·5 to 16·6 per cent. Taking girls alone, the number at school increased from 52,941 in 1886-87 to 82,163 in 1896-97, or by 56 per cent.; while the proportion to the female population of school-going age rose from 3·1 to 4·2 per cent. A feature in the Bombay system of public instruction is the success with which it has been extended to native states. In 1896-97, the total number of pupils in native states (not including Baroda) was 153,798, of whom 14,182 were girls. In 1886-87 the total expenditure on education was Rs.49,95,970, in 1896-97 it was Rs.73,72,981.

Public Calamities.—During the last few years the entire history of Bombay has been sadly affected by plague and famine. Bubonic plague, of a very fatal and contagious nature, first broke out in Bombay city in September 1896, and, despite all the efforts of the Government, quickly spread to the surrounding country. Since that date there have been fluctuations in the mortality, but the disease has never disappeared entirely. From September 1896 to March 1901, a period of four and a half years, the total number of deaths recorded from plague was no less than 335,555. The great cities of Bombay, Karachi, and Poona suffered most severely. A few districts in Gujarat almost entirely escaped; but the mortality was very heavy in Satara, Thana, Surat, Poona, Kolaba, and in the native states of Cutch, Baroda, Kolhapur, and Palanpur. The only sanitary measure that can be said to have been successful was complete migration, which could only be adopted in villages and smaller towns. Inoculation was extensively tried in some cases. Segregation was the one general method of fighting the disease; but, unfortunately, it was misunderstood by the people and led to some deplorable outbreaks. In Poona, during 1897, two European officials were assassinated; the editor of a prominent native paper was sentenced to imprisonment for sedition; and two leaders of the Brahman community were placed in confinement. At Bombay, in March 1898, a riot begun by Mahommedan weavers was not suppressed until several Europeans had been fatally injured. In Nasik district, in January 1898, the native chairman of the plague committee was brutally murdered by a mob. But on the whole the people submitted with characteristic docility to the sanitary regulations of the Government. Bombay, like the Central Provinces, suffered from famine twice within three years. The failure of the monsoon of 1896 caused widespread distress throughout the Deccan, over an area of 46,000 square miles, with a population of 7 millions. The largest number of persons on relief was 301,056 in September 1897; and the total expenditure on famine relief was Rs.1,28,00,000. The measures adopted were signally successful, both in saving life and in mitigating distress. In 1899 the monsoon again failed in Gujarat, where famine hitherto had been almost unknown; and the winter rains failed in the Deccan, so that distress gradually spread over almost the entire presidency. The worst feature was a virulent outbreak of cholera in Gujarat, especially in the native states. In April 1900 the total number of persons in receipt of relief was 1,281,159 in British districts, 566,671 in native states, and 71,734 in Baroda (Sir W. W. Hunter, *Bombay*, 1885-1890. London, 1892). For 1900-1 the total expenditure on famine relief was nearly 3 crores (say, £2,000,000 sterling); and a continuance of drought necessitated an estimate of 1 crore in the budget of the following year. (J. S. Co.)

Bombay City, the capital of Bombay presidency and chief seaport of Western India; situated in 18° 55′ N. lat. and 72° 54′ E. long. The city stands on an island of the same name, which forms one of a group now connected by causeways with the mainland. It occupies an area of 22 square miles; the population in 1881 was 773,196; in 1891 it was 821,764, showing an increase of 6 per cent.; and in 1901 it was 770,843, showing a decrease of 6 per cent., due to the effects of continued plague. Bombay thus falls to the second place, below Calcutta; but it is still the third most populous city in the British empire.

Classified according to religion, Hindus in 1891 numbered 543,276; Mahommedans, 155,247; Christians, 45,310, of whom 11,294 were Europeans and 4326 Eurasians, leaving 29,690 native converts, mostly Goanese; Parsis numbered 47,458, more than half the total in all India; Jains (including Buddhists), 25,415; Jews, 5021, nearly half the total in the presidency; "others," 37.

Bombay city is the centre of the cotton industry. In 1898 the number of cotton-mills was 70, with 19,303 looms and 2,040,409 spindles, employing about 65,000 hands, and consuming about 2,377,000 cwts. of cotton. The total number of factories of all kinds under inspection was 130, employing about 88,000 operatives.

Bombay contests with Calcutta the first place in the maritime trade of India. As the terminus of three railway systems, it serves Western and Central India; but this region cannot vie in productiveness with the valley of the Ganges. Bombay's commerce, like her cotton industry, has suffered severely in recent years from drought and plague. The following table gives the value (in tens of rupees) of the foreign imports and exports for the five years, 1893-94 to 1897-98:—

	Imports. Rx.	Exports. Rx.
1893-94	29,262,412	38,736,630
1894-95	28,786,724	34,371,984
1895-96	27,666,711	37,923,015
1896-97	26,855,083	32,162,284
1897-98	24,605,163	27,457,899

In 1897-98 the coasting trade was valued at Rs.10,42,58,674 for imports, and Rs.9,75,27,197 for exports.

In 1897-98, 40,051 vessels of 2,665,727 tons entered; and 31,264 vessels of 2,595,515 tons cleared the port.

The port of Bombay (including docks and warehouses) is managed by a port trust, the members of which are nominated by the Government from among the commercial community. In 1897-98 the revenue of the port trust was Rs.46,48,409, and the expenditure Rs.48,47,049, showing a deficit of Rs.1,98,640. The expenditure included Rs.24,67,927 for interest and sinking fund on a capital debt amounting to Rs.5,20,88,058. The municipal government of the city was framed by an Act of the Bombay legislative council passed in 1888. The governing body consists of a municipal corporation and a town council. The corporation is composed of 72 members, of whom 16 are nominated by the Government. Of the remainder, 36 are elected by the ratepayers, 16 by the justices of the peace, 2 by the senate of the university, and 2 by the chamber of commerce. The council, which forms the standing committee of the corporation, consists of 12 members, of whom 4 are nominated by the Government and the rest elected by the corporation.° Of the members of the corporation in 1898, 18 were Europeans, 16 Hindus, 12 Mahommedans, and 24 Parsis. In 1897-98 the total revenue was Rs.67,08,505, and the total expenditure Rs.74,96,970; on 31st March 1898 the total amount of loans outstanding was Rs.4,11,20,498, bearing interest at rates varying from 5 to 3½ per cent. A large proportion of these loans had been raised for waterworks and similar permanent outlay; but during 1897-98 it was found necessary to borrow no less than Rs.27,00,000 for temporary purposes. In this embarrassed condition of the corporation a new body was constituted in 1898 for the improvement and future expansion of the city, under the title of "Trustees for the Improvement of the City of Bombay." The board of trustees consists of fourteen members, of whom seven are elected. Their duties are to form new and alter existing streets, to remove and alter insanitary buildings, to provide open spaces for better ventilation and for recreation, to construct new sanitary dwellings for certain classes of the inhabitants, to lay out vacant lands, and to reclaim parts of the foreshore of the island. In April 1900 the Bombay Improvement Trust raised a loan of Rs.50,00,000 (say £333,333), in 4 per cent. debentures, on the London market.

The Bombay University was constituted in 1857 as an examining body, on the model of the University of London. During the five years ending 1897 the total number of persons who matriculated was 4813, while 815 graduated B.A., 859 passed examinations in law, 416 in medicine, and 314 in engineering. The chief educational institutions in Bombay city are the Government Elphinstone College, two missionary colleges (Wilson and St. Xavier), the Grant Medical College, the Government law school, the Sir Jamsetji Jijibhai School of Art, and the Victoria Jubilee Technical Institute. There are altogether twenty-four high schools for boys, and ten for girls. In 1897-98, a year of plague, the total number of pupils under instruction was 22,204, being 3·4 per cent. of the population.

The effects of the plague in Bombay city may be briefly shown by a few figures. From September 1896 to July 1898 the number of cases recorded was 31,083, of whom 27,533 died. In three years the number of deaths from plague was 1811 in 1898, 15,692 in 1899, and 13,247 in 1900. During 1897 the total number of deaths from all causes was 47,896, equal to a death-rate of 58·3 per thousand, compared with an average death-rate of 35 per thousand for the preceding five years. Among Europeans alone the death-rate was only 19 per thousand. In 1899 the death-rate rose to 69·5 per thousand. (J. S. Co.)

Bona (French, *Bône*), a seaport town of Algeria, on a bay of the Mediterranean, in the department of Constantine, 220 miles by rail W. of Tunis, with railway connexion with Guelma and Constantine. It is the seat of a sub-prefecture and an important commercial centre for the export of cereals, oils, corks, wools, and minerals. It owes its prosperity to the rich plain surrounding it. The port is now one of the best and safest on the Mediterranean coast, having been considerably enlarged in 1896-98. Its tonnage, 298,223 in 1890, amounted in 1898 (entered and cleared) to 583,144. There are forty-six merchant ships registered at the port. From 18,866 in 1872, the population increased to 26,475 in 1891, and 32,498 in 1900. Of this 12,011 were French, 7800 were Arabs, and about 12,500 were foreigners, chiefly Italians and Maltese.

Bonaparte, Napoleon Joseph Charles Paul (commonly known as PRINCE NAPOLEON, or by the *sobriquet* of "Plon-Plon"[1]), (1822-1891), the second son of Jerome Bonaparte, king of Westphalia, by his wife Catherine, princess of Würtemberg, was born at Trieste, 9th September 1822. After the French revolution of 1848 he was elected to the National Assembly as a representative of Corsica, and (his elder brother, Jerome Napoleon Charles, dying in 1847) assumed the name of Jerome. Notwithstanding his ostensible opposition to the *coup d'état* of 1851, he was, upon the establishment of the empire, placed in the direct line of succession, and received a liberal dotation, but was allowed no share in public affairs. Privately he professed himself the representative of the Napoleonic tradition in its democratic aspect, and associated mainly with men of advanced political opinions. In 1854 he took part in the Crimean campaign as general of division. His conduct at the battle of the Alma occasioned imputations upon his personal courage, but they seem to have been entirely groundless. Returning to France, he undertook the chief direction of the National Exhibition of 1855, in which he manifested great capacity. In 1858 he was appointed minister for the Colonies and Algeria, and his administration aroused great hopes, but his activity was diverted into a different channel by his sudden marriage in January 1859 with the Princess Clotilde, daughter of Victor Emmanuel, a prelude to the war for the liberation of Italy. In this war Prince Napoleon commanded the French corps that occupied Tuscany, and it was expected that he would become ruler of the principality, but he refused to exert any pressure upon the inhabitants, who preferred union with the Italian kingdom. The next few years were chiefly distinguished by remarkable speeches which displayed the prince in the unexpected character of a great orator. Unfortunately his indiscretion equalled his eloquence: one speech (1861) sent him to America to avoid a duel with the duke d'Aumale; another (1865), in which he justly but intemperately protested against the Mexican expedition, cost him all his official dignities. He was, nevertheless, soon restored to the position of dubious favour which he generally occupied under his cousin's reign, and was influential in effecting the reform by which, in 1869, it was sought to reconcile the empire with Liberal principles. The fatal war of 1870 was resolved upon during his absence in Norway, and was strongly condemned by him. After the first disasters he undertook an ineffectual mission to Italy to implore the aid of his father-in-law; and after the fall of the empire lived in comparative retirement until the death of the Prince Imperial (1879) made him direct heir to the Napoleonic succession. His part as Imperial pretender was unfortunate and inglorious: his democratic opinions were unacceptable to the Imperial party, and ere his death he was virtually deposed in favour of his son Prince Napoleon Victor. He died at Rome, 17th March 1891. His eldest son, Prince NAPOLEON VICTOR (born 1862), has since then been the head of the French Bonapartist party; but the second son, Prince LOUIS NAPOLEON, an officer in the Russian army, has given more reason to suppose that he has inherited some of the finer characteristics of his family. Prince Napoleon's sister, Princess MATHILDE LETITIA WILHELMINE BONAPARTE, born at Trieste, 27th May 1820, married in October 1841 Prince Anatole Demidoff. The prince's conduct led to a separation within four years, and he was compelled by the Tsar Nicholas to make the princess a handsome allowance. After the election of her cousin, Louis Napoleon, as president of the Republic, the princess took up her residence in Paris, and did the honours of the Élysée until his

[1] Derived, it is supposed, from the nickname "Plomb-plomb," or "Craint-plomb" (fear-lead), given him by his soldiers in the Crimea.

marriage. She has since continued to reside in Paris, distinguished as the friend and patron of men of letters and artists, and herself displaying no mean skill as a painter.

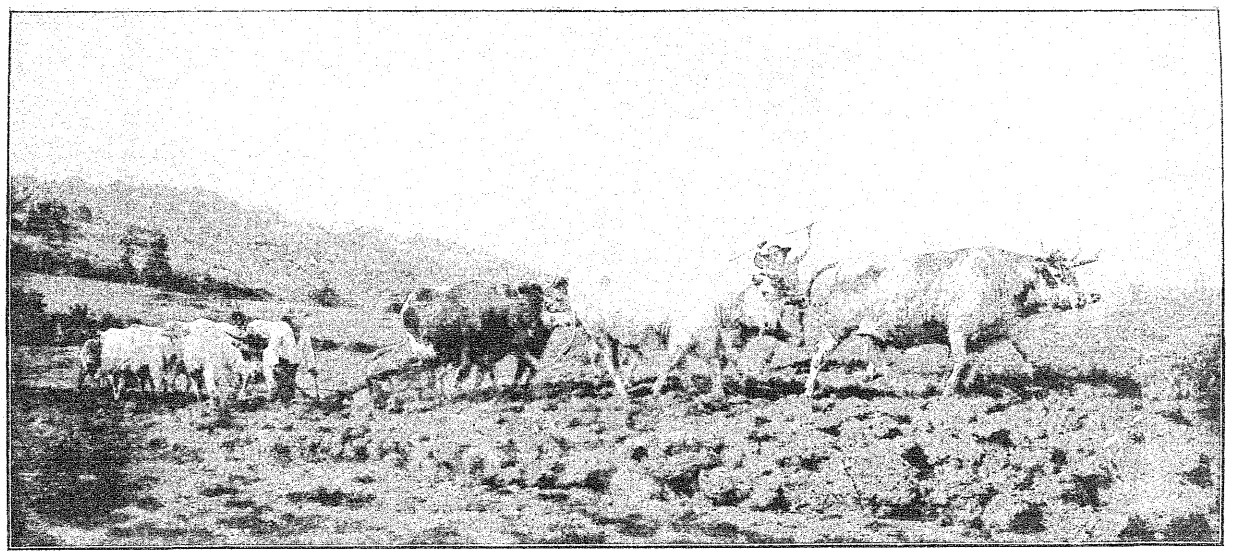
Able man though he was, Prince Napoleon was disqualified by character and temperament from success in public life. His democratic convictions, however sincere, coexisted with a despotic temper; his independence, in itself highly honourable to him, became in its excess disdain for public opinion and offensive brusqueness; while despising princely affectations, he failed to manifest princely dignity or princely munificence; and his private life was by no means exemplary. It would, moreover, have been difficult for any one to have resisted the constant stream of calumny directed against him by the absolutist and clerical sections of the Imperialist party; he was constantly taxed with disloyalty to the emperor, and yet, when his proceedings are impartially reviewed, he appears to have opposed all the mistakes that proved fatal to the dynasty, and to have invariably given the soundest advice. In the character of his intellect, as in personal appearance, he bore an extraordinary resemblance to the first Napoleon, possessing the same marvellous lucidity of insight, and the same gift of infallibly distinguishing the essential from the non-essential. He was a warm friend of literature and art, and in a private station would have achieved high distinction as a man of letters. (R. G.)

Bonaparte, Napoleon Eugène Louis Jean Joseph, Prince Imperial (1856-1879), son of the Emperor Napoleon III. and the Empress Eugénie, was born at Paris 16th March 1856. He received a careful education, and was considered a youth of promise. In the Franco-German war of 1870 he went to the front, though aged only fourteen, and much dynastic capital was made of his "baptism of fire" and his having discharged a mitrailleuse at the battle near Saarbrücken. So soon, however, as the campaign threatened to become disastrous he was sent to Brussels, and speedily joined his mother in England, residing at Chislehurst. Upon his father's death in 1873 he was proclaimed by the imperialist party as Napoleon IV., passing under the title of count de Pierrefonds. He had already, in 1872, entered the military academy at Woolwich, where he made fair progress in his studies, and gained the esteem of his teachers and companions by his amiable disposition. Desirous of acquiring military experience, and of recommending himself to the French nation by exploits in the field, he volunteered for service in the Zulu war, and departed for South Africa on 27th February 1879. His period of military service was short indeed, for he was killed in a reconnaissance on 1st June. His remains were brought home, and interred with those of his father at Chislehurst. His death was an event of considerable political importance, virtually destroying the Bonapartist party in France by transferring its leadership to the unpopular Prince Napoleon Jerome. The Prince Imperial's amiable character, and the romantic interest attaching to him, would have made him a formidable pretender in the event of any internal trouble menacing the stability of the Republic. (R. G.)

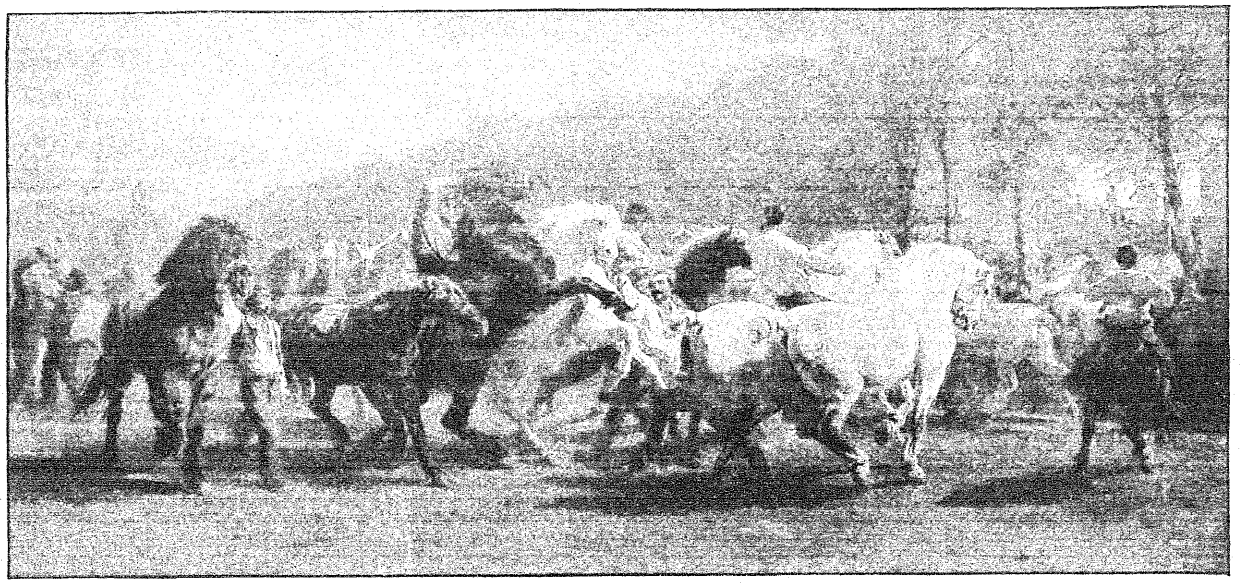
Bonghi, Ruggero (1828-1895), Italian politician, was born at Naples, 20th March 1828. Exiled from Naples in consequence of the movement of 1848, he took refuge in Tuscany, whence he was compelled to flee to Turin on account of a pungent article against the Bourbons. At Turin he resumed his philosophic studies and his translation of Plato, but in 1858 refused a professorship of Greek at Pavia, under the Austrian Government, only to accept it in 1859 from the Italian Government. In 1860, with the Cavour party, he opposed the work of Garibaldi, Crispi, and Bertani at Naples, and became secretary of Luigi Carlo Farini during the latter's lieutenancy, but, in 1865, assumed contemporaneously the editorship of the *Perseveranza* of Milan and the chair of Latin literature at Florence. Elected deputy in 1860 he became celebrated by the biting wit of his speeches, while, as journalist, the acrimony of his polemical writings made him a redoubtable adversary. Though an ardent supporter of the historic Right, and, as such, entrusted by the Lanza Cabinet with the defence of the law of guarantees in 1870, he was no respecter of persons, his caustic tongue sparing neither friend nor foe. Appointed minister for public instruction in 1873, he, with feverish activity, reformed the Italian educational system, suppressed the privileges of the university of Naples, founded the Vittorio Emanuele library in Rome, and prevented the establishment of a Catholic university in the capital. Upon the fall of the Right from power in 1876 he joined the Opposition, and, with characteristic vivacity, protracted during two months the debate on Baccelli's University Reform Bill, securing, single-handed, its rejection. A bitter critic of King Humbert, both in the *Perseveranza* and in the *Nuova Antologia*, he was, in 1893, excluded from court, only securing re-admission shortly before his death, on 22nd October 1895. In foreign policy a Francophil, he combated the Triple Alliance, and took considerable part in the organization of the inter-Parliamentary peace conference. (H. W. S.)

Bonham, a city of Texas, U.S.A., capital of Fannin county, in the N.E. part of the state, on a line of the Texas Pacific railway, and an important point in the shipment of cotton. Population (1890), 3361; (1900), (5042).

Bonheur, Marie Rosalie, known as Rosa Bonheur (1822-1899), one of the most famous women artists of the 19th century, was born at Bordeaux, in France, on the 22nd March 1822. She was of Jewish origin. Jacques Wiener, the Belgian medallist, a native of Venloo, says that he and Raymond Bonheur, Rosa's father, used to attend synagogue in that town; while another authority asserts that Rosa used to be known in common parlance by the name of Rosa Mazeltov (a Hebrew term for "good luck," *Gallicé* Bonheur). She was the eldest of four children, all of whom were artists: Auguste (1824-1884) painted animals and landscape; Juliette (1830-1891), "honourably mentioned" at the exhibition of 1855; Isidore, born in 1827, a sculptor of animals. Rosa at an early age was taught to draw by her father (who died in 1849), and he, perceiving her very remarkable talent, permitted her to abandon the business of dressmaking, to which, much against her will, she had been put, in order to devote herself wholly to art. From 1840 to 1845 she exhibited at the salon, and five times received a prize; in 1848 a medal was awarded to her. Her fame dates more especially from the exhibition of 1855; from that time Rosa Bonheur's works were much sought after in England, where collectors and public galleries competed eagerly for them. What is chiefly remarkable and admirable in her work is that, like her contemporary, Brascassat, she represents animals as they really are, as she saw them in the country. She gives us a picture of real life, instead of the often artificial presentment of rural scenes and incidents of animal life. Her gift of accurate observation was, however, allied to a certain dryness of style in painting; she often failed to give a perfect sense of atmosphere. On the other hand, the anatomy of her animals is always faultlessly true. There is nothing feminine in her handling; her treatment is always manly and firm. Of her many works, we may note the following—"Ploughing in the Nivernais" (1848), in the Luxembourg gallery (see Plate); "The



"Ploughing in the Nivernais." By Rosa Bonheur.



"The Horse Fair." By Rosa Bonheur.

Horse Fair" (1853), one of the two replicas of which is in the National Gallery, London, the original being in the United States (see Plate); and "Hay Harvest in Auvergne" (1855). She was "decorated" with the Legion of Honour by the Empress Eugénie, and was subsequently promoted to the rank of "officer" of the order. After 1867, Rosa Bonheur exhibited but once in the salon, in 1899, a few weeks before her death. She lived quietly at her country house at By, near Fontainebleau, where, for some years she had held gratuitous classes for drawing. She left at her death a considerable number of pictures, studies, drawings, and etchings, which were sold by auction in Paris in the spring of 1900. (H. FR.)

Bonhill. See ALEXANDRIA.

Boni (BONÉ), a vassal state belonging to the government of Celebes and its dependencies (Dutch East Indies), on the south-west peninsula of Celebes (*q.v.*), on the Gulf of Boni. Its area is 2548 square miles. The chief products are rice, tobacco, coffee, cotton, and sugar-cane, none of them important exports. The buffaloes and horses of this state are highly-esteemed breeds. The trade, shipping, and fishery, are in a state of decline. The chief town, Boni, lies 80 miles north-east of Macassar.

For the wars in Boni, see PERELAER, *De Bonische expeditiën*, 1859-60, Leiden, 1872; and MEYERS, in the *Militaire Spectator* (1880).

Bonifacio, a coast town in the arrondissement of Sartine, Corsica, 42 miles in direct line S.E. of Ajaccio, on the railway from Bastia. Cork-cutting, an industry of recent growth, employs in a single factory 200 persons, producing annually 50 millions of corks. Population (1881), 2790; (1896), 3191, (comm.) 3587.

Bonin Islands, called by the Japanese Ogasawarajima, a chain of small islands stretching nearly due north and south, a little to the east of 142° E. long., and from 26° 35′ to 27° 45′ N. lat. They number twenty, according to Japanese investigations, and have a coast-line of 174·65 miles long and a superficies of 28·82 square miles. Only ten of them have any appreciable size, and these are named—commencing from the north—Muko-shima (Bridegroom Island), Nakadachi-shima (Go-between Island[1]), Yome-shima (Bride Island), Ototo-jima (Younger-brother Island), Ani-shima (Elder-brother Island), Chichi-jima (Father Island), Haha-jima (Mother Island), Mei-jima (Niece Island), Ani-jima (Elder-sister Island), and Imoto-jima (Younger-sister Island). European geographers have been accustomed to divide the islands into three groups for purposes of nomenclature, calling the northern group the Parry Islands, the central the Beechey Islands, and the southern the Coffin, or Bailey Islands. The second largest of all, that is to say Chichi-jima (Father Island), in Japanese cartography, was called "Peel Island" in 1827 by Captain Beechey, and the same officer gave the name of "Stapleton Island" to the Ototo-jima of the Japanese, and that of "Buckland Island" to their Ani-jima. To complete this account of Captain Beechey's nomenclature, it may be added that he called a large bay on the south of Peel Island "Fitton Bay," and a bay on the south-west of Buckland Island "Walker Bay."[2] Port Lloyd, the chief anchorage (situated on Peel Island), is considered by Commodore Perry—who visited the islands in 1853 and strongly urged the establishment of a United States coaling station there—to have been formerly the crater of a volcano from which the surrounding hills were thrown up, the entrance to the harbour being a fissure through which lava used to pour into the sea. The islands are, indeed, plainly volcanic in their nature.

History.—The diversity of nomenclature indicated above suggests that the ownership of the islands was for some time doubtful. According to Japanese annals they were discovered towards the close of the 16th century, and added to the fief of a Daimyo, Ogasawa Sadayori, whence the name "Ogasawara-jima." They were also called *Bunin-jima* (corrupted by foreigners into "Bonin") because of their being without (*bu*) inhabitants (*nin*). Effective occupation did not take place, however, and communications with the islands ceased altogether in 1635, as was a natural consequence of the Japanese Government's veto against the construction of sea-going vessels.[3] In 1728 fitful communication was restored by the then representative of the Ogasawara family, only to be again interrupted until 1861, when an unsuccessful attempt was made to establish a Japanese colony at Port Lloyd. Meanwhile, Captain Beechey having visited the islands in the *Blossom*, having assigned names to some of them, and having published a description of their features, a small party consisting of two British subjects, two American citizens, and a Dane, sailed from the Sandwich Islands for Port Lloyd in 1830, taking with them some Hawaiian natives. These colonists hoisted the British flag on Peel Island (Chichi-jima), and settled there. When Commodore Perry arrived in 1853, there were on Peel Island thirty-one inhabitants, four being English, four American, one Portuguese, and the rest natives of the Sandwich Islands, the Ladrones, &c.; and when Mr Russell Robertson visited the place in 1875, the colony had grown to sixty-nine, of whom only five were pure whites. Mr Robertson found them without education, without religion, without laws, and without any system of government, but living comfortably on clearings of cultivated land. English was the language of the settlers, and they regarded themselves as a British colony. But (in 1861) the British Government renounced all claim to the islands in recognition of Japan's right of possession. There is now regular steam communication; the affairs of the islands are duly administered, and the population has grown to 4519. There are no mountains of any considerable height in the Ogasawara Islands, but the scenery is hilly with occasional bold crags. The vegetation is almost tropically luxuriant, palms, wild pineapples, and ferns growing profusely, and the valleys being filled with wild beans and patches of taro. Mr R. Robertson catalogues a number of valuable timbers that are obtained there, among them being Tremana, cedar, rose-wood, iron-wood (red and white), box-wood, sandal, and white oak. The kekop tree, the orange, the laurel, the juniper, the wild cactus, the curry plant, wild sage, and celery flourish. No minerals have yet been discovered. The shores are covered with coral; earthquakes and tidal waves are frequent, the latter not taking the form of bores, but of a sudden steady rise and equally sudden fall in the level of the sea; the climate is rather tropical than temperate, but sickness is almost unknown among the residents. (F BY.)

Bonn, a town of Prussia, in the Rhine province, 21 miles by rail S. by E. from Cologne, on the left bank of the Rhine. The river is here crossed by a fine bridge (1896-98), 1417 feet in length, flanked by an embankment two miles long, above and parallel with which is the Coblenzer Strasse, with beautiful villas and pretty gardens reaching down to the Rhine. There is a new railway station, which is not only commodious, but also a handsome structure. The minster was restored in 1875 and following years, and in 1890-94 was adorned with paintings by Martin. The "Stiftskirche" has been rebuilt, 1879-84. "Der alte Zoll," commanding a magnificent view of the Seven Mountains, is the only remaining bulwark of the old fortifications, the Sternthor having been lately removed in order to open up better communication with the rapidly increasing western suburbs and the terminus of the light railway to Cologne. The Roman Catholic archiepiscopal theological college, beautifully situated on an eminence overlooking the river, dates from 1892, and the provincial museum of antiquities from 1889-93. In 1889 a museum of Beethoven relics, &c., was opened in the house in which the musician was born. There are further a municipal museum, arranged in a private house since 1882, the academic art museum (1884), with some classic originals, a creation of F. G.

[1] Referring to the Japanese custom of employing a go-between to arrange a marriage.

[2] These details are taken from *The Bonin Islands* by Russell Robertson, formerly H.B.M. Consul in Yokohama, who visited the islands in 1875.

[3] The Bonins are 500 miles from the main island of Japan.

Welcker, and the provincial museum, lying near the railway station, which contains a collection of mediæval stone monuments and works of art, besides a small picture gallery. Amongst the university institutions may be mentioned the physical institute, eye hospital, ear hospital, palæontological museum, on the south of the old town; the pathological institute and medical schools on the north; and the chemical laboratory, anatomical school, and physiological institute at Poppelsdorf. The university library now numbers some 250,000 vols. and about 1350 MSS. The university itself was in 1900 attended by 2162 students, and had 152 professors. One of the most conspicuous features of Bonn, viewed from the river, is the pilgrimage (monastic) church of Kreuzberg (1627), behind and above Poppelsdorf; it has a flight of 28 steps, which are so venerated that they used to be ascended on the knees. Here, too, are a large provincial lunatic asylum (1883) and an agricultural college. In the chief cemetery are the tombs of (amongst others) Niebuhr, A. W. Schlegel, Schumann, Bunsen, and Simrock; also, Schiller's wife. The town is adorned with a marble monument of the 1870-71 war (1877), and with a fine fountain (1879). There are but few industries, chiefly jute spinning and weaving, the manufacture of porcelain, flags, machinery, and beer, and saw-milling. There are considerable numbers of foreign residents, notably English, attracted by the natural beauty of the place and by the educational facilities it affords. Population (1885), 35,989; (1900), 50,741.

Bonny. See NIGERIA.

Book-binding.—Recent years have witnessed a marked revival of interest in the art of book-binding, which, since the death of Roger Payne in 1797, had, in England, been wanting in vigour and originality. Concurrently with the revival of the easily appreciated artistic side of the subject, there has also arisen a remarkable development in the technical processes, owing to the invention of ingenious and delicate machinery which is capable of executing the work which has hitherto been always laboriously done by hand. The processes of folding the printed sheets, and sewing them together on bands, rounding the backs when sewn, and of making the outer cases, covering them with cloth or leather, and stamping designs upon them, can now all be efficiently executed by means of machines. The saving in time and labour thus effected is very great, although it must be said that the old methods of carrying out the process of sewing and rounding the backs of books by hand labour were safer and stronger, as well as being much less liable to bruise and injure the paper (Figs. 1, 2). These processes unfortunately are not only slow but also necessitate highly skilled labour. Already the larger trade binders utilize machines extensively and advantageously, but exclusively high-class trade binders do not as yet materially depart from the older methods. Private binders have naturally no reason to use machines at all. Fine and delicate examples of large electrotype blocks have been very successfully used for the decoration of covers measuring about 11½ by 8 inches. For the decoration of book-covers in gold alone it is probable that in the near future more use will be made of such blocks produced by the aid of photography from drawings, or from ordinary working designs made out in lamp black on white paper.

Besides the large trade binders working mainly by the help of machinery, and producing a great quantity of bound work which is not expected to last long, there also exists in London a small class of art binders who work throughout upon the principles which have been continuously in use for first-class work ever since about the 5th century, when vellum first began to be folded in quires. These binders are inaugurating what will in due time be recognized as the 19th-century style of decoration for book-bindings. The initial impetus to this school can be traced to William Morris, who actually made some beautiful designs himself for book-bindings, to be executed both in gold and in blind. Although he probably did not fully appreciate either the peculiar limitations or the possibilities of the art of gold-tooling on leather, nevertheless his genius guided him truly as to the spirit in which the designs should be conceived. The revived art soon reached its first stage of development under the guidance of Mr T. J. Cobden-Sanderson, who may fairly be considered as the founder of the modern school of design for gold-tooling on book-covers, the pre-eminence and individuality of his work in this direction being proved by the number of his imitators. Among the most successful of his pupils is Mr Douglas Cockerell, whose work is distinguished by a marked originality of treatment, while it shows a scholarly appreciation of ancient methods. A number of women artists, both in England and in America, have already discovered in book-binding a fitting and lucrative field for their energies. One, Miss Sarah Prideaux, is not only skilled and original in her own work, but she has also given us much valuable literature on her subject. Miss E. M. MacColl may claim to be the inventor of the small curved gold line produced by means of a tiny wheel, for though the

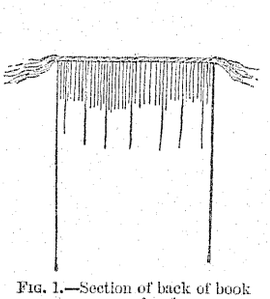


FIG. 1.—Section of back of book sewn on bands.

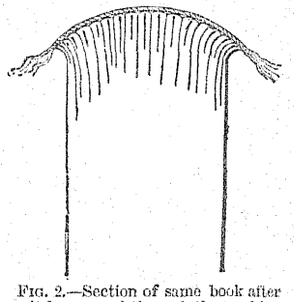
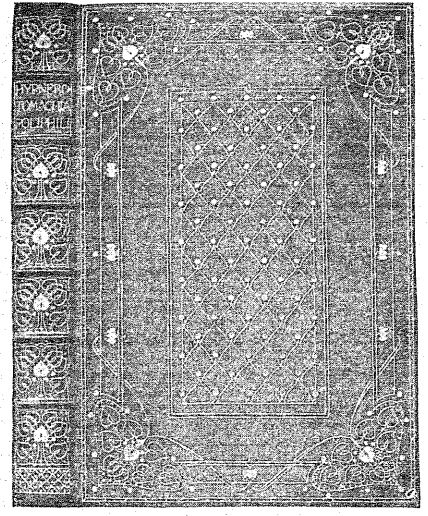


FIG. 2.—Section of same book after it has passed through the machine for rounding and backing.

possibility of producing such a line in blind was known for a long time, it was rarely used. The graceful curves and lines found on Miss MacColl's work are designed for her by her brother, Mr. D. S. MacColl. Miss Birkenruth recalls the highly decorative mediæval binding by her use of jewels cut *en cabochon*, but set in morocco instead of gold or silver, and there are many others who are working well and earnestly at art binding with delicate skill and taste. Outside the inner circle of professional book-binders, there is now growing up a new profession indirectly, but nearly, affecting their productions. It is that of the designer for pictorial book-covers, especially those intended to be shown in colour on cloth or paper. It is probably true that first-rate book-binding should be begun, carried forward, and finished entirely by the same artist from his own designs; still, the decoration of a cheap binding with a colour picture or design stamped upon it in colour from blocks, may be considered purely an artist's province.

As a designer for gold-tooling in book-bindings Mr Lewis F. Day has already brought his unrivalled knowledge into use. Mr A. A. Turbayne, himself a skilled finisher, is thoroughly conversant with the technical peculiarities of the art, and his designs consequently are pre-eminently workable. Mr. Walter Crane and Mr. Charles Ricketts have studied more especially pictorial art as applicable to book-covers.

Modern book-binding machines of all kinds are usually driven by steam-power, and in consequence of the necessary setting of most of them accurately to some particular size of book, they are



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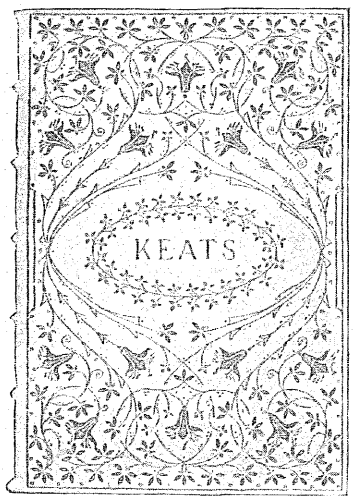

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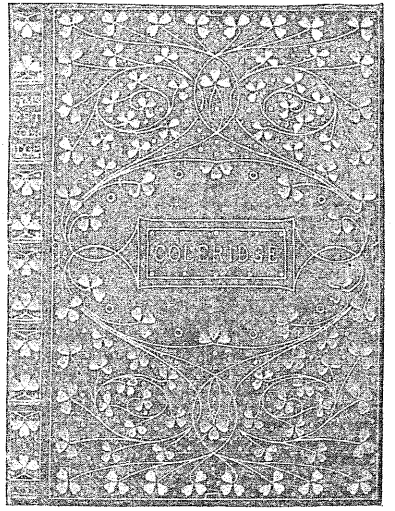

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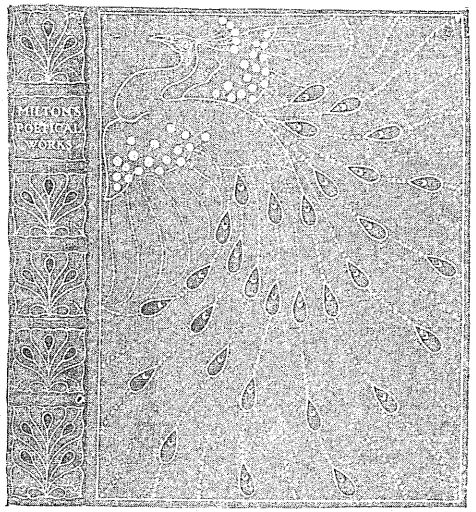

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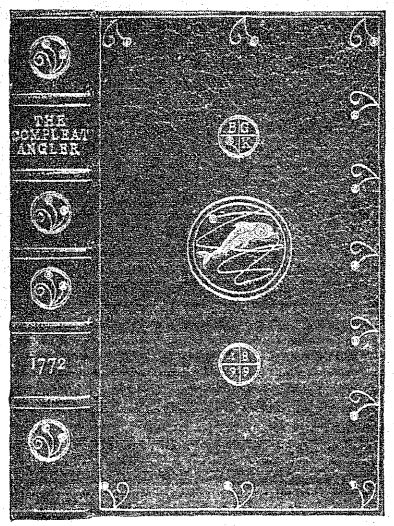
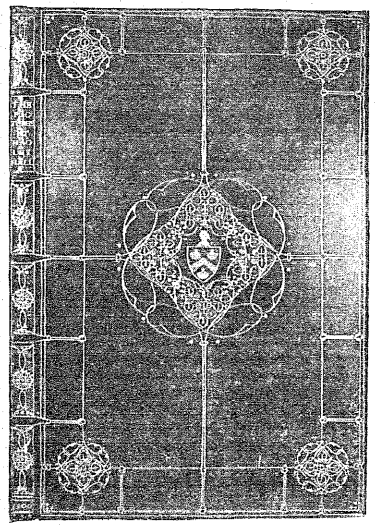
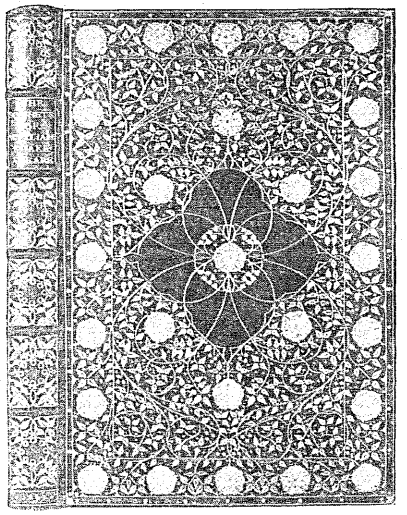
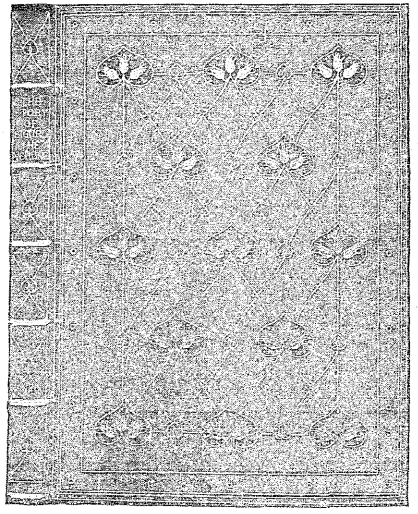








EXAMPLES OF MODERN ENGLISH BOOKBINDING.

(1) Colonna's Hypnerotomachia Poliphili, Venice, 1499. Morocco with gold tooling. (2) The Poems of Keats. White Pigskin tooled with gold. (3) Coleridge's Poems. Kelmscott Press, 1896. Morocco tooled with gold. (8) The Story of Sigurd the Volsung. Kelmscott Press, 1898. Pigskin and with inlay gold tooling.—All designed by T. J. Cobden-Sanderson, and executed at his Doves Bindery, Hammersmith. (4) Milton's Poetical Works. (A. A. Turbayne.) (5) Walton's Compleat Angler, 1772. Morocco tooled with gold. (D. S. MacColl, executed by Miss E. M. MacColl.) (6) The Pictures at Hagley Hall. Red Niger Morocco. (Douglas Cockerell.) (7) Shakespeare's Sonnets. Morocco with inlay and gold tooling. (Douglas Cockerell.)

not suitable for binding books of different sizes; but the full advantage of them can only be taken in the case of a large edition of one book.

Sewing Machine (Fig. 3).—American patent book-sewing machines appear to be largely of German manufacture. They are of two kinds; one sews the books on bands, either flat or round, and the

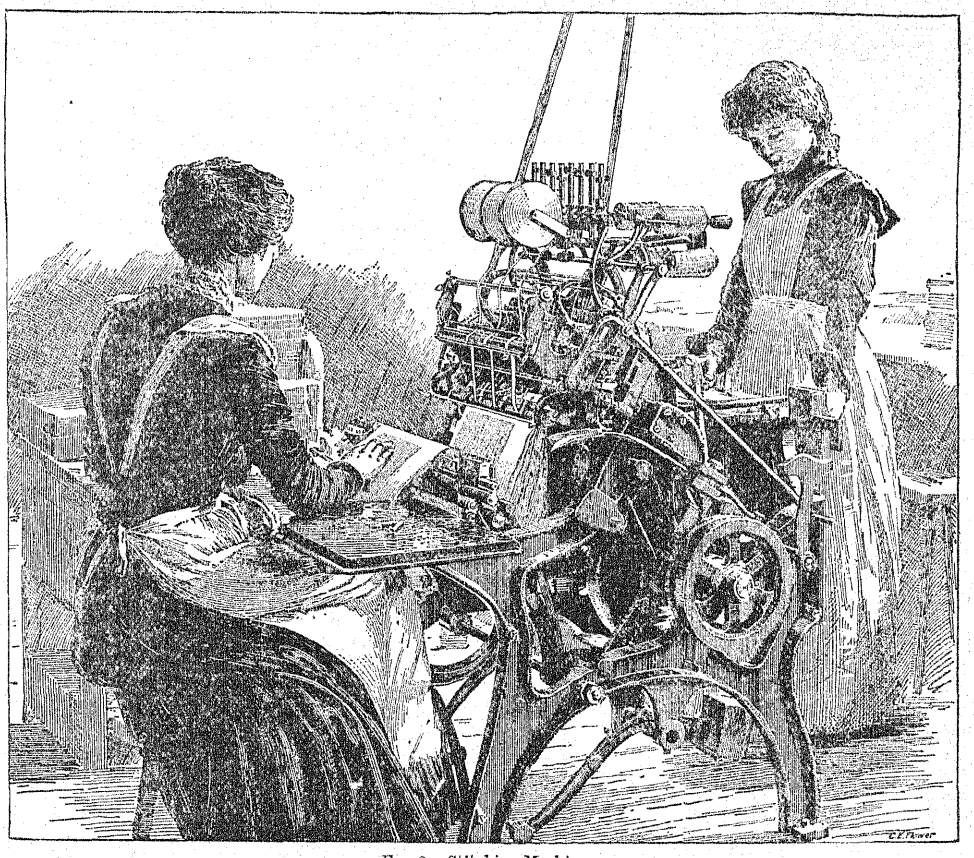


FIG. 3.—Stitching Machine.

other supplies the place of bands by a kind of chain stitch. The band-working machines bring the return thread back by pulling it through the upper and lower edges of the back of each section, thereby to some extent weakening each section, but at the same time this weakening can be to some extent neutralized by careful headbanding. The other system, where the band is replaced by a chain stitch, brings back the return thread inside each section; the objection to this is that there is a flattening out of the back of the

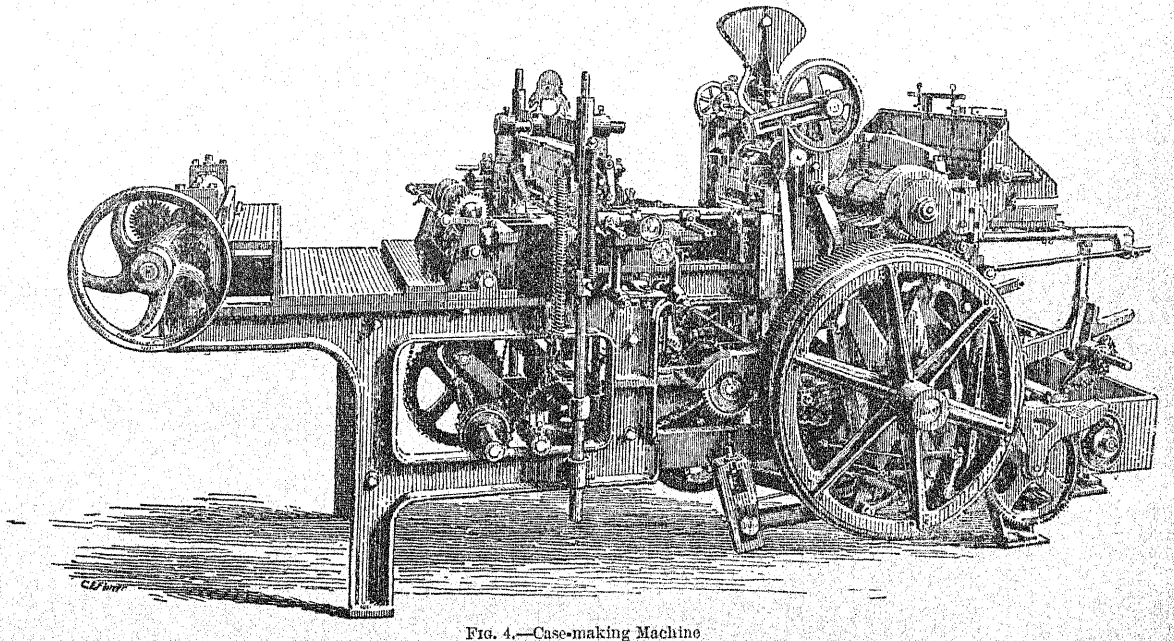


FIG. 4.—Case-making Machine

book, which becomes a difficulty when the subsequent operation of covering the book begins. The sections are sewn continuously in a long line, and are afterwards cut apart. The threads catch into hooked needles and are drawn through holes made by piercers set to a certain distance; a shuttle like that used in an ordinary sewing machine sews the inner thread backwards and forwards. Each section is placed upon a sort of metal saddle by the hand of the operator, one after the other, the machine working continuously

unless the action is cut off or controlled by a foot-lever or pedal. This machine is probably the type of the book-sewing machine of the future, as it is much quieter to work than the other, and although the inner threads are too bulky to be quite satisfactory, this is not a serious matter like the cutting of the upper and lower edges of the back already described, and, moreover, is probably capable of being either improved away or so minimized that it will become of small importance.

Rounding and Backing Machine.—An American machine for rounding and backing sewn books has been placed on the market. It requires a rather elaborate and very careful setting of several parts to the exact requirement of each size to be worked. The sewn book with the back glued is caught in a clip and forced between two tight rollers, the result being that the hitherto flat back is automatically turned into a rounded shape (Figs. 1 and 2). The book is then drawn forward, by a continuance of the onward movement, until it reaches the rounding plate, which is a block of steel with a polished groove a little larger than the size required. This rounding plate moves within a small arc by means of heavy counterweights, and on the back of the book being strongly pressed against it, it receives the permanent form of the groove cut in it, at the same time a strong grip on each side of the book causes the

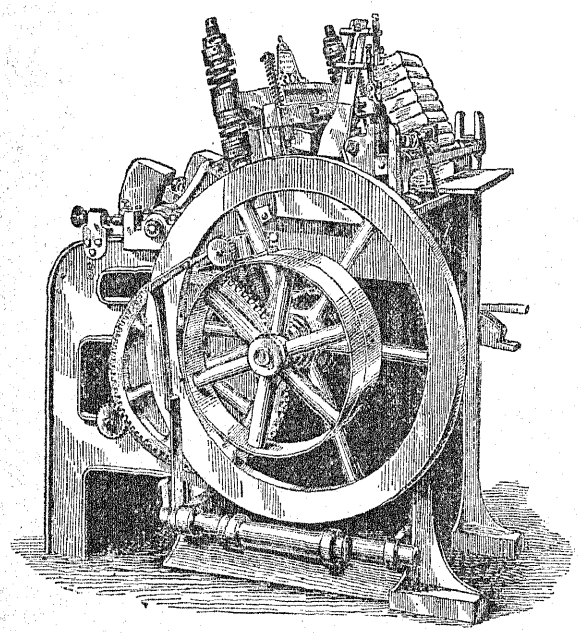


Fig. 5.—Rounding and Backing Machine.

ledge to rise up along each outer edge of the back. This ledge it is which enables the boards to be subsequently fixed in such a way as to hinge on a line outside the actual and natural boundary of the book. Before the discovery of the possibility of producing this ledge, the boards of books hinged upon a line coincident with the inner edges of the back, the result of which was that when the book was opened there was an invariable tendency to open and pull away the few outer sections of the paper or vellum itself—a destructive and disagreeable peculiarity. These machines are capable, after they are properly set, of rounding and backing about 750 volumes of the same size, within an hour.

Casing Machine.—A German patent machine for making cases, or "case" covers (Fig. 4), for books, is produced by an American firm. It is a large and complicated machine, but beautifully effective. It contains altogether over fifty springs, some of which are very small, like watch fittings, while others are large and powerful. The machine is fed with pieces of cardboard cut exactly to the sizes of the required boards, other pieces cut to the size of the back, and a long roll of the cloth with which the cases are to be covered, and when set working the roll of cloth is gradually unwound and glued by contact with a roller, which is drawn along until it reaches a point where the two boards are ingeniously dropped upon it one by one, then on again to where a long arm swings backwards and forwards, at each movement picking up a piece of cardboard for the back and placing it gently exactly upon the glued bed left for it between the two boards already fixed. Next, as the cloth passes along, it comes under the sharp influence of two rectangular gouges which cut out the corners, the remaining side pieces being gradually but irresistibly turned up by hollow raisers and flattened down by small rollers, a very delicate piece of machinery finishing the corners in a masterly way. Then, lastly, an arrangement of raisers and rollers acting at right angles to the last mentioned turn over and press out the remaining pieces of cloth. Of course each piece of cloth is cut across at the proper point before the turning up begins. This machine is capable of producing 1200 cases in an hour of any size that the machine will take.

Wiring Machine.—This executes a cheap form of sewing for keeping together thin parts of periodicals or tracts, and is simple in construction and use. It drives a short wire pin, bent at right angles at each end, through the folds of the sections of a book or through the entire thickness, sideways, after the manner of stabbing. The projecting ends, when through the substance of the paper, are bent over and flattened so as to grip firmly. The metal used for these pins was at first very liable to rust, and consequently did much damage to the paper near it, but this defect has now been largely remedied. At the same time the principle of using hard metal wire instead of flexible hempen thread is essentially vicious, and should only be used as a temporary expedient for publications of little value.

Blocking Machine.—The machines now used for blocking designs upon book-covers are practically the same as have been employed for many years. Several small improvements have been introduced as to better inking of the rollers for colour work, and better heating of the blocks used for gold work. A blocking press is now, in consequence of the size of many of the blocks, a large and cumbersome machine. The block itself is fixed firmly in a strong metal bed, and a movable table in front of it is fitted with gauges which keep the cover exactly in its right place. For gold work the block is kept at the proper temperature by means of gas jets, and the cover being properly overlaid with gold leaf is passed, on its table, directly under the block and then pressed steadily upwards against it, lowered, drawn out, and the superfluous gold rubbed off. The same process is followed in the case of colour blocks, only now the block need not be heated, but is inked by means of a roller for each impression. A separate printing is necessary for each colour. These printings always require great care on the part of the operator, who has to watch the working of each pull very carefully, and if any readjustment is wanted, to make it at once, so that it is difficult to estimate at what rate they can be made. In the matter of gold blocking there must be great care exercised in the matter of the heat of the block, for if it is too hot the gold will adhere where it is not wanted, and if too cool it will not adhere where it is required. Great nicety is also necessary as to the exact pressure required as well as the precise number of moments during which the block should be in contact with the gold, which is fastened to the cloth or leather by means of the solidification by heat of egg albumen. Blocking presses are mainly of German make, but Scottish and English presses are also largely used.

Authorities.—Gruel (L.). *Manuel de l'amateur de Relieures.* Paris, 1887.—Zaehnsdorf (J. W.) *The Art of Book-binding,* 2nd ed. London, 1890.—Prideaux (S. T.). *Historical Sketch of Book-binding.* London, 1893.—Thoinan (E.). *Les Relieurs Français.* Paris, 1893.—Horne (H. P.). *The Binding of Books.* London, 1894.—Fletcher (W. Y.). *English Book-bindings in the British Museum.* London, 1895.—*Foreign Book-bindings in the British Museum.* London, 1896.—Davenport (C. J.). *Royal English Book-bindings.* London, 1896.—*Cantor Lectures on Book-binding.* London, 1898.

(C. D.)

Book Illustration. See Illustration.

Book-plates.—The value attached to book-plates, otherwise than as an object of purely personal interest, is comparatively modern. The study of, and the taste for collecting, these private tokens of book-ownership hardly date farther back than a quarter of a century. Since then the book-plate, or *ex-libris* (to use a jargon term that is now finding its way into dictionaries), has become fully recognized as a small but attractive offshoot of the general subject of bibliography. As a matter of fact, the book-plate, or printed label intended to indicate ownership in individual volumes, is nearly as old as the printed book itself. It bears very much the same relation to the hand-painted armorial or otherwise symbolical personal device found in mediæval manuscripts that the printed page does to the scribe's work. The earliest known examples of book-plates are German. According to Friedrich Warnecke, of Berlin (one of the best authorities on the subject), the oldest movable *ex-libris* yet brought to light are certain woodcuts representing a shield of arms supported by an angel (Fig. 1), which were pasted in books presented to the Carthusian monastery of Buxheim by Brother Hildebrand Brandenburg of Biberach, about the year 1480—the date

being fixed by that of the recorded gift. The woodcut, in imitation of similar devices in old MSS., is hand

Fig. 1.—Gift-plate of Hildebrand Brandenburg of Biberach to the Monastery of Buxheim. *Circa* 1480.

painted. In France the most ancient *ex-libris* as yet discovered is that of one Jean Bertaud de la Tour-Blanche, the date of which is 1529; and in England

Fig. 2.—Book-plate of Sir Nicholas Bacon.

that of Sir Nicholas Bacon, a gift-plate for the books he presented to the University of Cambridge (Fig. 2). Holland comes next with the plate of a certain Anna van der Aa, in 1597; then Italy with one attributed to the year 1622. The earliest known American example is the plain printed label of one John Williams, 1679.

A sketch of the history of the book-plate, either as a minor work of symbolical and decorative art, or as an accessory to the binding of books, must obviously begin in Germany, not only because the earliest examples known are German, but also because they are found in great numbers long before the fashion spread to other countries, and are often of the highest artistic interest. Albert Dürer is known to have actually engraved at least six plates (some of very important size) between 1503 and 1516 (Fig. 3), and to have supplied designs for many others. Several notable plates are ascribed to Lucas Cranach and to Hans Holbein, and to that bevy of so-called "Little Masters," the Behams, Virgil Solis, Matthias Zundt, Jost Amman, Saldörfer, Georg Hüpschmann, and others. The

Fig. 3.—Book-plate of Lazarus Spengler, by Albert Dürer (1515).

influence of these draughtsmen over the decorative styles of Germany has been felt through subsequent centuries down to the present day, notwithstanding the invasion of successive Italian and French fashions during the 17th and 18th centuries, and the marked effort at originality of composition observable among modern designers. The heavy, over-elaborated German "style" never seems to have invaded neighbouring countries; but since it was undoubtedly from Germany that was spread the fashion of using ornamental book-plates as marks of possession, the history of German *ex-libris* remains on that account one of high interest to all those that are curious in the matter.

It was not before the 17th century that the *movable ex-libris* became tolerably common in France. Up to that time the more luxurious habit of stamping the cover with a personal device had been in such general favour with book-owners as to render the use of labels super-

fluous. From the middle of the century, however, the *ex-libris* proper became quite naturalized; examples of that period are very numerous, and, as a rule, are very handsome. It may here be pointed out that the expression *ex-libris*, used as a substantive, which is now the recognized term for book-plate everywhere on the Continent, found its origin in France. The words only occur in the

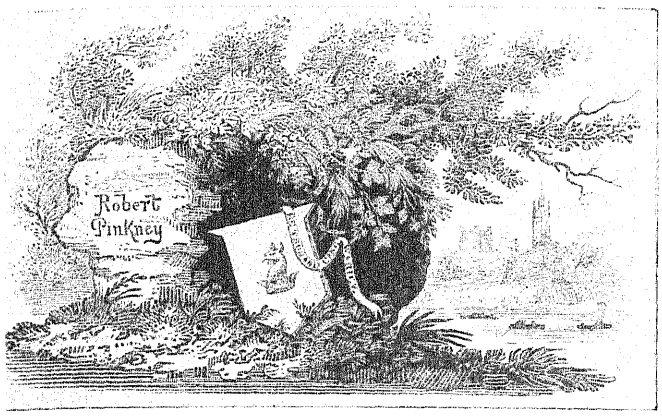
FIG. 4.—Book-plate of P. A. Convers, 1762.

personal tokens of other nationalities long after they had become a recognized inscription on French labels.

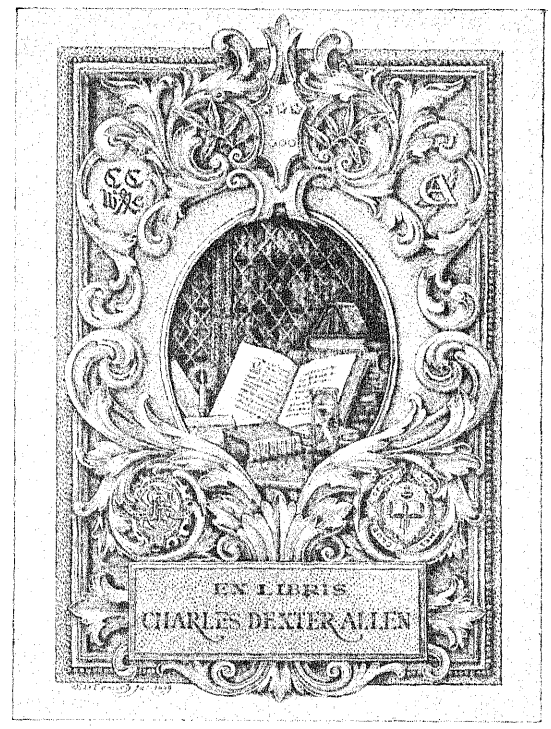
In many ways the consideration of the English book-plate, in its numerous "styles," from the late Elizabethan to the late Victorian period, is peculiarly interesting. In all its varieties it reflects with great fidelity the prevailing taste in decorative art at different epochs. Of English examples, none thus far seems to have been discovered of older date than the gift-plate of Sir Nicholas Bacon; for the celebrated, gorgeous, hand-painted armorial device attached to a folio that once belonged to Henry VIII., and now reposes in the King's Library, British Museum, does not come under the head of book-plate in its modern sense. The next is that of Sir Thomas Tresham, dated 1585. Until the last quarter of the 17th century the number of authentic English plates is very limited. Their composition is always remarkably simple, and displays nothing of the German elaborateness. They are as a rule very plainly armorial, and the decoration is usually limited to a symmetrical arrangement of mantling, with an occasional display of palms or wreaths. Soon after the Restoration, however, a book-plate seems to have suddenly become an established accessory to most well-ordered libraries. Book-plates of that period offer very distinctive characteristics. In the simplicity of their heraldic arrangements they recall those of the previous age; but their physiognomy is totally different. In the first place, they invariably display the "tincture" lines and dots, after the method originally devised in the middle of the century by Petra Sancta, the author of *Tesseræ Gentilitiæ*, which by this time had become adopted throughout Europe. In the second, the mantling assumes a much more elaborate appearance—one that irresistibly recalls that of the periwig of the period—surrounding the face of the shield. This style was undoubtedly imported from France, but it assumed a character of its own in England. As a matter of fact, thenceforth until the dawn of the French Revolution, English modes of decoration in book-plates, as in most other chattels, follow at some years' distance the ruling French taste. The main characteristics of the style which prevailed during the Queen Anne and early Georgian periods are:—ornamental frames suggestive of carved oak, a frequent use of fish-scales, trellis, or diapered patterns, for the decoration of plain surfaces; and, in the armorial display, a marked reduction in the importance of the mantling. The introduction of the scallop-shell as an almost constant element of ornamentation gives already a foretaste of the *Rocaille-Coquille*, the so-called "Chippendale" fashions of the next reign. As a matter of fact, during the middle third of the century this "Rococo" style (of which the *Convers* plate (Fig. 4) gives a tolerably typical sample) affects the book-plate as universally as all other decorative objects. Its chief element is a fanciful arrangement of scroll and shell work with curveting acanthus-like sprays—an arrangement which in the examples of the best period is generally made asymmetrical in order to give freer scope for a variety of countercurves. Straight or concentric lines and all appearances of flat surface are studiously avoided; the helmet and its symmetrical mantling tends to disappear and is replaced by the plain crest on a "fillet." The earlier examples of this "Chippendale" manner are tolerably ponderous and simple. Later, however, the composition becomes exceedingly light and complicated; every conceivable and often incongruous element of decoration is introduced, from cupids to dragons, from flowerets to Chinese pagodas. During the early part of George III.'s reign there is a return to greater sobriety of ornamentation, and a style more truly national, which may be called the "Urn" style, makes its

FIG. 5.—Book-plate of Francis Gwyn of Lansanor, 1698.

appearance. Book-plates of this period have invariably a physiognomy which at once recalls the decorative manner made popular by architects and designers such as Chambers, the Adams, Josiah Wedgwood, Hepplewhite, and Sheraton. The shield shows a plain spade-like outline, manifestly based upon that of the pseudo-classic urn then so much to the fore. The ornamental accessories are symmetrical palms and sprays, wreaths and ribbands. The architectural "boss" is also an important factor. In many plates, indeed, the shield of arms takes quite a subsidiary

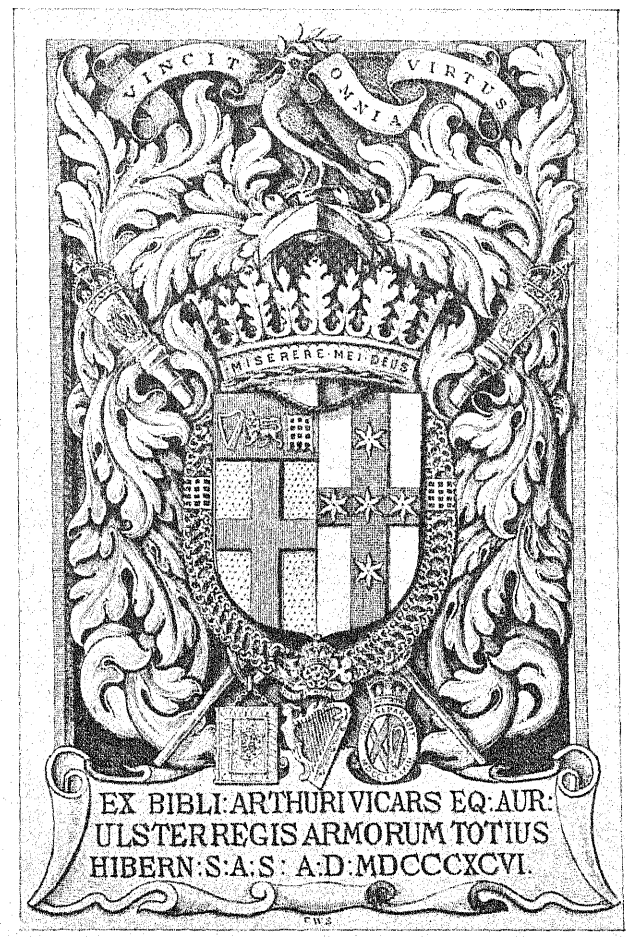


Book-plate of Robert Pinkney. By Thomas Bewick.



Book-plate of Charles Dexter Allen. By E. D. French.
(Reproduced by Process from original Engraving.)

Book-plate of Freiherr v. Lipperheide. By Karl Rickelt.



Book-plate of Sir Arthur Vicars. By C. W. Sherborn.
(Reproduced by Process from original Engraving.)

position by the side of the predominantly architectural urn. From the beginning of the 19th century, until comparatively recent days, no special style of decoration seems to have established itself. The immense majority of examples display a plain shield of arms with motto on a scroll below, and crest on a fillet above. Of late years, however, a rapid impetus appears to have been given to the designing of *ex-libris;* a new era, in fact, has begun for the book-plate, one of great interest.

The main styles of decoration (and these, other data being absent, must always in the case of old examples remain the criteria of date) have already been noticed. It is, however, necessary to point out that certain styles of composition were also prevalent at certain periods. Many of the older plates (like the majority of the most modern ones) were essentially pictorial. Of this kind the best defined English genus may be recalled: the "Library

Fig. 6.—Book-plate of William Hewer, 1699.

Interior"—a term which explains itself—and "Book-piles," exemplified by the *ex-libris* (Fig. 6) of W. Hewer (Samuel Pepys's secretary). We have also many "Portrait-plates," of which, perhaps, the most notable are those of Samuel Pepys himself and of John Gibbs, the architect; "Allegories," such as were engraved by Hogarth, Bartolozzi, Pine, and George Vertue; "Landscape-plates," by wood engravers of the Bewick school (see Plate), &c. In most of these the armorial element plays but a secondary part.

Concerning the taste for collecting book-plates, it may be said that it originated in England. The first impetus was given to it by the appearance of the *Guide* by the late Lord de Tabley (then the Hon. Leicester Warren) in 1880. This work, highly interesting from many points of view, established what is now accepted as the general classification of "styles": "Early Armorial" (*i.e.*, previous to Restoration, exemplified by the Nicholas Bacon plate); "Jacobean," a somewhat misleading term, but distinctly understood to include the heavy decorative manner of the Restoration, Queen Anne, and early Georgian days (the Lansanor plate, Fig. 5, is typically "Jacobean"); "Chippendale" (the style above described as *Rococo*, tolerably well represented by the French plate of Convers); "Wreath and Ribbon," belonging to the period described as that of the "Urn," &c. Since then the literature on the subject has grown considerably. Societies of collectors have been founded, first in England, then in Germany and France, and in the United States, most of them issuing a "Journal" or "Archives:" *The Journal of the Ex-libris Society* (A. and C. Black, London), the *Archives de la société française de collectionneurs d'ex-libris* (Paris), both of these monthlies; the *Ex-libris Zeitschrift*, Berlin, a quarterly.

Much has been written for and against book-plate collecting. If, on the one hand, the more enthusiastic "ex-librists" (for such a word has actually been coined) have made the somewhat ridiculous claim of "science" for "ex-librisme," the bitter animadversion, on the other, of a certain class of intolerant bibliophiles upon the "vandalism" of removing book-plates from old books has at times been rather extravagant. Book-plates are undoubtedly very often of high interest (and of a value often far greater than the odd volume in which they are found affixed), either as specimens of bygone decorative fashion or as personal relics of well-known personages. There can be no question, for instance, that engravings or designs by artists such as Holbein and Dürer and the "Little Masters" of Germany, by Eisen, Gravelot, Chodowiecki, or Gribelin; by W. Marshall, Faithorne, David Loggan, Sir Robert Strange, Piranesi; by Hogarth, Cipriani, Bartolozzi, Sherwin, Henshaw, Hewitt, or Bewick and his imitators; or, to come to modern times, that the occasional examples traced to the handicraft of Thomas Stothard, Thackeray, Millais, Maclise, Bell Scott, T. G. Jackson, Walter Crane, Caldecott, Stacy Marks, Edwin Abbey, Kate Greenaway, Gordon Browne, Herbert Railton, Aubrey Beardsley, Alfred Parsons, D. Y. Cameron, Paul Avril—there can indeed be no doubt that these things are worth collecting.

Until the advent of the new taste the devising of book-plates was almost invariably left to the routine skill of the heraldic stationer. Of late years the composition of personal book-tokens has become recognized as a minor branch of a higher art, and there has come into fashion an entirely new class of designs which, for all their wonderful variety, bear as unmistakable a character as that of the most definite "styles" of bygone days. Broadly speaking, it may be said that the purely heraldic element tends to become subsidiary and the allegorical or symbolic to assert itself more strongly. Among modern English artists who have more specially paid attention to the devising of book-plates and have produced admirable designs, may be mentioned C. W. Sherborn, G. W. Eve, Robert Anning Bell, J. D. Batten, Erat Harrison, J. Forbes Nixon, Charles Ricketts, John Vinycomb, John Leighton, and the late Warrington Hogg. The development in various directions of "process" work, by facilitating and cheapening the reproduction of beautiful and elaborate designs, has no doubt helped much to popularize the book-plate—a thing which in older days was almost invariably restricted to ancestral libraries or to collections otherwise important. Thus the great majority of modern plates are reproduced by "process." There are, however, a few artists left who devote to book-plates their skill with the graver. Some of the work they produce challenges comparison with the finest productions of bygone engravers. Of these the best known are C. W. Sherborn (see Plate) and G. W. Eve in England, and in America E. D. French of New York City (see Plate). The process work which it has been necessary here to employ in reproducing book-plates of this kind cannot render justice to the exquisiteness of their treatment.

The curious in the matter of book-plate composition will find it treated in the various volumes of the Ex-libris Series (London: George Bell and Sons); and almost every other item of information in the following works:—

Poulet-Malassis. *Les Ex-Libris Français.* Paris, 1875.—

Hon. J. Leicester Warren [Lord de Tabley]. *A Guide to the Study of Book-plates*. London, 1880.—Sir A. W. Franks. *Notes on Book-plates*, 1574-1800 [Private]. London, 1887.—Friedrich Warnecke. *Die Deutschen Bücherzeichen*, Berlin, 1890.—Henri Bouchot. *Les Ex-Libris et les Marques de Possession du Livre*. Paris, 1891.—Egerton Castle. *English Book-plates*. G. Bell and Sons, London, 1892.—Walter Hamilton. *French Book-plates*. G. Bell and Sons, London, 1892.—*Dated Book-plates*. G. Bell and Sons, London, 1895.—H. W. Fincham. *Artists and Engravers of British and American Book-plates*, 1897.—*German Book-plates*, by Count K. E. zu Leiningen-Westerburg, translated by G. R. Dennis. G. Bell and Sons, 1901. (E. Ca.)

Book-Printing.—The latest development in printing, in which each component of a book is controlled by a sense of harmony and beauty, owes its conception and realization to William Morris, and takes definite form in the founts and books of the Kelmscott Press. Previous efforts by Morris himself, Mr Daniel of Oxford, and others, count only as experiments towards a tasteful use of material to hand. The great originality of the Kelmscott books lies, not merely in the order and design shown in their "build" and decoration, but in the vivifying of each part from type to paper by a high order of design and execution. Herein they differed in 1891 in all essentials, and in many new particulars, from all other modern books both in aim and aspect.

The *Kelmscott Press* is distinguished by the use of three founts designed by William Morris. The Troye and Chaucer founts, both of them Gothic, named after books in which they first appeared, are best fitted for ornamented mediæval works. These books owe their chief interest to the bold and handsome decoration by Mr Morris, and to woodcuts after designs by Sir Edward Burne-Jones; one of the most noteworthy examples is the "Chaucer," of a page of which we are, by the special permission of William Morris's trustees, enabled to give a reduced facsimile (p. 307). In Swinburne's *Atalanta in Calydon* we note the partial failure of this order of type to fit the character of a modern book. In the Golden or Roman fount lie the strength and future of the Kelmscott Press as an influence on type. The Golden type is without the exaggerated contraction of form laterally, the exaggerated use of thick and thin strokes, or the vicious stroke-terminations common to modern founts. It is a type of full body, designed in careful relation to the up-and-down strokes, and resting upon solid serifs, as with Jenson, for instance, but in detail more allied to fine penmanship or even black letter. The character of the decoration in the Kelmscott pages is stamped with the vigour which one expects from a designer of Morris's importance. Usually on a black ground, the forms combine a northern character in thistle leaf and composite flower, with a fluency of curve comparable to the famous borders of Ratdolt of Venice.

The *Vale* books, often classed by writers and collectors with the Kelmscott, may be counted with them so far as they also are singular in being controlled by one designer, from the important matter of type, decoration, and illustration, to that of "build" and press-work. The first Vale book in which each of these conditions was achieved is *Milton's Minor Poems* (1896). In this the Roman type, known as the Vale fount, designed by Charles Ricketts, differs from the Venetian and Kelmscott founts by a greater roundness or fulness of body, and in a modification of details by the conditions of type-making. The second fount used in the Vale issues, first employed in *The Plays of Shakespeare* (1896), is less round in body, more traditional in detail, and lighter in effect. To be mentioned with the foregoing are some half-dozen books, printed by L. Pissarro in the Vale fount at his press, "The Eragny Press," with woodcut decorations. They are unique in the revival of printing by the occasional use of colours and gold.

No other books have hitherto combined the conditions specified of new type, woodcut decoration, original woodcuts, and personal control. Two American founts, adapted from Morris, are tentatively used by publishers. Mons. Grasset, in France, has designed an eclectic fount, but none of these can be associated with a special press or series of notable books. Recently, however, Messrs. Sanderson and Walker have recut Jenson's fount and established the *Doves Press*, conspicuous for its taste and technical excellence.

A certain number of technical conditions had to be faced in the revival of printing for the first time in late years, *i.e.*, the printing of woodcuts on hand-made paper, and the printing of borders and initials in the body of the text; both in pitch and in sustained evenness of tone the Kelmscott Press (notably in the Chaucer) remains unsurpassed. The inking-up process employed to achieve the above conditions is a very gradual one. The paper chosen for its regular thickness is, moreover, slightly damped, to avoid a gritty aspect in the blacks; hence the delicate embossed appearance of the pages, and the absence of all overloading with ink. In the manipulation of English or "Roman" vellum the consistency of the inks used is even greater, the vellum, of course, not being damped. The so-called "Roman" vellum is made at Brentford. The vellum used for the Kelmscott *Chaucer* was damped.

Authorities.—Articles on the revival have appeared in the *Athenæum*, the *Saturday Review*, *Magazine of Art*, *The Studio*, and the *Contemporary Review*. More detailed and more accurate information will be found in *A Note by William Morris on his Aims in founding the Kelmscott Press*. Kelmscott Press, 1898.—Floury. *De la typographie et de l'harmonie de la page imprimée*. Paris.—Hacon and Ricketts. *A Defence of the Revival of Printing*.—See also article, Morris, William. (C. Ri.)

Boom, a town of Belgium, in the province, and 10 miles S. by rail, of Antwerp. Its numerous manufactures include boat-building, sail-making, and extensive brewing. Population (communal) (1880), 12,657; (1897), 14,971.

Boone, capital of Boone county, Iowa, U.S.A., situated on Des Moines river, near the centre of the state, at an altitude of 1134 feet. Two railways cross here, the Chicago and North-Western, and the Des Moines, Northern and Western. Population (1880), 3330; (1900), 8880.

Booth, Charles (1840-——), English sociologist, was born at Liverpool on 30th March 1840, and has been since 1862 a partner in Alfred Booth and Company, a Liverpool firm engaged in the Brazil trade. He has for many years past devoted his time, and no inconsiderable sums of money, to inquiries into the statistical aspects of social questions. The results of these are chiefly embodied in a work entitled *Life and Labour of the People in London*, of which the earlier portion appeared under the title of *Life and Labour* in 1889. The nine volumes that have appeared deal only with East, Central, and Southern London. The book is designed to show "the numerical relation which poverty, misery, and depravity bear to regular earnings and comparative comfort, and to describe the general conditions under which each class lives." It contains a most striking series of maps, in which the varying degrees of poverty are represented street by street, by shades of colour. The data for the work were derived in part from the detailed records kept by school-board "visitors," partly from systematic inquiries directed by Mr. Booth himself, supplemented by information derived from relieving officers and the Charity Organization Society. Mr. Booth has also paid much attention to a kindred subject—the lot of the aged poor. In 1894 he published a volume of statistics on the subject, and, in 1891 and 1899, works on "Old Age pensions," his scheme for the latter depending on a general provision of pensions of five shillings a week to all aged persons, irrespective of the cost to the State.

Booth, Edwin (Thomas) (1833-1893), the most famous of American tragic actors, was born in Harford county, Maryland, 13th November 1833. His father, Junius Brutus Booth (1796-1852), was an elevated and powerful, if erratic, English tragedian who had emigrated to the United States. Edwin's first regular appearance was in 1849 as Tressel in "Richard III.," and he early played Wilford in "The Iron Chest." He was a youthful Apollo, lithe and graceful in figure, buoyant in spirits. His dark hair fell in waving curls across his brow, and his glowing eyes were soft and luminous, and most expressive. His father watched him with great interest, but with evident disappointment, and the members of the theatrical profession, who held the acting of the elder Booth in great reverence, seemed to agree that the genius of the father had not descended to the son. It was not until after his parent's death that the son showed any histrionic talent. Between 1852 and 1856 he played in California, Australia,

I have no wommen suffisaunt certayn
The chambres for tarraye in ordinaunce
After my lust, and therfore wolde I fayn
That thyn were al swich manere governaunce;
Thou knowest eek of old al my plesaunce;
Thogh thyn array be badde and yvel biseye,
Do thou thy devoir at the leeste weye.

"NAT oonly, lord, that I am glad, quod she,
To doon youre lust, but I desire also
Yow for to serve and plese in my degree
Withouten feyntyng, and shal everemo;
Ne nevere, for no wele ne no wo,
Ne shal the goost withinne myn herte stente
To love yow best with al my trewe entente.

And with that word she gan the hous to dighte,
And tables for to sette and beddes make;
And peyned hire to doon al that she myghte,
Preyynge the chambereres for Goddes sake
To hasten hem, and faste swepe and shake;
And she, the mooste servysable of alle,
Hath every chambre arrayed and his halle.

ABOUTEN undren gan this erl alighte,
That with him broghte thise noble children tweye,
For which the peple ran to seen the sighte
Of hire array, so richely biseye;
And thanne at erst amonges hem they seye,
That Walter was no fool, thogh that hym leste
To chaunge his wyf, for it was for the beste.

For she is fairer, as they deemen alle,
Than is Grisilde, and moore tendre of age,
And fairer fruyt bitwene hem sholde falle,
And moore plesant, for hire heigh lynage;
Hir brother eek so faire was of visage,
That hem to seen the peple hath caught plesaunce,
Commendynge now the markys governaunce.

Auctor

STORMY peple! unsad and evere untrewe!
Ay undiscreet and chaungynge as a vane,
Delitynge evere in rumbul that is newe,
For lyk the moone ay wexe ye and wane;
Ay ful of clappyng, deere ynogh a jane;
Youre doom is fals, youre constance yvele preeveth,
A ful greet fool is he that on yow leeveth!

Thus seyden sadde folk in that citee
Whan that the peple gazed up and doun,

REDUCED FACSIMILE OF A PAGE OF THE KELMSCOTT CHAUCER.

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and the Sandwich Islands, and those who had known him in the East were surprised when the news came that he had captivated his audiences with his brilliant acting. From this time forward his dramatic triumphs were warmly acknowledged. There was no dissenting voice. His Hamlet, Richard, and Richelieu were pronounced to be superior to the performances of Edwin Forrest. In 1862 he became manager of the Winter Garden Theatre, New York, where he made a series of Shakespearean productions of then unexampled magnificence (1864-67), including "Hamlet," "Othello," and "The Merchant of Venice." In 1868-69 he built a splendid theatre of his own—Booth's Theatre—and organized a stock company. The company was headed by such actors as Edwin Adams, Lawrence Barrett, Edwin L. Davenport, and J. W. Wallack, Jr., and was of extreme excellence. It gave splendid productions of "Romeo and Juliet," "The Winter's Tale," "Julius Cæsar," "Macbeth," "Much Ado about Nothing," "The Merchant of Venice," and others. In all cases Booth used the original text of Shakespeare, thus antedating by many years a similar reform in England. Besides this, Booth's theatre presented a series of attractions by the leading actors and companies of the United States. Almost invariably his ventures were successful; but he was of a generous and confiding nature, and his management was not economical. In 1874 the grand dramatic structure he had raised was taken from him, and with it went his entire fortune. By arduous toil, however, he again accumulated wealth, in the use of which his generous nature was shown. He converted his spacious residence in Gramercy Park, New York, into a club—The Players'—for the elect of his profession, and for such members of other professions as they might choose. The house, with all his books and works of art, and many invaluable mementos of the stage, became the property of the club. A single apartment he kept for himself. In this he died on 7th June 1893. Among his parts were Macbeth, Lear, Othello, Iago, Shylock, Wolsey, Richard II., Richard III., Benedick, Petruccio, Richelieu, Sir Giles Overreach, Brutus (Payne's), Bertuccio (in Tom Taylor's "The Fool's Revenge"), Ruy Blas, Don Cesar de Bazan, and many more. His most famous part was Hamlet, for which his extraordinary grace and beauty and his eloquent sensibility peculiarly fitted him. He probably played the part oftener than any other actor before or since. He visited London in 1851, and again in 1880 and in 1882, playing at the Haymarket Theatre with brilliant success. In the last year he also visited Germany, where his acting was received with the highest enthusiasm. His last appearance was in Brooklyn as Hamlet in 1891.

Edwin Booth's prompt books were edited by William Winter, 1878. In a series of volumes, *Actors and Actresses of Great Britain and America*, edited by Lawrence Hutton and Brander Matthews, Edwin Booth contributed recollections of his father, which contain much valuable autobiographic material. For the same series Lawrence Barrett contributed an eloquent article on Edwin Booth. *Life and Art of Edwin Booth*, by William Winter, 1893. *Edwin Booth*, by Lawrence Hutton, 1893.

(J. J.*)

Booth, William (1829-——), founder of the Salvation Army, was born at Nottingham on 10th April 1829. At the age of 15 his mind took a strongly religious turn, under the influence of the Wesleyan Methodists, in which body he became a local preacher in the year following. In 1849 he came to London, where, according to his own account, his passion for open-air preaching caused his severance from the Wesleyans. Joining the New Connexion, he was ordained a minister, but not being employed as he wished in active "travelling evangelization," left that body also. During this period he had married, and had now a family of four children. Both he and his wife occupied themselves with preaching, first in Cornwall and then in Cardiff and Walsall. At the last-named place was first organized a "Hallelujah band" of converted criminals and others, who testified in public of their conversion. In 1864 William Booth went to London and continued his services in tents and in the open air, and founded a body which was successively known as the *East London Revival Society*, the *East London Christian Mission*, the *Christian Mission*, and (in 1878) the *Salvation Army*. The Army operates (1) by holding meetings out of doors, and marching singing through the streets, in harmony with law and order; (2) by visiting public-houses, gin-palaces, prisons, private houses, and speaking to and praying with all who can be got at; (3) by holding meetings in theatres and the other common resorts of those who prefer pleasure to God, and turning factories and other strange buildings into meeting-rooms; (4) by using the most popular song-tunes and the language of everyday life, &c.; (5) by making every convert a daily witness for Christ, both in public and private. The Army is divided into a quasi-military organization, and Booth modelled its "Orders and Regulations" on those of the British army. The "campaigns" of the Army excited violent opposition, a "Skeleton Army" being organized to break up the meetings, and for many years Booth's followers were subjected to fine and imprisonment as breakers of the peace. Since 1889, however, these disorders have been little heard of. The operations of the Army were extended in 1880 to the United States, in 1881 to Australia, and have since spread to the Continent, to India, Ceylon, and elsewhere. The wife of Mr Booth (*née* Kate Mumford), whom he married in 1855, was actively associated with him in his work, more especially in preaching. In 1859 she published a pamphlet, entitled *Female Teaching*, in defence of women as preachers. Mrs Booth died in 1890. In 1890 Mr Booth attracted public attention by the publication of a work entitled *In Darkest England, and the Way out*, in which he proposed to remedy pauperism and vice by a series of ten expedients: (1) the city colony; (2) the farm colony; (3) the over-sea colony; (4) the household salvage brigade; (5) the rescue homes for fallen women; (6) deliverance for the drunkard; (7) the prison gate brigade; (8) the poor man's bank; (9) the poor man's lawyer; (10) Whitechapel-by-the-sea. The scheme was much criticized, and has not been fully carried out, though a very large amount of money, for which Mr Booth appealed to the public, was subscribed to start it. In the year ending 30th September 1899 the Salvation Army possessed 68,000 "officers"; and £52,000 was subscribed in Great Britain alone for its operations (apart from the "Darkest England" scheme).

Boothia, or Boothia Felix, a peninsula of Franklin district, British North America, is situated between 69° 30′ and 72° N. lat. and 91° 30′ and 97° W. long. It includes an area of 13,100 square miles.

Boothia Gulf, in the Arctic ocean, situated between 85° and 94° W. long. and 67° and 72° N. lat., separates the north-western portion of Baffin Land and Melville Peninsula from Boothia Peninsula. It is connected with Lancaster Sound by Prince Regent Inlet, with Franklin Strait by Bellot Strait, and with Fox Channel by Fury and Hecla Strait. The principal bays are Committee and Pelly in the southern portion, and Lord Mayor in the western.

Boppard, a town of Prussia, in the Rhine province, on the left bank of the Rhine, 12 miles S. of Coblenz, is an old town in part surrounded by mediæval fortifications. Noteworthy buildings are the parish church (12th and 13th centuries); the Carmelite church (1318); the

former castle, now administrative offices; the Evangelical church (1851, enlarged 1887); the hydropathic Marienberg (1839), occupying a former Benedictine abbey, which crowned a hill 100 feet above the Rhine. Population (1900), 5806.

Borås, a town of Sweden, province Elfsborg, 36 miles E. of Gothenburg by rail, on the river Wiske, with numerous cotton spinning and weaving mills. It was founded by Gustavus Adolphus in 1632, and has a mineral spring. Population (1880), 4723; (1898), 13,772.

Bordeaux, capital of the department of Gironde, and metropolis of south-western France, 359 miles from Paris by rail. It is one of the finest cities of France, owing to its position on the left bank of the Garonne, its spacious quays, promenades, broad roads bordered with handsome buildings, and the animation of its streets and places of business. It is also rich in scientific institutions, which have recently taken new developments and acquired fine premises. The faculty of medicine and pharmacy, built between 1880 and 1888, is attended by 1200 students. The faculty of literature and science, built between 1881 and 1886, possesses the grave of Montaigne, one of the most celebrated inhabitants of the district, whose body was transported here. It also contains numerous laboratories, and an astronomical observatory adjoins it. Attached to the natural history museum is a prehistoric, anthropological and ethnographical museum, which has been furnished with valuable types by the grottos and caves of the Dordogne and Gironde. The Théâtre Louis, burnt in 1888, was replaced in 1890 by the Théâtre des Arts; and in 1893 the Olympia replaced the former Théâtre Français, burnt in 1855. A magnificent monument to commemorate the Girondists and in honour of the republic has been erected on the Place des Quinconces. The town of Bordeaux, formerly supplied by local wells and springs, acquired (1883-87) the spring of the Fontbannes, on the bank of the Ciron, thus securing a daily allowance of 40 gallons of water per head to 250,000 persons.

The works for the improvement of the port commenced during the Second Empire have been proceeded with. A vast wet dock with one mile of quayage, and capable of accommodating ships of 5000 tons has been excavated. The bed of the river has been dredged to admit vessels of 2000-2500 tons each. On the borders of the new quays and the wet dock powerful cranes are set in motion by compressed water. A long timber boom has been constructed opposite the city on the right bank, where are also the chief ship-building yards, from which have issued a large number of ships of the national fleet. In 1899, 10,041 vessels (coasting included) entered the port, and 10,169 cleared, with a total of 3,776,548 tons. The value of exports reached £14,564,000, that of imports £12,788,000. Wine forms the staple article of Bordeaux trade. Twenty-two millions of gallons in casks, and a million bottles are exported annually, to which must be added the quantity despatched by rail. The total amount of this export is 66,000,000 gallons. The chief lines of steamers connect Bordeaux with the West Coast of Africa, and with South America. The Basques who emigrated to Brazil and especially to La Plata, have established between France and those countries important relations. There is no part of the world which is not in regular communication with this important commercial port. Pine-wood is exported to England for the working of mines. The population of the town in 1886 was 225,281; in 1896, 239,806; in 1901, 257,471.

Bordentown, a borough of Burlington county, New Jersey, U.S.A., situated in 40° 08′ N. lat., and 74° 43′ W. long., on the east bank of Delaware river, 6 miles below Trenton, and on the Pennsylvania railway. It is the terminus of the Delaware and Raritan canal. Population (1880), 4258; (1900), 4110.

Bordighera, a winter resort of the province of Porto Maurizio, Liguria, Italy. It stands about midway between San Remo and Ventimiglia, 91 miles W. by S. of Genoa by rail. Bordighera consists of the New Town, close down by the shore, the "Visitors'" Town, on a gently rising plain behind it, backed by the Old Town and hills (600 to 1000 ft. in alt.). It is famous for its palms and other exotic plants, and grows large quantities of flowers and lemons for export. Amongst its "lions" are the Villa Bischoffsheim and the Villa Garnier, the latter with wall-paintings by French artists. The parish church dates from 1648, and was restored in 1886. There are two museums, one containing Roman antiquities found on the Ligurian coast, paintings by Italian artists of the 17th century, and natural history collections, the other containing botanical and ethnographical collections. Population, about 3500.

Borgerhout, a town of Belgium, in the province and 1 mile E. of the town of Antwerp, with a station on the railway between Antwerp and Brussels. Candles, cigars, and tobacco are among its manufactures. Its *Maison Communale*, completed in 1890, is one of the finest in the district of Antwerp. Population (communal) (1880), 20,268; (1897), 33,419.

Borgo, a town of Finland, 33 miles by rail N.E. of Helsingfors, situated on a river of the same name, at its entrance into a bay of the Gulf of Finland. It was here that the Chamber of Deputies framed, in 1802, the constitution of Finland. Trade, which is chiefly in furs, leather, &c., is hindered by the shallowness of the bay. Population, 4420.

Borgo San Sepolchro, a town and episcopal see of the province of Arezzo, Tuscany, Italy, 29 miles N.E. of Arezzo on the railway to Ancona, and on the river Tiber. It stands at the foot of Monte Maggiore, and is still surrounded by mediæval town walls. Its chief claim to notice is as the birthplace of Piero della Francesca, Raffaello dal Colle, and Gherardi, whose paintings adorn the cathedral and other churches, the town picture-gallery, a large hospital (dating from 1466), and the Collacchioni house. A monument to the first named was erected in the public gardens in 1892. There is a technical school, and woollens are manufactured. Population of commune, about 8300; of town, about 3700.

Borgu. See NIGERIA.

Borisov, a district town of Russia, government and 50 miles N.E. of Minsk. It is a very old town, mentioned in the 12th century. It was annexed to Russia after the first partition of Poland, and is famous for a battle fought in 1812, which compelled Napoleon I. to make the disastrous passage of the Berezina. Population, 14,900.

Borisovka, a village of Middle Russia, government of Kursk, near the Kursk to Kharkov railway, 32 miles from Byelgorod railway station. It has developed rapidly with the extension of the railway, and has a steam flour-mill, and many tanneries, and carries on a lively business in corn, hides, leather, and holy pictures. Population, 16,420.

Borku. See SAHARA.

Borkum, an island and summer resort of Prussia, the westernmost of the (German) East Frisian chain, lying between the E. and W. arms of the estuary of the Ems, and opposite to the Dollart. It belongs to the province of Hanover, and is visited by some 14,000 persons annually. The island affords pasture for cattle, and is a breeding-place for sea-birds. In the village of Borkum there are a couple of lighthouses, a Reformed church (1897), and a Roman Catholic chapel. Population, about 1350.

Bormio, an Alpine resort of the province of Sondrio, Lombardy, Italy, 35 miles N.E. of Sondrio. It stands at an altitude of 4380 ft. on the Adda and at the

mouth of the Turva valley, but enjoys a July mean temperature of 59°. Its mineral springs and baths were known to the Romans, and were frequented all through the Middle Ages. Their water is saline, with a temperature of 98·6° to 107·6°, and is used for drinking, as well as in mud baths, spray baths, steam baths, etc. In the Turva valley are the ferruginous springs and baths of Santa Caterina, 5801 ft. above sea-level. The village of Bormio is two miles below the baths. Population of commune, about 2000.

Borna, a town of Germany, on the Wirha emptying into the Pleisse, 17 miles S. by E. by rail of the town and in the circle of Leipzig, kingdom of Saxony. The industries include peat-cutting, iron-foundries, organ, pianoforte, felt, and shoe factories. Population (1890), 7485; (1900), 8422.

Borneo, next to New Guinea the largest island in the world, is situated about the middle of the East Indian archipelago, and extends from 7° N. to 4° 20′ S. lat., and from 108° 53′ to 119° 22′ E. long. It is some 750 miles long by 600 miles' maximum breadth; its area, according to the more correct calculations of the Topographical Bureau at Batavia (1894), comprises 293,496 square miles. The highest mountain chains and plateaus in the centre are formed of granite and crystalline schists—the oldest formations of the island—varying with sandstone and grauwacke. The surrounding coasts of the Borneo of that age, broken in all probability into a number of islands occupying a much smaller area than does the present island, were a Tertiary deposition, buttressed with the débris of the older formations borne down by rivers and with the chalk of foraminifera and corals. Bordering the mountain chains and plateaus, the hills of Borneo are formed of Tertiary strata with their eruptive rocks (andesite and basalt). More recent formations, the diluvium, still embedding in it abundant platinum, diamonds, and metals of the primary formation, and the alluvium of sea and rivers, next filled up gulfs, bays, and basins of the earlier Borneo, spread out its coasts, built up its higher and lower plains, and thus pieced out the island to its modern dimensions. The explorations of Professor Molengraaff have proved that there is no proper nucleus of mountains whence chains ramify in different directions. The centre, however, of the island is occupied by three mountain chains and a plateau, namely—1st. The folded chain of the Upper Kapuas, dividing the western division of Dutch Borneo from Sarawak, extending W.S.W. to E.N.E., ending probably in Beru, and attaining near the sources of the Kapuas a height of 5500 to 6000 feet. To this chain belongs the plateau of the Baram river. 2nd. The Schwaner plateau, south of the Kapuas, with summits ranging from 3000 up to 7500 feet in the Bukit Raja, a plateau dividing the waters of the Kapuas from the rivers of South Borneo. 3rd. The high plateau of Madi (3000 to 4000 feet), clothed with tropical high fens. 4th. The Müller chain of mountains, between the Madi plateau and the Kapuas chain, a volcanic region presenting heights that were once active volcanoes, such as Bukit Terata (4700 feet), long extinct. The chains and plateaus extend all in a W. to E. direction. They are homologous in structure with the mountains, not of Celebes or Halmaheira, but of Malacca, Banka, and Billiton. Rimmed round with low alluvial lands, and resting on a submarine plateau of no great depth, the coasts of Borneo are marshy, sandy, sometimes of the character of sawahs, presenting cliffs or mudbanks to the sea, which round the shore has a maximum depth of but 1 to 3 fathoms. The coast offers, therefore, few accessible ports. The towns and seaports are to be found at such river mouths as are not barricaded by sandbanks or mudbanks. All round the island there are but seven places at which the steamers of the Dutch Packet Company call—Pontianak, Banjermasin, Kota Baru, Pasir, Samarinda, Beru, and Balungan. The rivers play a very important part in the economy of Borneo, as highways and as the lines along which run the main arteries of population. Within recent years the exploration of nearly all the larger rivers has been advanced. The most important are those having their outlet at the west coast: the Sambas, navigable in its lower course for vessels of 25 feet draught, and the Kapuas, of volume varying with the tide and the amount of rainfall, normally navigable by small steamers and praus of 4 to 5 feet draught for 300 to 400 miles, from Pontianak up to Sintang, and thence as far as Benut. The mid-part of this river, shallower and broader than in its lower course, gives rise to a region of inundations and lakes extending as far as the northern mountain-chain. Among its considerable tributaries may be mentioned the southern Melawi with its affluent the Pinuh. Of less importance in the way of commerce and navigation, but noticeable in the way of the political division of the country, are the Simpang, Pawan, and Kandawangan, with the chief native villages at their mouths or on the seaboard near by. The Rejang, a river of Sarawak, is navigable for over 100 miles. The southern rivers—Katingan, Kahayan or Great Dayak, the Kapuas Murung or Little Dayak, and the Barito—are waters of capacious drainage, the Kahayan basin having an area of 16,000 square miles, and the Barito of 38,000 square miles. These rivers are navigable for two-thirds of their course by larger steamers; but in many cases their mouths are barred by banks of sand or mud which cannot be cleared by ships of more than 8 or 9 feet draught. Most of the larger affluents of the Barito are, in the greater part of their course, also navigable. The largest river discharging at the east coast is the Kutei, which at a great distance from its mouth has still a depth of three fathoms, and in all its physical features is comparable with the Kapuas and the Barito.

Climate.—Throughout Borneo the temperature averages 78·8° to 80° Fahr., with very slight variations. The rainy W. (S.W. and N.W.) wind prevails at all the meteorological stations, not the comparatively dry S.E. wind. Even at Banjermasin the N.W. wind brings an annual rainfall of 60 inches, against 33 inches of rain carried by the S.E. wind.

Minerals.—Since 1875, Dr Posewitz and mining engineers have more exactly defined the distribution of diamonds, gold, platinum, quicksilver, iron, tin, &c, and have discovered new mineral regions. The exploitation of the mines suffers, however, from inadequate means of export, the high duties payable to the native princes, the competition among the rival companies, and the often too limited quantities of minerals found in the mines. In West Borneo the production of gold during 1895-99 amounted to from one to two million florins annually. The Asahan mines of Orange Nassau and of Kutei yield some thousands of tons annually. In Sarawak a coal mine at Sadong yields nominally 130 tons daily, though now actually much less. Another coal mine at Brooketon yields 50 tons daily, an output which cannot but increase indefinitely. It is only now that a serious attempt is being made to work the mineral oil known to exist in Sarawak. The Borneo Company are working gold mines in Upper Sarawak under a large staff of Europeans, and the mines are known to offer good prospects.

Fauna and Flora.—Animals of economic value are the sea-swallows, whose edible nests are prized as the best in the archipelago; bees yielding wild wax; the elephant; the civet; the ciawan, a species of fish found in the rivers and valued for its spawn, which is salted; the turtle; and the trepang, &c. Pearl-shell is also of commercial importance. Besides the ordinary products of the forests, rice is cultivated near the rivers and lakes and on ladangs in the forests; sugar-cane of superior quality in Sambas and Montrado; cotton on the banks of the Negara (a tributary of the Barito), sometimes exported in small quantities. Indigo, coffee, and pepper have been cultivated since 1855 in the western division of Dutch Borneo, and tobacco in both the eastern and western divisions, but rarely by Europeans, and of small commercial value.

Population.—The political division of Borneo is as follows:—

	Population.
Dutch Borneo . .	1,180,580
British N. Borneo .	175,000
Sarawak . . .	500,000
Brunei	25,000
Total . .	1,880,580

Dutch Borneo.—Dutch Borneo is divided into two parts—the western, and the south and eastern division. The (estimated) population in each of the two divisions and their distribution according to races in 1896 were:—

Division.	European.	Chinese.	Arabs.	Other Oriental Foreigners.	Natives.	Total.
Western	302	37,735	1542	437	330,759	370,775
S. and Eastern	598	4,542	1534	116	803,015	809,805

In both divisions there is an average density of about 1 to every 2 square miles. The sparseness of population throughout the whole of the Dutch territory is due in part to the physical character of the country, but in part also to historic causes: the prejudicial influence in earlier times of Malayan, Arabian, Chinese, and Buginese colonists; to wars, piracy, and head-hunting, now suppressed by the Dutch Government. Among the natives, nomadic life in the wide forests, poverty, insufficient nourishment, feasts and other injurious habits, have contributed to the mortality. In Sambas, Montrado, and some parts of Pontianak, the greater density of population is due to the greater fertility of the soil, the opening of mines, the navigation and trade plied on the larger rivers, and the concentration of population at the junctions of rivers, the mouths of rivers, and the seats of government. Pontianak has about 9000 inhabitants; Sambas, 8000 to 9000; Montrado, Mampawa, Landak, between 2000 and 4000. In the south and eastern division, in Amuntai and Martapura, Hindu colonization, the fertile soil, navigable rivers, and trade and industry have co-operated towards the growth of a population, in marked contrast with that in the interior parts of the Upper Barito and of the more westerly rivers.

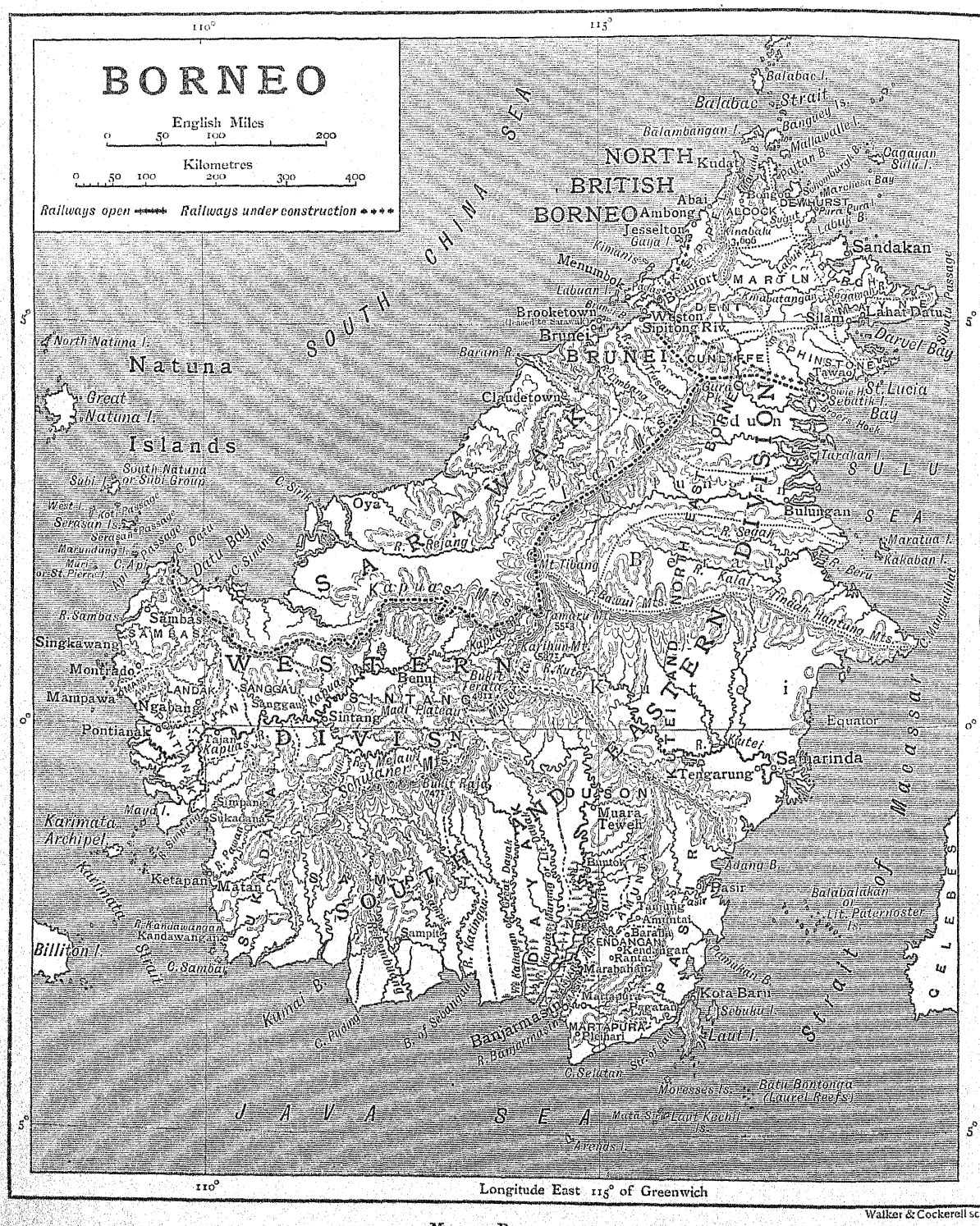
Only a very small part of the Europeans in Dutch Borneo live by agriculture and industry; the great majority of them belong to the Civil Service. The Arabs and Chinese are engaged in trading, shipping, mining, fishing, and agriculture. Of the natives 90 per cent. live by agriculture. Their industries are confined to the ordinary native crafts of spinning, weaving, and dyeing, the manufacture of iron agricultural implements, shipbuilding, &c. More particularly in the south-eastern division (in the districts of Negara, Banjermasin, Amuntai, Martapura), shipbuilding, iron-forging, gold- and silver-smith's work, and the polishing of diamonds, are industries of high development in the larger centres of population: Banjermasin, with 40,000 inhabitants; Marabahan, Amuntai, Negara, Samarinda, Tengarung, each with 5000 to 10,000 inhabitants.

British North Borneo or Sabah[1]

The State of North Borneo is the official term applied to the whole of that portion of the island of Borneo formally recognized by the Charter of Incorporation granted in November 1881 as the territory of the British North Borneo Company (see Chartered Companies). It may roughly be said to form a pentagon, of which three sides, the north-west, north-east, and east sides are washed by the sea, while the remaining two sides, the west and the south, are bordered respectively by the independent Malayan Sultanate of Brunei, and by the territory of Dutch Borneo. The western boundary, with Brunei, is formed by a purely conventional line drawn from Gura Peak (3° 50′ N. lat., 115° 10′ E. long.), to the mouth of the river Sipitong on the west coast. The boundary between the Company's territory and that of Dutch Borneo is defined by a treaty concluded on 20th June 1891. It runs due east from Gura Peak to 115° 22′ E. long., and thence in a north-easterly direction until the 116th meridian is reached on parallel 4° 20′ N. lat. Thence the boundary follows parallel 4° 10′ N. lat. until the 117th meridian is intersected, whence it dips to the south-east until the coast is reached at Broers Hoek, 117° 37′ E., and 4° 10′ N. The total area of the Company's territory is estimated at about 31,000 square miles, with a coast-line of over 900 miles. The greater portion is exceedingly mountainous, and the interior consists almost entirely of highlands, with here and there open valleys and plateaus of fifty or sixty square miles in extent. On the west coast the mountain range runs parallel with the seashore, at a distance of from fifteen to twenty-five miles. Of this range the great central feature is the mountain of Kinabalu (the Chinese Widow), built up of porphyritic granite and igneous rocks to a height of 13,698 feet. Some fifteen or twenty miles to the north rises Mount Madalon (5000 feet). Inland, across the valley of the Pagalan river, which is itself a double row of hills from 1000 to 2000 feet in height, with a few plateaus marking the scenes of former lakes, the great peak of Trus Madi rises to a height estimated at 11,000 feet above sea-level, and between its base and the east coast the country is again covered with mountains and hills of varying height and magnitude. The principal plateaus are those of the Tambunan and Kaningau valleys, in the basin of the Pagalan, and the Ranau plain to the eastward of the base of Kinabalu. Other similar plateaus of minor importance are also found dotted about the interior. The close proximity of the mountain range to the seashore causes the rivers on the west coast to be rapid boulder-obstructed streams, which, with the single exception of the Padas, are of little value as means of communication for a distance of more than half-a-dozen miles from their mouths. The Padas is navigable for light-draught steam-launches for a distance of about fifty miles, and boats can be punted up stream as far as Rayoh, a distance of some seventeen miles farther. Here further passage is stopped finally by rapids, down which nothing can be brought, and even below Rayoh navigation is rendered difficult and sometimes dangerous by obstructions of a similar nature. The other principal rivers on the west coast are the Kalias, Kimanis, Benoneh, Papar, Kinarut, Putatan, Inanam, Mengkabong, Tampassuk, and Pandasan rivers, none of which, however, are of any great importance as means of communication. The Tampassuk is noted for a stout breed of pony, and also for Kalupis waterfall (1500 feet), one of the highest in the world. At the northern extremity of the island Marudu Bay receives the waters of the Marudu, which rises on the west side of Mount Madalon. On the east coast the principal rivers are the Sugut, which rises in the hills to the east of Kinabalu, and forms its delta near Torongohok or Pura-Pura island; the Labuk, debouching in Labuk Bay, and having its sources seventy miles inland; the Kinabatangan, the largest and most important river in the territory, which has its rise, it is believed, to the eastward of the range of mountains of which Trus Madi is the principal feature, and is navigable by steamer for a considerable distance, and by boats for over a hundred miles from its mouth; the Segamah, which rises to the west of Darvel Bay; the Kumpong, and the Kalabakang, which debouches in Cowie Harbour. Taking it as a whole, the Company's territory is less generously watered than are other parts of Borneo, which again compare unfavourably in this respect with the Malayan States of the peninsula. Many of the rivers, and especially those on the west coast, are further obstructed by bars at their mouths, which render access to them difficult. Several of the natural harbours of North Borneo, on the other hand, are at once accessible, safe, and commodious. Sandakan Harbour, on the north-east coast (5° 40′ N. lat. and 118° 10′ E. long.), runs inland for some seventeen miles

[1] Sabah is the name applied by the natives to certain portions of the territory in the west coast of Borneo, now under the control of the Chartered Company of British North Borneo, but it is doubtful how far this term can with propriety be applied to the whole of the territory.

with a very irregular outline broken by the mouths of numerous creeks and streams. The mouth, only two miles across, is split into two channels by the little island of Balhala. The depth in the main entrance varies from 17 to 10 fathoms, and vessels drawing 20 feet can advance half-way up the bay. The seat of government is the town of Sandakan, situated just inside the mouth of the Sarwaka inlet. At Silam, on Darvel Bay, there is good



MAP OF BORNEO.

anchorage; and Kudat, in Marudu Bay, discovered by Commander Johnstone of H.M.S. *Egeria* in 1881, is a small but valuable harbour. On Gaya Bay stands Jesselton, the principal coast terminus of the railway (110 miles in length), in course of construction along the coast from Weston, in Padas Bay, whence the line is already open to Beaufort on the Padas river, a distance of twenty miles. From Beaufort the line runs along the right bank of the Padas river through the gorge from Rayoh to Tenom, a distance of about twelve miles. A road to Tenom down the whole length of the Pagalan valley, which will connect a large tract of country

Menumbok to Kudat, with connexion at Jesselton and other intermediate stations.

See also BRUNEI and SARAWAK.

AUTHORITIES.—POSEWITZ. *Borneo: Its Geology and Mineral Resources.*—MARTIN in *Tijdschr. Aardr. Gen.* vii. *Jaarboek van het Mijnwezen*, 1875-1900.—MOLENGRAAFF. "Die Niederländische Expedition nach Central Borneo" in *Petermann's Mitteil.*, 1895; and *Borneo Expedition* (Geological explorations in Central Borneo), with Atlas. Leyden, 1900.—TROMP. "Mededeelingen uit Borneo" in *Tijdschr. Aardr. Gen.* vii. (N. S.) 1890.—BOCK. *Reis in O. en Z. Borneo van Koetei naar Banjermasin*, 1881-87.—NIEUWENHUIS. "Die Durchquerung Borneos" in *Pet. Mitt.*, 1898; and *In Centraal Borneo.* Leyden, 1900.—VAN DER STOK. *Atlas of Wind and Weather* (Batavia), 1897.—KAN. "Borneo," and PLEYTE, "Dajaks," in the *Encyclopædie van Ned. Indie.*—FRANK HUTTON. *North Borneo.*—JOSEPH HUTTON. *The New Ceylon.*—Mrs W. B. PRYOR. *A Decade in Borneo.* (C. M. K.; H. CL.)

Bornholm, an island of Denmark, in the Baltic, 90 miles E. of Copenhagen and 23 S.E. of the coast of Sweden. Population, about 38,000. Excavations were carried on in the castle of Hammershuus in 1893. At Neksö a bust commemorates J. N. Madvig, who was born there in 1804 (died 1886). Coal-mining is now discontinued. A railway from Rönne (the capital; population, 9000) to Neksö, 22 miles, was opened in 1899.

Bornu, formerly a negro kingdom of some importance in the Central Sudan. Since 1880 it has steadily declined, owing to the political disturbances of which it has been the scene. The greater part of the area, which extends W. of Lake Chad in the valley of the Yobe, and S. between that river and the Shari, has been placed by international agreements within the British and German spheres of Nigeria and Cameroon, but no practical steps had been taken up to 1901 to establish the authority of these Powers in the country. After the visits of Rohlfs (1866) and Nachtigal (1871-73) the country was visited by no European traveller until 1892, when Colonel Monteil resided for a time at Kuka during his great journey from the Senegal to Tripoli. The French traveller noticed many signs of decadence, the energy of the people being sapped by luxury, while a virtual anarchy prevailed owing to rivalries and intrigues among members of the royal family. The king of Zinder had ceased to pay tribute, and the sultan was not strong enough to exact it by force. At the same time a danger was threatening from the south, where the negro adventurer Rabe or Rabah, once a slave of Zobeir Pasha, was menacing the kingdom of Baghirmi. After making himself master of the fortified town of Manifa, Rabe proceeded against Bornu, soon defeating the army of the sultan Ahsem in two pitched battles. In December 1893 Ahsem fled from Kuka, which was entered by Rabe and soon afterwards destroyed, the capital being transferred to Dikoa in the south of the kingdom. These events ruined the trade between Tripoli and Kuka by the long-established route *vid* Bilma, which has not since recovered its importance. Rabe had by this time raised a large, well-drilled army, and proved a formidable opponent to the French in their advance on Lake Chad from the south. The expedition under Lieutenant Bretonnet was cut to pieces by his troops in 1899, but later in the same year he met with a severe defeat at the hands of Captain Robillot, and early in 1900 was again defeated, and killed, at Kussuri, near the lower Shari, by the combined forces of three French expeditions which had been converging from the Congo, the Sahara, and the Niger. By the Anglo-French agreement of 1898 the tributary state of Zinder in the north fell to the French sphere, and French influence has been established there by the expeditions under Foureau, Joalland, and Peroz. (See also RABAH.)

See MONTEIL. *De St. Louis à Tripoli par le Lac Tchad.* Paris, 1895.—FOUREAU, in *La Géographie*, December 1900.—JOALLAND, *ibid.*, May 1901. (E. HE.)

Borrow, George Henry (1803-1881), English traveller, linguist, and author, was born at East Dereham, Norfolk, 5th July 1803, of a middle-class Cornish family. His father was a recruiting officer. His mother was a Norfolk lady of French extraction. From 1816 to 1818 Borrow attended, with no very great profit, the grammar school at Norwich. After leaving school he was articled to a firm of Norwich solicitors, where he neglected the law, but gave a great deal of desultory and unscholarly attention to languages. On the death of his father in 1824 he went to London to seek his fortune as a literary adventurer. Engaged by Sir Richard Phillips, the publisher, as a hack-writer at starvation wages, his experiences in London were bitter indeed. His struggles at last became so dire that if he would escape Chatterton's doom, he must leave London and either return to Norwich

GEORGE BORROW.
(From the painting by Phillips in the possession of Mr John Murray.)

and share his mother's narrow income, or turn to account in some way the magnificent physical strength with which Nature had endowed him. Determining on the latter of these courses, he left London on tramp. As he stood considerably more than 6 feet in height, was a fairly trained athlete, and had a countenance of extraordinary impressiveness, if not of commanding beauty—Greek in type with a dash of the Hebrew—we may assume that there had never before appeared on the English high-roads so majestic-looking a tramp as he who, on an afternoon in May, left his squalid lodging with bundle and stick to begin life on the roads. Shaping his course to the south-west, he soon found himself on Salisbury Plain. And then his extraordinary adventures began. After a while he became a travelling hedge-smith, and it was while pursuing this avocation that he made the acquaintance of the splendid road-girl, born at Long Melford Workhouse, whom he has immortalized under the name of Isopel Berners. He was now brought much into contact with the gypsies, and this fact gave him the most important subject-matter for his writings. For picturesque as is Borrow's style, it is this subject-

matter of his, the Romany world of Great Britain, which —if his pictures of that world are true—will keep his writings alive. Now that the better class of gypsies have migrated so rapidly to America that scarcely any are left in England, Borrow's pictures of them are challenged as being too idealistic. It is unfortunate that no one who was brought into contact with Borrow, and with the gryengroes or horse-dealers with whom he associated, and whom he depicted, has ever written about him and them. Full of "documents" as is Dr Knapp's painstaking biography, it cannot be said to give a vital picture of Borrow and his surroundings during this most interesting period of his life. It is this same peculiar class of gypsies (the gryengroes) with whom the present writer was brought into contact, and he can only refer, in justification of Borrow's pictures of them, to certain publications of his own, where the whole question is discussed at length, and where he has set out to prove that Borrow's pictures of the section of the English gypsies he knew are true to the life. As to the deep impression that Borrow made upon his gypsy friends, that is partly explained by the singular nobility of his appearance. For the gypsies are extremely sensitive upon matters of this kind. The silvery whiteness of the thick crop of hair which Borrow retained to the last seemed to add in a remarkable way to the nobility of his hairless face, but also it gave to the face a kind of strange look "not a bit like a Gorgio's," to use the words of one of his gypsy friends. Moreover, the shy, defiant, stand-off way which Borrow assumed in the company of his social equals left him entirely when he was with the gypsies. The result of this was that these wanderers knew him better than did his own countrymen. Seven years after the events recorded in *Lavengro* and *The Romany Rye* Borrow obtained the post of agent to the Bible Society, in which capacity he visited St Petersburg (1833-35) (where he published *Targum*, a collection of translations), and Spain, Portugal, and Morocco (1835-39). The result of these travels and adventures was the publication, in 1841, of *Zincali, or The Gypsies in Spain*. In 1843 appeared *The Bible in Spain*, when suddenly Borrow became famous. Every page of the book glowed with freshness, picturesqueness, and vivacity. In 1840 he married a well-to-do widow, and permanently settled at Oulton, near Lowestoft, with her and her daughter. Here he began to write again. Very likely Borrow would never have told the world about his vagabond wanderings in England as a hedge-smith had not *The Bible in Spain* made him famous as a wanderer. *Lavengro* appeared in 1851 with a success which, compared with that of *The Bible in Spain*, was only partial. He was much chagrined at this, and although *Lavengro* broke off in the midst of a scene in the Dingle, and only broke off there because the volumes would hold no more, it was not until 1857 that he published the sequel, *The Romany Rye*. In 1844 he travelled in South-Eastern Europe, and in 1854 he made a tour with his stepdaughter in Wales. This tour he described in *Wild Wales*, published in 1862. In 1874 he brought out a volume of ill-digested material upon the Romany tongue, *Romano Lavo-lil, or Word-book of the Gypsy Language*. In the summer of 1874 he left London, bade adieu to Mr Murray and a few friends, and returned to Oulton. On the 26th July 1881 he was found dead in his house at Oulton, in his seventy-ninth year. (T. W.-D.)

Borrowstounness, or Bo'NESS, a seaport, burgh of barony, and police burgh (1880), on the Firth of Forth, Linlithgowshire, Scotland. The harbour has been largely extended in recent times. At the end of 1898 the port register contained 10 vessels of 2385 tons; in 1898, entered 1097 vessels of 326,167 tons, cleared 1127 vessels of 324,194 tons. Coal and pig-iron are the principal commodities shipped, and Bo'ness is the principal port of discharge in Scotland for pitwood from the Baltic. Imports were valued at £219,778 in 1888, and at £223,612 in 1898; exports at £161,081 in 1888, and £219,582 in 1898. Iron foundries (7) and engineering works are now of great importance. Shipbuilding and whale-fishing are extinct. One of the schools has a well-equipped secondary department. Population (1881), 5284; (1901), 9100.

Borszék, a health resort of Eastern Hungary, situated among the Carpathians, 95 miles E. by N. of Kolosvár. It is noted for its mineral springs, six of which are rich in carbonic acid and one in iron oxide. From three to four million bottles of mineral water are prepared annually.

Bórysław, a village in Galicia, Austria, at the foot of the lower northern slopes of the Carpathians, about 6 miles S. of Drohobycz. It is the chief centre of the Galician petroleum wells and ozocerite deposits. The oil beds occur immediately at the foot of the range of hills along a terrace but lightly raised above the level of the plain, where the sandstone is so saturated with petroleum as to form a soft white mass. The quality of the oil is inferior to that of Western Galicia and the yield has declined, while that of ozocerite has increased. Both products are refined at Bórysław and the neighbouring village of Wolauka. The village is connected with the Austrian state railway by a branch line. Population (1890), 10,424 (double that of 1869); (1900), 10,671.

Borzhom, a small watering-place of Russia, Transcaucasia, government and 93 miles S.W. of Tiflis, 18 miles from the Transcaucasian railway. It is situated at an altitude of about 3000 feet, in the Borzhom gorge, a narrow rift in the Little Caucasus mountains. Its warm climate, its two hot springs, and the good state in which its beautiful parks are kept (the estate belonging to a member of the Russian imperial family), make it a favourite summer resort in Transcaucasia, and give it its popular name of "the pearl of Caucasus." The export of the bottled mineral waters, which was only 5350 bottles in 1890, reached 653,250 in 1897.

Borzna, a district town of S.W. Russia, government of Chernigov, 15 miles S. of the junction of the Desna with the Seim, and 9 miles from the Pliski station of the railway Kursk to Kieff. It is situated on sandy ground and surrounded on the north with marshes. It was annexed to Russia in 1654. Population, 12,500.

Bosboom, Anna Louisa Geertruida, *née* TOUSSAINT (who assumed the name of BOSBOOM-TOUSSAINT, after marrying at the Hague, in 1851, the well-known Dutch painter, Bosboom), (1812-1886), a distinguished Dutch novelist, was born at Alkmaar in North Holland, on 16th September 1812. Her father, a local chemist of Huguenot descent, gave her a fair education, and at an early period of her career Miss Toussaint developed a taste for historical research, fostered, perhaps, by a forced indoor life, the result of weak health. Her first romance, *Almagro*, appeared in 1837, followed by the *Graaf van Devonshire* (*The Earl of Devonshire*) in 1838; the *Engelschen te Rome* (*The English at Rome*) in 1840, and *Het Huis Lauernesse* (*The House of Lauernesse*) in 1841, an episode of the Reformation, translated into many European languages. These stories, mainly founded upon some of the most interesting epochs of Dutch history, betrayed a remarkable grasp of facts and situations, combined with an undoubted mastery over her mother tongue, though her style is sometimes involved, and not always faultless. Ten years (1840-50) were mainly devoted to further

studies, the result of which was revealed in 1851-54, when her *Leycester in Nederland* (3 vols.), *Vrouwen van het Leycestersche Tydperk* (*Women of Leicester's Epoch*, 3 vols.), and *Gideon Florensz* (3 vols.), appeared, a series dealing with Robert Dudley's adventures in the Low Countries. After 1870 Mrs Bosboom-Toussaint abandoned historical romance for the modern society novel, but her *Delftsche Wonderdokter* (*The Necromancer of Delft*, 1871, 3 vols.) and *Majoor Frans* (1875, 3 vols.) did not command the success of her earlier works. *Major Frank* has been translated into English (1885). Mrs Bosboom died at the Hague, 13th April 1886. Her novels have been published there in a collected edition (1885-88, 25 vols.) (H. TI.)

Boshof. See ORANGE RIVER COLONY.

Bosnia and Herzegovina.—By the Berlin Treaty of 1878 the Turkish provinces of Bosnia and Herzegovina were handed over for civil administration and military occupation to the monarchy of Austria-Hungary. To Austria-Hungary was also committed the military occupation of the Turkish sanjak of Novi-Bazar, its civil administration being left to Turkey. Approximately of the shape of an equilateral triangle, the compact territory of Bosnia and Herzegovina forms the north-western part of the Balkan peninsula. It is bounded on the W. by Dalmatia, on the N. by Croatia and Slavonia, on the E. by Servia, and on the S. by Turkey and Montenegro. Leaving out 6 kilometres of maritime boundary, the frontier line for about two-fifths of its length is formed by continuous watercourses, and for the remaining three-fifths runs over solid land, yet always following distinctive geographical features. According to the cadastral survey, the area of Bosnia and Herzegovina amounts to 19,700 square miles. The land is in general mountainous, yet ranges from low-lying plain up to the region of high mountains. In the north of Bosnia, along the Save, low-lying land, forming a continuation of the Hungaro-Slavonian depression, cuts here and there pretty deeply into the country, but in its progress to the south and south-west the land gradually rises, first to a hilly and then to a highland formation till, in the centre of the country and in Herzegovina, it attains the unequivocal character of high mountain. The hilly land reaches a mean elevation of about 1500 feet; the zone of highlands comprises heights of 3000 to 4500 feet; in the mountain districts of Travnik, Sarajevo, and Mostar, the principal peaks mount to over 6000 feet. In the depression, occupying about 5 per cent. of the land, the prevalent soil consists of exceedingly fertile alluvial deposits. The hilly land, about 24 per cent. of the whole area, and comprising fruitful valleys at the lower courses of its rivers, approximates in natural fertility of soil to the depression. The mountains and woodland, about 42 per cent. of the whole area, display not only natural forest and meadow, but also, though to a less extent, productive pasture. The Karst region, 29 per cent. of the whole area, from its scarcity of water and general poverty of soil, is suitable for cultivation only in the valleys and adjacent slopes, the rest being for the most part available only as pasture land. Geologically, the highlands of Bosnia and Herzegovina are to be regarded, both in their orographic and tectonic character, as a continuation of the South Alpine calcareous belt. Along the west frontier there appear broad and strongly-marked zones of Cretaceous limestone, alternating with Jurassic and Triassic, joined by a strip of Palæozoic formations running from the north-west corner of Bosnia. Next, proceeding from this region in an easterly direction, are the Neogene freshwater formations, filling up the greatest part of the north-east of Bosnia, as also a zone of flysch intermingled with several strips of eruptive rock. In the south-east of Bosnia the predominant formations are Triassic and Palæozoic strata with red sandstone and quartzite. Along the whole northern rim of Bosnia, as also in the fluvial and Karst valleys (Poljes), are found diluvial and alluvial formations, interrupted at one place by an isolated granite layer.

Climatically, considerable variations are observable in different parts of Bosnia and Herzegovina. The winter rains of the Karst region show how it belongs to the fringe of the sub-tropical climatic zone. The greater part of Bosnia falls within a zone in which the atmospheric precipitations are, with approximate equableness, distributed all over the year, having affinity on one side to the Alpine climate of the southern highlands of Austria, and on the other side to the continental climate of the regions of the Danube and Theiss. The yearly precipitation amounts in the Herzegovina to 1610 mm.; in Bosnia to 1030 mm. The mean yearly temperature in the Herzegovina is in the lower lands 11·7° to 14·7° Celsius; in high regions, 7·7° Celsius; in Bosnia, 8·7° to 10° Celsius.

SKETCH MAP OF BOSNIA AND HERZEGOVINA.

In correspondence with the natural configuration of the land and the variation of climate, the productions of the soil in the four natural regions are different. Fifty-five per cent. of the lowland is laid out in plough-land, garden, and meadow; 40 per cent. of it is pasture and woodland. In the hilly region 41 per cent. consists of plough-land, garden, and meadow; 56 per cent. of pasture and woodland. In the highlands plough-land occupies about 26 per cent.; pasture and woodland, 72 per cent. In the Karst region 16 per cent. is under the plough, and 81 per cent. is pasture and wood. The forest of the Karst region is mainly brushwood; that of the other regions tall timber and copse.

For purposes of administration, Bosnia and Herzegovina are divided into six districts (Kreise), the names, areas, and populations of which, according to the census of 1895, are as follows:—

District.	Area in Kilometres.	Civil Population.			Number of Persons to a Kilometre.	Natural Increase of Population since 1885, p.c.
		Males.	Females.	Persons.		
Sarajevo .	8,411	121,131	106,976	228,107	27·12	1·86
Banjaluka .	9,044	175,322	154,177	329,499	36·43	2·02
Bihać . .	5,526	102,896	89,001	191,897	34·90	2·06
Dolnja Tuzla	8,904	189,222	169,678	358,900	40·32	1·45
Travnik .	10,023	128,515	111,573	240,088	23·35	1·82
Mostar (Herzegovina) .	9,119	111,104	108,407	219,511	24·07	1·70
Total .	51,027	828,190	739,812	1,568,002	30·73	1·79

Males accordingly constitute 52·86 per cent. of the total civil population. In respect of creeds, 35 per cent. of the inhabitants are Mahommedans; 43 per cent. Oriental Orthodox; 21·3 per cent. Roman Catholics; 0·5 per cent. Israelites. The Mahommedans are most strongly represented in the district of Sarajevo, making 49 per cent. of the population; the Oriental Orthodox in Banjaluka, 59·2 per cent.; the Roman Catholics in Travnik, 37·7 per cent.; and in Mostar, 40·2 per cent.; the Jews in Sarajevo, 2·1 per cent. Since 1885 the Mahommedans have increased by 11 per cent.; the Oriental Orthodox, 18 per cent.; the Roman Catholics, 26 per cent.; and the Jews, 41·5 per cent. The occupation of the land shows a preponderance of small settlements. In 73 per cent. of all the inhabited places the maximum population is 300; 23 per cent. of inhabited places have from 300 to 1000 inhabitants; only forty places have a population of more than 2000; eleven places have over 5000 inhabitants each. 32·4 of the population live in little settlements of a maximum population of 300; 39·8 per cent. in places of between 300 and 1000; 12·6 per cent. in places of between 1000 and 2000; 15·2 per cent. in places of larger population. The capital town, Sarajevo, has 38,083 inhabitants. The agricultural population of the whole land numbers 1,385,291 persons, or 88·4 per cent. of the total population. There are 221,581 heads of families. Of these 2·63 per cent. are landed proprietors; 39·21 per cent. are free peasants; 40·15 per cent. are *Kmeten* (not free); 10·23 per cent. are free peasants and at the same time *Kmeten*; and 7·78 are of other ranks engaged in agriculture.

There is a Roman Catholic archbishopric in Sarajevo, one bishopric in Mostar, and one Apostolic administrator in Banjaluka. There is further an Oriental Orthodox metropolitan in each of the towns of Sarajevo, Dolnja Tuzla, and Banjaluka. The Reis-el-Ulema is the highest Mahommedan ecclesiastical authority.

In the way of education, there are 3 higher gymnasia, a higher *real*, 1 technical, and 3 higher-grade girls' schools, a training college for teachers, a scheviot (rough wool) weaving school, a Roman Catholic archiepiscopal gymnasium and priest seminary, an Oriental Orthodox theological institute, 10 commercial schools, several handicraft schools, 108 general elementary schools, 1 national museum—all under State administration. There are, further, 1 private institute for female teachers, 1 Mahommedan training school for teachers, 1030 Mahommedan religious schools (among them 25 reformed), 41 *medresse* or Mahommedan high schools, 79 Oriental Orthodox and 29 Roman Catholic schools, 2 Jewish normal primary schools, 4 German private primary schools, and 6 Roman Catholic congregational female schools.

The budget for the administration of Bosnia and Herzegovina for the year 1900 showed the expenditure and revenue as follows:—

	Ordinary.	Extra-ordinary.	Total.
Expenditure.	£	£	£
Central Government	143,606	8,368	151,974
Ministry of the Interior	675,242	33,956	709,198
,, ,, Finance	519,187	11,653	530,840
,, ,, Justice	66,921	4,484	71,405
,, ,, Buildings	203,605	61,803	265,408
Total	1,608,561	120,264	1,728,825
Revenue.			
Central Government	1,249	...	1,249
Ministry of the Interior	102,358	...	102,358
,, ,, Finance	1,398,236	666	1,398,902
,, ,, Justice	4,896	42	4,938
,, ,, Buildings	226,728	...	226,728
Total	1,733,467	708	1,734,175

The entire area is laid out as follows:—

	Square Kilometres.	Percentage of Total Area.
Plough-land	11,032	21·63
Garden ground	483	0·95
Meadow	3,465	6·79
Vineyard	59	0·11
Pasture	8,418	16·50
Wood	26,581	52·10
Unproductive	989	1·93

The yearly average total produce in wheat, rye, barley, oats, spelt, buckwheat, millet, corn and wheat mixed, maize, and marsh-millet, for the period 1892-96, amounted to over 5 million centners against a yearly average for the period 1882-86 of 2·24 millions, showing an increase for 1892-96 of more than double. The largest produce was yielded by maize, with 25,483 wagons (each 100 quintals); next, barley, 7879; wheat, 7864; oats, 4501; millet, 1590; spelt, 1318; rye, 1249; mixed corn and wheat, 1229; marsh-millet, 481; buckwheat, 88 wagons. In the north of the land and on the Dalmatian frontier the principal product is maize; in the south, barley. The yearly produce of pulse averaged, for the period 1892-96, 142,669 centners—an increase of 126·82 per cent. on the yield for 1882-86. The yearly yield of potatoes for 1892-96 averaged 519,667 centners, 190 per cent. more than in the corresponding years of the previous decade. Other products of the soil are tobacco, chiefly in Herzegovina, 37,160 centners; other commercial plants (rape-seed, hemp, linen, pyrethrum, madder), 32,225 centners. The yearly hay crop averaged, for the period 1892-96, 6,621,734 centners, 105 per cent. more than in the corresponding years of the previous decade; clover, principally in the district of Banjaluka, 19,761 centners.

Of great importance in the husbandry of Bosnia is the fruit culture, the yearly yield of which for the period 1892-96 was—

	Centners.	Increase per cent. on 1882-86.
Black damsons	1,149,429	94·89
Other stone fruit	140,926	240·40
Kernel fruit	209,457	20·66
Nuts	18,476	91·18
Tropical fruits (only in Herzegovina)	7,402	280·57
Grapes (principally in Herzegovina)	64,549	73·40

The following table shows the supply and distribution of cattle, &c., according to the census of 1895:—

	Number.	Number to a Kilometre.	For every 100 Agricultural Inhabitants.	Per cent. Increase since 1879.
Horses, Asses, and Mules	239,626	4·69	17·30	48·68
Horned cattle	1,417,341	27·77	102·31	85·98
Sheep	3,230,720	63·32	233·22	284·62
Goats	1,447,049	28·36	104·46	177·15
Swine	662,242	12·98	47·80	53·88
Beehives	140,061	2·75	10·83	26·20

Mining forms an important branch of the industry of Bosnia. The metalliferous beds known from olden times have since the Austro-Hungarian occupation been taken in hand, and further openings have been made, first in 1881 by the Mining Company of Bosnia, an undertaking taken over by the State in 1886.

The mining output in 1898 was—

	Quantity, Quintals.	Value in Florins.
Fallow copper ore	5,380	13,050
Copper ore	37,850	23,546
Iron ore	585,327	128,357
Chrome ore	4,580	16,370
Manganese ore	53,196	93,154
Zinc ore	100	260
Pyrites	2,404	...
Brown coal	2,711,835	566,324
	Hectol.	
Salt spring	1,177,708	47,112

The smelting works yielded in 1898:—

	Quantity, Quintals.	Value in Florins.
Mercury	40·5	9,315
Pure copper	1,489	109,340
Copper wares	499	...
Raw iron	135,365	505,025
Castings	9,419	106,675
Martiningots	86,694	...
Rolled iron	85,109	737,470
Salt from evaporation	144,962	1,120,264

The total value of the products of the smelting works was accordingly 2,588,080 florins, or, after deduction of waste stuffs from smelting, 2,138,945 florins. The mining output amounted to the value of 889,073 florins, an increase of 11 per cent. on the value of the preceding year's output.

The chief industries are weaving, leather, and metal work carried on by the workmen in their own houses. The Government has set up some workshops of its own with a view to a higher technical and artistic development of the house industry. More particularly, chased and inlaid metallic wares, bez (thin cotton), and carpet-weaving receive Government support. The four tobacco factories of the land, the national printing-press, an annular furnace for brick-burning, an iron-foundry, and several blast-furnaces are also under the management of the State. Among the larger private establishments are seven breweries, one brandy distillery, one sugar, two jam, two soap and candle factories, two building and furniture works, a factory for twisting thread, one

iron and steel-works, one paper and one ammonia and soda factory, and one mineral-oil refinery.

In respect of foreign trade Bosnia and Herzegovina have since 1882 been included in the customs and commercial system of Austria-Hungary, to the extinction of all intermediate imposts. Since 1898 special statistics have been drawn up respecting its trade also with Austria and Hungary. According to these statistics the most important articles of export are wood, 722,000 centners; coal and turf, 373,000 centners; fruit, 417,000 centners; minerals, 217,000 centners; soda, 124,000 centners; iron and steel, 82,000 centners; cattle, 324,000 head. Other articles of export are chemicals, dyeing and tanning stuffs, tobacco, sugar-beet, and kitchen-salt. The import consists principally of food stuffs, 546,000 centners; building materials, 228,000 centners; drinks, 95,000 centners; sugar, 45,000 centners; besides machinery, glass, fats, clothes, wooden and stone wares, and other products of industry. The total export in 1898 amounted to 3,861,759 centners; the total import to 1,937,291 centners. Of this trade nearly 19 per cent. was absorbed in the intercourse with Austria-Hungary by highways and transport; 46 per cent. by the State railways of Bosnia and Herzegovina.

In 1898 the total length of the railways was 877 kilometres, or 176 kilometres of railway to every 10,000 kilometres of the land. In 1898 the total length of the telegraph lines was 2840 kilometres, or 7182 kilometres' length of wire-line. Both are under State administration.

There is a national bank in Sarajevo with a joint stock of 10,000,000 florins, also carrying on a hypothecary credit business and managing the wholesale trade of the tobacco factories. There are savings banks in Banjaluka, Bjelina, and Brčka—all in stocks (340,000 florins joint stock), with a deposit, at the end of 1897, of 741,000 florins.

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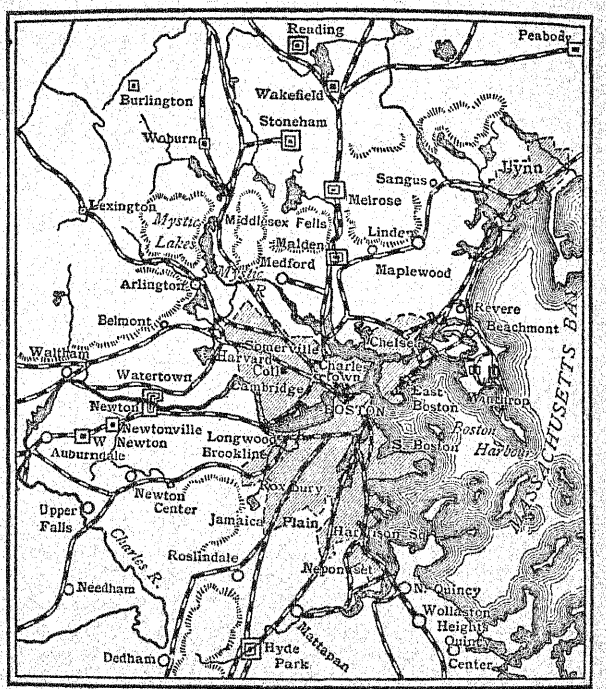

SKETCH MAP OF ENVIRONS OF BOSTON.

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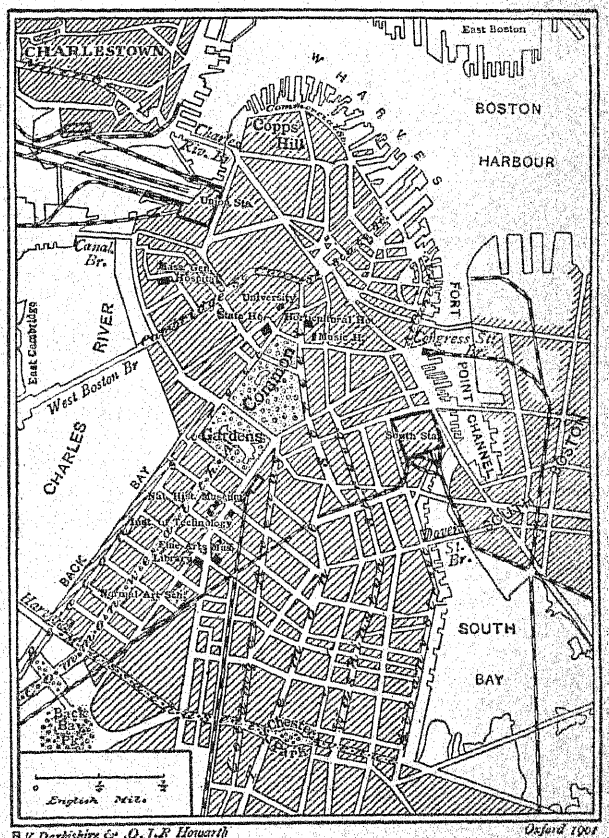

PLAN OF BOSTON.

iron and steel-works, one paper and one ammonia and soda factory, and one mineral-oil refinery.

In respect of foreign trade Bosnia and Herzegovina have since 1882 been included in the customs and commercial system of Austria-Hungary, to the extinction of all intermediate imposts. Since 1898 special statistics have been drawn up respecting its trade also with Austria and Hungary. According to these statistics the most important articles of export are wood, 722,000 centners; coal and turf, 373,000 centners; fruit, 417,000 centners; minerals, 217,000 centners; soda, 124,000 centners; iron and steel, 82,000 centners; cattle, 324,000 head. Other articles of export are chemicals, dyeing and tanning stuffs, tobacco, sugar-beet, and kitchen-salt. The import consists principally of food stuffs, 546,000 centners; building materials, 228,000 centners; drinks, 95,000 centners; sugar, 45,000 centners; besides machinery, glass, fats, clothes, wooden and stone wares, and other products of industry. The total export in 1898 amounted to 3,861,759 centners; the total import to 1,937,291 centners. Of this trade nearly 19 per cent. was absorbed in the intercourse with Austria-Hungary by highways and transport; 46 per cent. by the State railways of Bosnia and Herzegovina.

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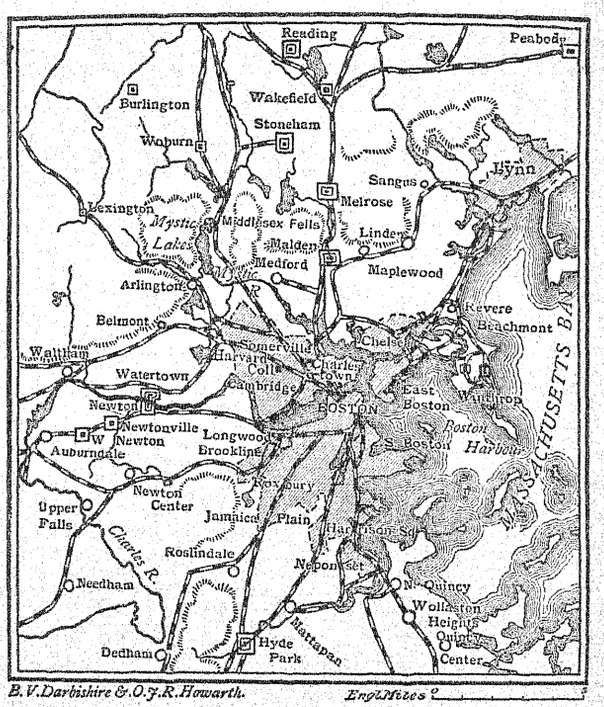

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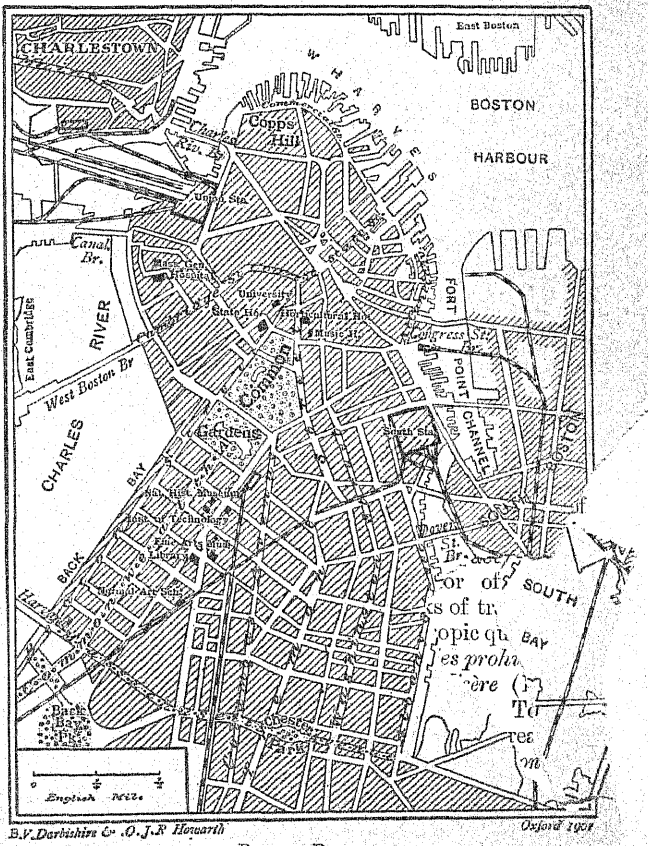

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courses of free public lectures upon branches of natural and moral science by the foremost authorities of the day on these subjects. The theatres number seventeen. There are twenty clubhouses, one of which, that of the Mayflower club, is for women. Of churches there are 296—228 Protestant, 49 Roman Catholic, and 19 Jewish synagogues. The Roman Catholic churches outnumber those of any single Protestant denomination, the largest among the latter—thirty-eight—being credited to the Baptists; the Congregational Trinitarians and the Methodist Episcopalians come next with thirty-six each; the Protestant Episcopalians, thirty-four; and the Congregational Unitarians, twenty-five. In private charities, philanthropic and beneficent work, Boston annually expends large sums through organizations of various classes. There are about 300 of these bodies, or one society for every 1800 persons in the city. The charitable capital has been estimated at upwards of $17,000,000, and the annual contribution of citizens for charitable and benevolent purposes at more than $600,000. The Associated Charities of Boston is an incorporated organization (1881), with a central office, and district offices in various sections, employing numerous paid agents and volunteer assistants, the objects of which are to secure the concurrent and harmonious action of the different charities of the city. Among the larger and more important of the beneficent institutions are thirty-three thoroughly equipped special hospitals, and three general hospitals, the latter including the Massachusetts general hospital, and the Massachusetts homœopathic hospital.

The foreign commerce of Boston is second only to that of New York. The exports for the year ending 30th June 1901, valued at $143,708,268, were the largest in the history of the port; the imports were $61,452,370. The aggregate foreign commerce for 1900, $192,608,536, shows increase in a quarter of a century, or since 1875, of 99,760,279. Nearly one-fourth of the entire American ports of the various meat and dairy products classed as the year ending 30th June 1899, passed It holds the first place among American ports of live cattle. It is the largest wool largest fish market in the country, in each ne world to London. The ocean tonnage eared in the foreign trade in the year ending 900 aggregated 4,145,187 tons; the steamship foreign ports were 973. In connexion with at service there has been built up between Boston verpool a passenger service of increasing proportions. The arrivals in the coastwise trade in 1900 were 10,436, an aggregate tonnage of 8,244,860 tons. In various industries the census of 1895 showed $77,064,107 of capital invested. The great railway systems having their terminals in Boston—the Boston and Maine (with which are consolidated the former Eastern; the Boston and Lowell systems, extending into New Hampshire and Canada, and the Fitchburg and Hoosac tunnel system), entering on the north side of the city; the New York, New Haven, and Hartford (controlling by lease the Boston and Providence, the Old Colony, and the New England railways), and the Boston and Albany (New York Central) systems, entering on the south side—now enter two immense stations—the Union, or North station, and the South Terminal—in place of eight separate stations, four on each side. The Union station, first completed (1893), a structure of brick, granite, and brown stone, covers an area of 9 acres. The train-shed is 539 feet long, 537 feet wide, and 51 feet high, and contains 23 tracks. The length of tracks under cover is 2 miles, and nearly 600 passenger trains arrive and depart from this station each week-day. The South Terminal station (built 1897-98) is called the largest and most costly of modern railway stations. It covers an area of 13 acres. The train-shed is with curved roof of one sweep 602 feet long, 570 feet wide, and 112 feet extreme height. There are 32 tracks—28 on the main floor, and 4 in the shape of 2 loop tracks on the lower or subway, for suburban traffic. The length of tracks under the roof is 4 miles, and the number of trains using the station daily is 750; on Sundays 195. It was estimated in 1900 that 50,000,000 passengers were carried to and from Boston yearly upon the railway routes within a radius of 50 miles of the city. The street electric car system is the most extensive in the world, the total length of track being 337 miles, and the number of passengers annually carried upwards of 190,000,000. Many of its lines pass through the heart of the city by the subway, an underground work built in 1895-98 to relieve the congestion caused by the pressure of cars and traffic in some of the most crowded thoroughfares. The subway is about a mile and two-thirds in length, partly with four tracks and partly with two. Grade crossings are avoided by means of interior loops, with sub-subways at junction points. The width of the four-track portion is 48 feet. The average height is 14 feet. The platforms at the stations are island platforms. The interior is lighted throughout by electricity, and thoroughly ventilated by fans. The subway was built under the supervision of the Boston Transit Commission at a cost of $4,250,000 within the appropriation Over 50,000,000 passengers are carried through it annually. The compensation paid by the railway company for its use is a sum per annum equal to 4½ per cent. of its net cost. An elevated railway through portions of the city, completed in 1901, is worked in connexion with the surface system.

Boston has a magnificent system of public parks, in addition to the historic Common in the heart of the city, which has been a Common almost since the founding of the town, and the unique public garden separated from the Common by a single street. This system, a chain of parks, embraces 2308 acres of picturesque lands, 126·9 acres of ponds and rivers, 38·45 miles of drives, 70·01 miles of walks, and 8·7 miles of rides. There are, besides, numerous playgrounds and separate parks. The cost of the system, including lands and construction, to January 1900 was $16,627,033. In the outlying districts, mostly within the boundaries of "Greater Boston," is the larger metropolitan parks system, established by the state, which embraces 9279 acres of forest or woods, seashore, and river-bank reservations, and 17 miles of park-ways and boulevards, valued at $10,000,000. Notable additions to the public statues and monuments of the city are the monument by Augustus St Gaudens to Colonel Robert G. Shaw (1895), commander of the first enlisted coloured regiment in the Civil War, killed at its head while leading the assault on Fort Wagner in 1863; statues of General, afterwards Judge Charles Devens (1898), of Sir Henry Vane, in the vestibule of the public library, and of Admiral Farragut (1896); and a monument to John Boyle O'Reilly (1892). A regular department of the city government is an art department, in charge of five commissioners, serving without pay, appointed by the mayor from candidates named by certain local art and literary institutions, without whose approval no work of art can become the property of the city. (E. M. B.)

Botany. See ANATOMY OF PLANTS, CYTOLOGY, PALÆOBOTANY, PATHOLOGY OF PLANTS, PHYSIOLOGY OF PLANTS, &c.

Bothnia, Gulf of. See BALTIC SEA.

Bothwell, a village of Lanarkshire, Scotland, stands near the Clyde, 8 miles S.E. of Glasgow by rail. A gravitation water-supply has been introduced, the old

parish church restored, and a statue of the poetess, Joanna Baillie, a native, erected (1899). Population (1881), 1535; (1901), 3097. The parish of Bothwell, which contains coal-mines, quarries, and ironworks, embraces also the towns of Uddingston (5099), Bellshill (3330), and Holytown (2811), and parts of two others, besides several large villages. Population (1881), 25,540; (1901), 45,901.

Botoşani, a town in Rumania, in the north of Moldavia, situated in the midst of a rich agricultural and pastoral country. It has a commercial importance, being the town through which goods from Poland and Galicia pass in transit for the south. There are extensive flour-mills equipped with modern appliances. The town of Botoşani owes its name to a Tartar chief, Batus or Batu Khan, grandson of Genghis Khan, who occupied the country in the 13th century. There is a large colony of Armenians. Population (1895), 33,000; (1900), 32,193.

Bottesini, Giovanni (1823-1889), Italian contrabassist and musical composer, was born at Crema in Lombardy on 24th December 1823. He studied music at the Milan Conservatoire, devoting himself especially to the double-bass, an instrument with which his name is principally associated. On leaving Milan he spent some time in America and also occupied the position of principal double-bass in the theatre at Havana. Here his first opera, *Cristoforo Colombo*, was produced in 1847. In 1849 he made his first appearance in England, playing double-bass solos at one of the Musical Union concerts. After this he made frequent visits to England, and his extraordinary command of his unwieldy instrument gained him great popularity in London and the provinces. Apart from his triumphs as an executant, Bottesini was a conductor of European reputation, and earned some success as a composer, though his work had not sufficient individuality to survive the changes of taste and fashion. He was conductor at the Théâtre des Italiens in Paris from 1855 to 1857, where his second opera, *L'Assedio di Firenze*, was produced in 1856. In 1861 and 1862 he conducted at Palermo, supervising the production of his opera *Marion Delorme* in 1862, and in 1863 at Barcelona. During these years he diversified the toils of conducting by repeated concert tours through the principal countries of Europe. In 1871 he conducted a season of Italian opera at the Lyceum Theatre in London, during which his opera *Ali Baba* was produced, and at the close of the year he was chosen by Verdi to conduct the first performance of *Aïda*, which took place at Cairo on 27th December 1871. Bottesini wrote three operas besides those already mentioned: *Il Diavolo della Notte* (Milan, 1859); *Vinciguerra* (Paris, 1870); and *Ero e Leandro* (Turin, 1880), the last named to a libretto by Arrigo Boito, which was subsequently set by Mancinelli. He also wrote *The Garden of Olivet*, a devotional oratorio (libretto by Joseph Bennett), which was produced at the Norwich Festival in 1887, a concerto for the double-bass, and numerous songs and minor instrumental pieces. Bottesini died at Parma on 7th July 1889. (R. A. S.)

Botzen (German, *Bozen*; Italian, *Bolzano*) the chief town of the government-district of the same name in Tirol, Austria. Population (1890), 11,744; (1900), 13,632; Catholic and German, with the exception of about 12 per cent. Italians. There is a garrison of 1032 men. Botzen, which is the busiest commercial town in the German Tirol, owes a portion of its prosperity to its popularity, and that of the adjoining village of Gries, as a winter resort. This accounts for the handsome new district, with hotels and villas, which has grown up in the south-western outskirts of the town. Viticulture and the growth of fruit and vegetables, in which there is an important export trade not only to the neighbouring countries but to North Germany, Russia, and America, is the principal resource of the district, in addition to the important transit trade.

Boucher de Crèvecœur de Perthes, Jacques (1788-1868), French geologist and antiquary, was born on 10th September 1788, at Rethel, Ardennes, France. He was the eldest son of Jules Armand Guillaume Boucher de Crèvecœur, botanist and customs officer, and of Étienne-Jeanne-Marie de Perthes (whose surname he assumed in addition to his father's). A fancy for a seafaring life was quenched in him by a short experience at the age of thirteen, and in 1802 he entered Government employ as an officer of customs. His duties kept him for six years in Italy, whence returning (in 1811) he found rapid promotion at home, and finally was appointed (March 1825) to succeed his father at Abbeville, where he remained for the rest of his life, being superannuated in January 1853, and dying at Amiens on 5th August 1868. His leisure was chiefly devoted to the study of what was afterwards called the Stone Age, "ante-diluvian man," as he expressed it. By his collections of flints gathered in Europe, Asia, and Africa, and by his monumental work *Antiquités celtiques et antédiluviennes; Mémoire sur l'industrie primitive et les arts à leur origin* (Paris, 1847, 1857, 1864, 3 vols.) he was the first to establish the existence of man in the Quaternary period. His views met with little approval, till the English geologists, following Falconer and Prestwick, pronounced in their favour. In 1863 and 1864 the discovery of human jawbones together with worked flints in the quarry of Moulin-Quignon near Abbeville seemed to vindicate Boucher de Perthes entirely, but doubt was thrown on the genuineness of the find, though not on the good faith of the discoverer, who was the same year made an officer of the Legion of Honour together with Quatrefages his champion. Boucher de Perthes displayed activity in many other directions. He was the author of several tragedies, two books of fiction, several works of travel, and a number of books on economic and philanthropic questions, *e.g.*, *Opinion de M. Christophe Vigneron sur les prohibitions et la liberté de commerce* (1831-84), *De la Misère* (1840), *De la Femme dans l'état social, &c.* (1860). To his scientific books must be added a rather fantastic treatise: *De la création: essai sur l'origine et la progression des êtres* (1839-41).

See Alcius Ledien. *Boucher de Perthes; sa vie, ses œuvres, sa correspondance.* Abbeville, 1885. (J. M'F.)

Bouches du Rhône, a French department on the Mediterranean, washed by the Rhône (which, discharging its waters into the sea, there forms a large delta), by the Durance, a tributary of the Rhône, forming the N.E. frontier of the department, and by the Arc.

Area, 2026 square miles, divided among 29 cantons and 109 communes. The population, 604,857 in 1886, had increased to 734,347 in 1901. This increase is due in part to foreign immigration, mostly Italian, the contingent of which mounted from 42,955 in 1872 to 97,500 in 1896. Births in 1899, 16,683, of which 2079 were illegitimate; deaths, 17,831; marriages, 5031. In 1896 the primary schools numbered 872, with 790,000 pupils; 4 per cent. of the population was illiterate. The chief towns are Marseilles (the capital, and the third city of France), with 442,389 inhabitants in 1896, Aix and Arles the sub-prefectures. The surface under cultivation in 1896 amounted to only 741,000 acres, of which 390,260 acres were plough-land and 61,750 acres in vines. The wheat crop in 1899 was of the value of £400,010, and the other cereals also yielded but mediocre returns. The vine brought the department a revenue of over £1,043,000. Among the other cultures may be mentioned olive, yielding (1898) £245,779; and mulberry, £19,737. The sericultural product amounted to 2999 cwts. The live stock has largely increased since 1872, especially sheep. Out of 626,670 head in all in 1899, 528,490 were sheep. The mineral production registered, in 1896, 364,000 tons of lignite

of the value of £132,000, and 63,500 tons of salt got from the salt-pans of the coast. Mining in 1898 yielded 16,000 tons of iron and cast-iron. Altogether, its gross returns exceeded the value of £250,000; its principal centres are the forges and ship-engineering works of Marseilles and Ciotat. Other industries are manufactures of oil, soap, glass, and chemicals. Including its transit trade, the commerce of Marseilles amounted in 1898 to the value of £78,200,000, more than a sixth of the general commerce of France, which totalled the value of £440,000,000.

Boucicault, Dionysius Lardner (commonly known as DION) (1822-1890), actor and playwright, was born in Dublin, 26th December 1822. His education was partly gained in Dublin and partly in London. Before he was twenty he was fortunate enough to make an immediate success as a dramatist with his play, *London Assurance*, which was produced at Covent Garden on 4th March 1841 with a cast that included Charles Mathews, Farren, Mrs. Nesbitt, and Madame Vestris. It was given out to be from the pen of "Mr. Lee Morton," but all Boucicault's succeeding plays appeared under his own name. Amongst his most conspicuous early successes were: *Alma Mater* (Haymarket, September 1842), *Old Heads and Young Hearts* (Haymarket, November 1844), *A School for Scheming* (Haymarket, February 1847), and *The Broken Vow* (Olympic, February 1851). In June 1852 he made his first appearance as an actor, in a melodrama of his own entitled *The Vampire*, at the Princess's Theatre. Soon after this he went to the United States, where he remained (principally in New York) till 1855. A play of his called *The Fox Hunt* was successfully produced at Burton's Theatre, New York, in November 1853. In September 1860 he reached the climax of his career in the production of *The Colleen Bawn* at the Adelphi, a play that was hailed as one of the best domestic dramas of the day. This was followed at the same theatre by *The Octoroon* in November 1861. Boucicault's next marked success was with *Arrah-na-Pogue*, at the Princess's Theatre in March 1865. In this play he gave a masterly delineation of Irish character in the part of a Wicklow carman, a performance which won him the reputation of the best stage Irishman of his time. Plays, original and adapted, flowed in numbers from his pen during the next ten years; until, after the production of *The Shaughraun* at Drury Lane in September 1875, he returned to New York, and finally made his home there. Previous to this he had undertaken the partial or entire management of various London theatres, usually with disastrous financial results. During the latter years of his life he exercised a powerful influence in the theatrical world of New York, and was still prolific in his output of original plays and adaptations. He paid occasional visits to London, where his last appearance as an actor was made in his play, *The Jilt*, at the Prince of Wales's Theatre in 1886. He was twice married, his second wife being Agnes Robertson, the adopted daughter of Charles Kean. He died in New York on 18th September 1890. (R. F. S.)

Bougie, a seaport of Algeria, on the Bay of Bougie, 120 miles E. of Algiers, at the foot of Mount Guraya. It is the seat of a sub-prefecture in the department of Constantine. It serves Central Kabylia, and is a centre for the commerce in oils, wools, hides, and minerals. The traffic of the port amounted in 1898 to 70,000 tons. The population in 1872 was only 7200, but, owing to the impulse given to colonization, it had increased in 1890 to 12,380, and in 1900 to 14,290 (2510 French).

Bouguereau, Adolphe William (1825-——), French painter, was born at La Rochelle, 30th November 1825. From 1843 till 1850 he went through the course of training at the École des Beaux Arts, and in 1850 divided the Grand Prix de Rome scholarship with Baudry, the subject set being "Zenobia on the banks of the Araxes." On his return from Rome in 1855 he was employed in decorating several aristocratic residences, deriving inspiration from the frescoes which he had seen at Pompeii and Herculaneum, and which had already suggested his "Idyll" (1853). He also began in 1847 to exhibit regularly at the Salon. "The Martyr's Triumph," the body of St Cecilia borne to the catacombs, was placed in the Luxembourg after being exhibited at the Great Exhibition of 1855; and in the same year he exhibited "Fraternal Love," a "Portrait," and a "Study." The State subsequently commissioned him to paint the emperor's visit to the sufferers by the inundations at Tarascon. In 1857 Bouguereau received a first prize medal. Nine of his panels executed in wax-painting for the mansion of M. Bartholomy were much discussed—"Love," "Friendship," "Fortune," "Spring," "Summer," "Dancing," "Arion on a Sea-horse," a "Bacchante," and the "Four Divisions of the Day." He also exhibited at the Salon "The Return of Tobit" (now in the Dijon Gallery). While in antique subjects he showed much grace of design, in his "Napoleon," a work of evident labour, he betrayed a lack of ease in the treatment of modern costume. M. Bouguereau subsequently exhibited "Love Wounded" (1859), "The Day of the Dead" (at Bordeaux), "The First Discord" (1861, in the Club at Limoges), "The Return from the Fields" (a picture in which Théophile Gautier recognized "a pure feeling for the antique"), "A Fawn and Bacchante," and "Peace"; in 1863 a "Holy Family," "Remorse," "A Bacchante teasing a Goat" (in the Bordeaux Gallery); in 1864 "A Bather" (at Ghent), and "Sleep"; in 1865 "An Indigent Family," and a portrait of Mme. Bartholomy; in 1866 "A First Cause," and "Covetousness," with "Philomela and Procne"; and some decorative work for M. Montlun at La Rochelle, for M. Emile Péreire in Paris, and for the churches of St Clotilde and St Augustin; and in 1866 the large painting of "Apollo and the Muses on Olympus," in the Great Theatre at Bordeaux. Among other works by this artist may be mentioned "Between Love and Riches" (1869), "A Girl Bathing" (1870), "In Harvest Time" (1872), "Nymphs and Satyrs" (1873), "Charity" and "Homer and his Guide" (1874), "Virgin and Child," "Jesus and John the Baptist," "Return of Spring" (which was purchased by an American collector, and was destroyed by a fanatic who objected to the nudity), a "Pietà" (1876), "A Girl defending herself from Love" (1880), "Night" (1883), "The Youth of Bacchus" (1884), "Biblis" (1885), "Love Disarmed" (1886), "Love Victorious" (1887), "The Holy Women at the Sepulchre" and "The Little Beggar Girls" (1890), "Love in a Shower" and "First Jewels" (1891). To the Exhibition of 1900 were contributed some of Bouguereau's best known pictures. Most of his works, especially "The Triumph of Venus" (1856) and "Charity," are popularly known through engravings. "Prayer," "The Invocation," and "Sappho" have been engraved by M. Thirion, "The Golden Age" by M. Annetombe. Bouguereau's pictures, highly appreciated by the general public, have been severely criticized by the partisans of a freer and fresher style of art, who have reproached him with being too content to revive the formulas and subjects of the antique. At the Great Exhibition of 1867 M. Bouguereau took a third-class medal, in 1878 a medal of honour, and the same again in the Salon of 1885. He was chosen by the Society of French Artists to be their vice-president, a post he filled with much energy. He was made a member of the Legion of Honour in 1856, an officer of the Order 26th July 1876, and Commander 12th July 1885. He succeeded Pils as member of the Institute, 8th January

1876. Bouguereau has also been highly distinguished as a teacher.

CH. VENDRYES. *Catalogue Illustré des Œuvres de Bouguereau*. Paris, 1885.—JULES CLARETIE. *Peintres et Sculpteurs Contemporains*. Paris, 1874.—P. G. HAMERTON. *French Painters.—Artistes Modernes: Dictionnaire Illustré des Beaux Arts*, 1885.—"W. Bouguereau," *Portfolio*, 1875.—ÉMILE BAYARD. "William Bouguereau," *Monde Moderne*, 1897.

Boulanger, George Ernest Jean Marie (1837-1891), French general, was born at Rennes, 29th April 1837. He entered the army in 1856, and served in Algeria, Italy, Cochin-China, and the Franco-German war, earning the reputation of being a smart soldier. He was made a brigadier-general in 1880, on the recommendation of the duc d'Aumale, then commanding the 7th army corps, and Boulanger's expressions of gratitude and devotion on this occasion were remembered against him afterwards when, as War Minister in M. Freycinet's Cabinet, he erased the name of the duc d'Aumale from the Army List, as part of the republican campaign against the Orleanist and Bonapartist princes. In 1882 his appointment as director of infantry at the War Office enabled him to make himself conspicuous as a military reformer; and in 1884 he was appointed to command the army occupying Tunis, but was recalled owing to his differences of opinion with M. Cambon, the political resident. He returned to Paris, and began to take part in politics under the ægis of M. Clémenceau and the Radical party; and in January 1886, when M. Freycinet was brought into power by the support of the Radical leader, Boulanger was given the post of War Minister. By introducing genuine reforms for the benefit of officers and common soldiers alike, and by laying himself out for popularity in the most pronounced fashion—notably by his fire-eating attitude towards Germany in April 1887 in connexion with the Schnæbelé frontier incident—he came to be accepted by the mob as the man destined to give France her revenge for the disasters of 1870, and to be used simultaneously as a tool by all the anti-Republican intriguers. His action with regard to the royal princes has already been referred to, but it should be added that Boulanger was taunted in the Senate with his ingratitude to the duc d'Aumale, and denied that he had ever used the words alleged. His letters containing them were, however, published, and the charge was proved. Boulanger fought a bloodless duel with the baron de Lareinty over this affair, but it had no effect at the moment in dimming his popularity, and on M. Freycinet's defeat in December 1886 he was retained by M. Goblet at the War Office. M. Clémenceau, however, had by this time abandoned his patronage of Boulanger, who was becoming so inconveniently prominent that, in May 1887, M. Goblet was not sorry to get rid of him by resigning. The mob clamoured for their "brav' général," but M. Rouvier, who next formed a Cabinet, declined to take him as a colleague, and Boulanger was sent to Clermont-Ferrand to command an army corps. A Boulangist "movement" was now in full swing. The Bonapartists had attached themselves to the general, and even the comte de Paris encouraged his followers to support him, to the dismay of those old-fashioned Royalists who resented Boulanger's treatment of the duc d'Aumale. His name was the theme of the popular song of the moment—"C'est Boulanger qu'il nous faut"; the general and his black horse became the idol of the Parisian populace; and he was urged to play the part of a plebiscitary candidate for the Presidency. The general's vanity lent itself to what was asked of it; after various symptoms of insubordination had shown themselves, he was deprived of his command in 1888 for twice coming to Paris without leave, and finally, on the recommendation of a council of inquiry composed of five generals, his name was removed from the Army List. He was, however, almost at once elected to the Chamber for the Nord, his political programme being a demand for a revision of the constitution. In the Chamber he was in a minority, since genuine Republicans of all varieties began to see what his success would mean, and his actions were accordingly directed to keeping the public gaze upon himself. A popular hero survives many deficiencies, and neither his failure as an orator nor the humiliation of a discomfiture in a duel with M. Floquet, an elderly civilian, sufficed to check the enthusiasm of his following. During 1888 his personality was the dominating feature of French politics, and, when he resigned his seat as a protest against the reception given by the Chamber to his revisionist proposals, constituencies vied with one another in selecting him as their representative. At last, in January 1889, he was returned for Paris by an overwhelming majority. He had now become an open menace to the parliamentary Republic. Had Boulanger immediately placed himself at the head of a revolt, he might at this moment have effected the *coup d'état* which the intriguers had worked for, and might not improbably have made himself master of France; but the favourable opportunity passed. The Government, with M. Constans as Minister of the Interior, had been quietly taking its measures for bringing a prosecution against him, and within two months a warrant was signed for his arrest. To the astonishment of his friends, on 1st April he fled from Paris before it could be executed, going first to Brussels and then to London. It was the end of the political danger, though Boulangist echoes continued for a little while to reverberate at the polls during 1889 and 1890. Boulanger himself, having been tried and condemned *in absentiâ* for treason, in October 1889 went to live in Jersey, but nobody now paid much attention to his doings. The world was startled, however, on 30th September 1891 by hearing that he had committed suicide in a cemetery at Brussels by blowing out his brains on the grave of his mistress, Madame de Bonnemains (*née* Marguerite Crouzet), who had died in the preceding July.

See also the article FRANCE, *History*; and VERLY, *Le Général Boulanger et la conspiration monarchique*, Paris, 1893. (H. CH.)

Boulder, capital of Boulder county, Colorado, U.S.A., situated at the base of the Front Range, on Boulder Creek, in 40° 01′ N. lat. and 105° 17′ W. long., at an altitude of 5047 feet. It is a point of distribution for an important mining region, and is entered by the Union Pacific, the Colorado and North-Western, and the Colorado and Southern railways. Population (1880), 3669; (1900)), 6150.

Boulogne-sur-Mer, a fortified seaport of France, chief town of arrondissement, department of Pas-de-Calais, 25 miles from Calais by rail. It is 28 miles from Folkestone, with which there is a fixed steamboat service, the average passage occupying one hour and a half. A new deep-sea harbour is in course of construction, affording accommodation for the largest sea-going vessels. The southern pier, the so-called "Mole de Carnot," has a length of 1½ miles. A new railway station has been opened at the Tintilleries in the upper town on the through main line from Calais to Paris, the old town station being now mostly used for local traffic. Boulogne is rapidly extending northwards up the coast, and is connected by an electric tram-line with the pretty little watering-place, Vimille-Wimereux, 3 miles distant, which thus practically forms a suburb of the larger town. Public institutions include the communal college, schools of practical commerce and industry. The number of volumes in the library has more than doubled, and there are now three other libraries, two museums, and three hospitals. Several

learned societies meet here. Fish-curing occupies several large establishments. The commercial activity of the town is of great and growing importance, and extends to all parts of the world. The numbers of vessels entered and cleared in 1899 (including French coasting vessels) were, respectively, 2946 of 1,295,360 tons, and 2961 of 1,293,270 tons. Of these there entered British vessels 1976 of 548,083 tons, and cleared 1983 of 549,203 tons. Of exports in 1899 wines formed the bulk; next came cement, then potatoes, fresh fruit, and vegetables. The principal imports during the same year were coal and wood coke. The total value of the imports in 1899 was £6,584,000, and of the exports, £12,360,000. The total number of passengers arriving at Boulogne in 1899 was 115,967, and of departures 130,029. In 1899 the fisheries of Boulogne, including the sub-ports of Étaples, Andresselles, Le Partel, and Équihen, employed 400 boats and 5350 men, the value of the fish taken being estimated at £505,680. Steamboats are gradually replacing the smaller sailing boats. Population (1881), 43,954; (1891), 44,340; (1901), 49,083.

Boulogne-sur-Seine. See PARIS.

Bourbaki, Charles Denis Sauter (1816-1897), French general, was born at Pau, 22nd April 1816, being the son of a Greek colonel who died in the War of Independence in 1827. He entered St Cyr, and in 1836 joined the Zouaves, becoming lieutenant of the Foreign Legion in 1838, and aide-de-camp to King Louis Philippe. It was in the African expedition that he first came to the front. In 1842 he was captain in the Zouaves; 1847, colonel of the Turkos; 1850, lieutenant-colonel of the 1st Zouaves; 1851, colonel; 1854, brigadier-general. In the Crimean war he commanded a portion of the Algerian troops; and at the Alma, Inkerman, and Sebastopol Bourbaki's name became famous. In 1857 he was made general of division, commanding in 1859 at Lyons. His success in the war with Italy was only second to that of MacMahon, and in 1862 he was proposed as a candidate for the vacant Greek throne, but declined the proffered honour. In 1870 the emperor entrusted him with the command of the Imperial Guard, and he played an important part in the fighting round Metz. On 25th September Bourbaki escaped from Metz in disguise, though whether his departure was the result of an intrigue on the part of Bazaine or of connivance on the part of the German authorities (who, it is said, were anxious that communications should be opened up with the Empress Eugénie), has not been sufficiently cleared up. At all events it was given out that he had a mission to Chiselhurst, and he went to England with a safe-conduct, but soon returned to France having effected nothing. He offered his services to Gambetta and received the command of the Northern army, but was recalled on 19th November and transferred to the army of the Loire. Towards the end of the siege of Paris he unsuccessfully attempted to create a diversion by cutting the Prussian line at Belfort, but was outmanœuvred by Manteuffel, and driven across the Swiss frontier. His troops were in the most desperate condition, owing to lack of food; and out of 150,000 men under him when he started, only 84,000 escaped from the Germans into Swiss territory. Bourbaki himself, rather than submit to the humiliation of a probable surrender, on 26th January 1871 delegated his functions to General Clinchant, and in the night fired a pistol at his own head, but the bullet, owing to a deviation of the weapon, was flattened against his skull and his life was saved. General Clinchant carried Bourbaki into Switzerland, and he recovered sufficiently to return to France. In July 1871 he again took the command at Lyons, and subsequently became military governor. In 1881, owing to his political opinions, he was placed on the retired list, together with Generals de Barail, Bataille, and Ducrot. In 1885 he was an unsuccessful candidate for the Senate. He died 27th September 1897. A patriot and a brilliant soldier and leader, Bourbaki was yet not equal to the tasks that fell to his lot; and in this he resembled some other French generals of the Second Empire whose training had been obtained in Africa. (H. CH.)

Bourgeois, Léon Victor Auguste (1851-——), French statesman, was born at Paris, 21st May 1851, and educated for the law. After holding a subordinate office (1876) in the department of public works, he became successively prefect of the Tarn (1882) and the Haute-Garonne (1885), and then returned to Paris to enter the Ministry of the Interior. He became prefect of police in November 1887, at the rather critical moment of President Grévy's resignation. In the following year he entered the Chamber, being elected deputy for the Marne, in opposition to General Boulanger, and joined the Radical Left. He was Under-Secretary for Home Affairs in the Floquet Ministry of 1888, and resigned with it in 1889, being then returned to the Chamber for Reims. In the Tirard Ministry, which succeeded, he was Minister of the Interior, and subsequently Minister of Public Instruction in the Cabinet of M. Freycinet, a post for which he had qualified himself by the attention he had given to educational matters. In this capacity he was responsible in 1890 for some important reforms in secondary education. He retained his office in M. Loubet's Cabinet in 1892, and was Minister of Justice under M. Ribot at the end of that year, when the Panama scandals were making the office one of peculiar difficulty. He energetically pressed the Panama prosecution, so much so that he was accused of having put wrongful pressure on the wife of one of the defendants in order to procure evidence. To meet the charge he resigned in March 1893, but again took office, and only retired with the rest of the Freycinet Ministry. In November 1895 he himself formed a Cabinet of a pronouncedly Radical type, the main interest of which was attached to its fall, as the result of a constitutional crisis arising from the persistent refusal of the Senate to vote Supply. The Bourgeois Ministry appeared to consider that popular opinion would enable them to override what they claimed to be an unconstitutional action on the part of the Upper House; but the public was indifferent and the Senate triumphed. The blow was undoubtedly damaging to M. Bourgeois's career as an *homme de gouvernement*. After officiating as Minister of Public Instruction in the short-lived Brisson Cabinet of 1898, he represented his country with dignity and effect at the Hague Peace Congress.

Bourges, chief town of department Cher, France, 137 miles S. of Paris, on the railway from Paris to Nevers, is the headquarters of the 8th army corps, and its military establishments have become of the very highest importance; they include, amongst other departments, schools of artillery and pyrotechnics, engineering works, and a national cannon foundry. At Mazières also, about 1½ miles S. of Bourges, are very important metallurgical works. Population (1881), 29,001; (1901), 39,822.

Bourget, Paul (1852-——), French novelist and critic, was born at Amiens, 2nd Sepember 1852. His father, a professor of mathematics, was afterwards appointed to a post in the college at Clermont-Ferrand. Here Bourget received his early education. He then proceeded to the college of Sainte-Barbe at Paris, and

followed a course at the Lycée Louis-le-Grand, where he studied with distinction, and passed his first examination with honours. In 1872-73 he produced a volume of verse, *Au bord de la mer*, which was followed by others, the last, *Les Aveux*, appearing in 1882. Meanwhile he was making a name in literary journalism, and in 1883 he published *Essais de Psychologie Contemporaine*, studies of eminent writers first printed in the *Nouvelle Revue*, and now brought together. In 1884 Bourget paid a long visit to England, and there wrote his first published story (*L'Irréparable*). *Cruelle Énigme* followed in 1885; and in 1887 *André Cornelis* and *Mensonges* were received with much favour. *Le Disciple* (1889) showed the novelist in a graver attitude; while in 1891 *Sensations d'Italie*, notes of a tour in that country, revealed a fresh phase of his powers. In the same year appeared the novel *Cœur de Femme*, and *Nouveaux Pastels*, types of the characters of men, the sequel to a similar gallery of female types (*Pastels*, 1890). His later novels include *La Terre Promise* (1892); *Cosmopolis* (1892), a psychological novel, with Rome as a background; *Une Idylle Tragique* (1894); *La Duchesse Bleue* (1897); and some volumes of shorter stories—*Complications Sentimentales* (1896), the powerful *Drames de Famille* (1898), and *Un Homme Fort* (1900). *Études et Portraits*, first published in 1888, contains impressions of Bourget's stay in England and Ireland, especially reminiscences of the months which he spent at Oxford; and *Outre-Mer*, a book in two volumes, is his critical journal of a visit to the United States in 1893. He was admitted to a chair at the Academy in 1894, and in 1895 was promoted to be an officer of the Legion of Honour, having received the decoration of the order ten years before.

As a writer of verse Bourget was merely trying his wings, and his poems are chiefly interesting for the light which they throw upon his mature method and the later products of his art. It was in criticism that his genius first found its true bent. The habit of close scientific analysis which he derived from his father, the sense of style produced by a fine ear and moulded by a classical education, the innate appreciation of art in all its forms, the taste for seeing men and cities, the keen interest in the oldest not less than the newest civilizations, and the large tolerance not to be learned on the *boulevard*—all these combined to provide him with a most uncommon equipment for the critic's task. It is not surprising that the *Sensations d'Italie*, and the various psychological studies, are in their different ways scarcely surpassed throughout the whole range of literature. Bourget's reputation as a novelist has long been assured. Deeply impressed by the singular art of Henry Beyle (Stendhal), he struck out on a new course at a moment when the realist school reigned without challenge in French fiction. His idealism, moreover, had a character of its own. It was constructed on a scientific basis, and aimed at an exactness, different from, yet comparable to, that of the writers who were depicting with an astonishing faithfulness the environment and the actions of a person or a society. With Bourget observation was mainly directed to the secret springs of human character. At first his purpose seemed to be purely artistic, but when *Le Disciple* appeared, the preface to that remarkable story revealed in him an unsuspected fund of moral enthusiasm. Since then he has varied between his earlier and his later manner, but his work in general has been more seriously conceived. From first to last he has figured with a most delicate brush the intricate emotions of women, whether wronged, erring, or actually vicious; and he has described not less happily the ideas, the passions, and the failures of those young men of France to whom he makes special appeal.

Bourget has been charged with pessimism, and with undue delineation of one social class. The first charge can hardly be sustained. The lights in his books are usually low; there is a certain lack of gaiety, and the characters move in a world of disenchantment. But there is no despair in his own outlook upon human destiny as a whole. As regards the other indictment, the early stories sometimes dwell to excess on the mere framework of opulence; but the pathology of moral irresolution, of complicated affairs of the heart, of the ironies of friendship, in which the writer revels, can be more appropriately studied in a cultured and leisured society than amid the simpler surroundings of humbler men and women. The style of all Bourget's writings is singularly graceful. His knowledge of the literature of other lands gives it a greater flexibility and a finer allusiveness than most of his contemporaries can achieve. The precision by which it is not less distinguished, though responsible for a certain over-refinement, and for some dull pages of the novels, is an almost unmixed merit in the critical essays. As a critic, indeed, either of art or letters, Bourget leaves little to be desired. If he is not in the very first rank of novelists, if his books display more ease of finished craftsmanship than joy in spontaneous creation, it must be remembered that the supreme writers of fiction have rarely succeeded as he has in a different field.

Bourke, a town in New South Wales, Australia, 503 miles by rail N.W. from Sydney, on the south bank, and at the head of the ordinary winter navigation, of the Darling river, in the county of Cowper. Remarkably rich copper ore exists in the district (which is also pastoral and agricultural) in great abundance. Population, about 3000.

Bournemouth, a municipal (1890) and county (1900) borough and watering-place in the parliamentary borough of Christchurch, England, 107½ miles S.W. by W. of London by rail. The town has been greatly extended in recent years, and many new streets and villas have been erected, as well as hotels, for the increasing number of visitors that frequent the town. Modern erections include twelve Established churches and several chapels, a science and art school, a public library, two drill halls, the Royal Victoria Hospital, and the Royal Boscombe and West Hants Hospital. The iron pier has been extended to 1000 feet in length. Golf links of 60 acres have been provided in Meyrick Park. The beautiful chines at Boscombe, Alum, and Branksome have attracted a large number of wealthy residents, and Talbot Woods is a favourite resort. Area, 2592 acres; population (1881), 18,607; (1891), 37,781; (1901), 47,003. The urban districts of Pokesdown and Winton, which adjoin Bournemouth on the west and north, were included in the borough in November 1901, and their population is respectively 4930 and 6719. Parts of the rural parishes of Holdenhurst and Southbourne have also been incorporated.

Bouscat, Le, a suburban and residential town, department of Gironde, France, in the arrondissement and 3 miles N. by W. of Bordeaux, on electric tramway to Eysines. It has a hydropathic establishment, and the Bordeaux racecourse is here. Population (1881), 3644; (1896), 9234; (1901), 10,462.

Boussu, a town of Belgium, in the province of Hainaut, 7 miles W. of Mons by rail. In its neighbourhood copper-, bronze-, and iron-founding, and sugar manufacture are carried on, also the building of steam-machinery and boats. Mines and quarries are also worked in the vicinity. Population (communal) (1880), 8722; (1897), 10,564.

Bowen, Charles Synge Christopher, Baron (1835-1894), English judge, was born on 1st January 1835, at Woolaston in Gloucestershire, his father, the Rev. Christopher Bowen of Hollymount, Co. Mayo, being then curate of the parish. At ten years of age Charles Bowen was sent to school at Lille, whence he was transferred to Blackheath proprietary school. In 1850 he went to Rugby, entering the school-house. The master of his first form (the upper fifth) was Bradley, afterwards dean of Westminster, and his tutor was Cotton, afterwards headmaster of Marlborough, and subsequently bishop of Calcutta. At Rugby Bowen had a brilliant career, which he closed by winning a Balliol scholarship in 1853, while he was noted (as he was afterwards at Balliol) as a cricketer and football player. At Oxford he made good the promise of his earlier youth, his principal achievements being the Hertford scholarship 1855, First Class Classical Moderations 1856, Ireland scholarship 1857, Chancellor's prize for Latin verse 1857, First Class in *Lit. Hum.* 1858, Balliol Fellowship 1858, Arnold prize for English essay 1859. He also won the friendship of, among many others, Benjamin Jowett, then tutor, afterwards master of Balliol, a friendship which only ended when Jowett died in 1893, a year before his pupil, who had in 1885 become visitor of the college. From Oxford Bowen went to London, where he was called to the bar at Lincoln's Inn in 1861, and while studying law he wrote regularly for the *Saturday Review*, and also later for the *Spectator*. For a time he had little success at the bar considering his talents, and came near to exchanging it for the career of a college tutor. He had friends, however, who believed in him, and the persuasion of Mr Coleridge, afterwards Lord Chief Justice, the leader of the Western Circuit, which he had joined, and of Mr G. Baugh Allen, a well-known special pleader with whom he had read, and others, induced him to persevere. Soon after he had begun to make his mark he was briefed against the Claimant in the civil and criminal trials connected with the famous "Tichborne Case." Bowen's services to his leader, Sir John Coleridge, during the former helped to procure for him the appointment of junior counsel to the Treasury (known in the legal vernacular as Attorney-General's devil), when Sir John had passed, as he did while the trial proceeded, from the office of Solicitor-General to that of Attorney-General; and from this time his practice became a very large one. The strain, however, of the Tichborne trials had been great, and possibly the combination of severe intellectual effort with the struggle for athletic distinction at school and at college had told upon his constitution, for his physical health became unequal to the tasks which his zeal for work imposed upon it, and in 1879 his acceptance of a judgeship in the Queen's Bench Division, on the retirement of Mr Justice Mellor, gave him the opportunity of comparative rest, while it closed to him the prospect of distinction in politics before he had had time to seek it. The character of Charles Bowen's intellect hardly qualified him for some of the duties of a puisne judge; but it was otherwise when, in 1882, in succession to Lord Justice Holker, he was raised to the Court of Appeal. As a Lord Justice of Appeal he was conspicuous for his learning, his industry, and his courtesy to all who appeared before him; and in spite of failing health he was able to sit more or less regularly until August 1893, when on the retirement of Lord Hannen he was made a Lord of Appeal in ordinary, and a baron for life, with the title of Baron Bowen of Colwood. By this time, however, his health had finally broken down; he never sat as a law lord to hear appeals, and he gave but one vote as a peer, while his last public service consisted in presiding over the Commission which sat in October 1893 to inquire into the Featherstone riots. He was barely able to attend the meeting held on 2nd December in order to raise a memorial to Dr Jowett, at which both his old friend Lord Chief Justice Coleridge and he, respectively mover and seconder of a resolution as to the disposal of the fund to be raised, made their last speeches in public. Lord Coleridge lived till 14th June, but Lord Bowen became rapidly worse during the early months of 1894, and died on 10th April. He was buried in the churchyard of Slaugham, near Colwood, his country house in Sussex; and a marble tablet has been erected to his memory in the vestibule of Lincoln's Inn chapel, bearing a Latin inscription from the pen of the Hon. George Denman, formerly a judge of the Queen's Bench Division, and a senior classic, who also died soon afterwards.

Lord Bowen was regarded with great affection by all who knew him either professionally or privately. In the more intellectual circles of English society he had many friends, including Mr Gladstone. He had a polished and graceful wit, of which many instances might be given, although such anecdotes lose force in print. For example, when it was suggested on the occasion of an address to Queen Victoria, to be presented by her judges, that a passage in it, "conscious as we are of our shortcomings," suggested too great humility, he proposed the emendation "conscious as we are of one another's shortcomings"; and on another occasion he defined a jurist as "a person who knows a little about the laws of every country except his own." Of Lord Bowen in the Court of Appeal Lord Davey wrote (*Law Quarterly*, July 1894), "It is upon his work there that his judicial reputation will rest. Law to Bowen was not a mere collection of rules, but was the embodiment of the conscience of the nation. . . . Lord Bowen will be remembered amongst the great judges who steered the ship in the transition from the old system to the new. . . . There will be found in the series of judgments delivered by him a luminous interpretation of legal principles as applied to the facts and business of life, expressed in language worthy even of his literary reputation." Among good examples of his judgment, Lord Davey proceeded to cite that given in advising the House of Lords in *Angus* v. *Dalton* (6 App. Cas. 740), and those delivered in *Abrath* v. *North-Eastern Railway* (11 Q.B.D. 440); *Thomas* v. *Quartermaine* (18 Q.B.D. 685); *Vagliano* v. *Bank of England* (23 Q.B.D. 243) (in which he prepared the majority judgment of the Court, which was held to be wrong in its conclusion by the majority of the House of Lords); and the *Mogul Steamship Company* v. *M'Gregor* (23 Q.B.D. 598). Of Lord Bowen's literary works besides those already indicated may be mentioned his translation of Virgil's *Eclogues*, and *Æneid*, books i.-vi., his article on the "Administration of the Law," contributed to *The Reign of Queen Victoria*, edited by Mr Humphry Ward, and his pamphlet *The Alabama Claim and Arbitration considered from a Legal Point of View*. Lord Bowen married in 1862 Emily Frances, eldest daughter of Mr James Meadows Rendel, F.R.S. (and sister of Mr Stuart Rendel, afterwards raised to the peerage as Baron Rendel), by whom he had issue, William Edward, a clergyman, born 1862, who succeeded to Hollymount; Maxwell Steele, born 1865; and Ethel Kate, born November 1870.

See also *Lord Bowen*, by Sir Henry Stewart Cunningham.

(E. A. Ar.)

Bowles, Samuel (1826-1878), American journalist, was born in Springfield, Massachusetts, 9th February 1826. He was the son of Samuel Bowles, an editor of the same city, who had established the weekly *Springfield Republican* in 1824. The daily *Republican* was begun in

1844, as an evening newspaper, afterwards becoming a morning journal. To its service Samuel Bowles, junior, devoted his life (with the exception of a brief period during which he was in charge of a daily in Boston), and gave it a national reputation by the vigour, incisiveness, and independence of its editorial utterances, and the concise and convenient arrangement of its local and general news-matter. During the controversies affecting slavery and resulting in the Civil war, Bowles supported, in general, the Whig and Republican parties, but in the period of reconstruction under President Grant his paper represented anti-administration or "Liberal Republican" opinions, while in the disputed election of 1876 it favoured the claims of Tilden, and has since been independent of all party control. He died at Springfield on 16th January 1878. During his lifetime, and subsequently, the *Republican* office became a sort of school for young journalists, especially in the matter of pungency and conciseness of style, one of his maxims being "put it all in the first paragraph." Bowles wrote several ephemeral books of travel in the western part of the United States, but his best work was in the columns of his newspaper. A eulogistic *Life and Times of Samuel Bowles* (2 vols., 1885), by George S. Merriam, is virtually a history of American political movements after the compromise of 1850.

Bowling Green, capital of Warren county, Kentucky, U.S.A., situated on Barren river, at the head of navigation, in the southern part of the state, at an altitude of 468 feet, and on the Louisville and Nashville railway. Population (1880), 5114; (1900), 8226.

Bowling Green, a town of Ohio, U.S.A., capital of Wood county, in the north-western part of the state, 20 miles S. of Toledo, at the intersection of lines of the Cincinnati, Hamilton, and Dayton, and the Toledo and Ohio Central railways. It is in an oil and natural gas region. Population (1890), 3467; (1900), 5067.

Bowls.—Since 1880 there has been a remarkable revival of interest in the game of Bowls in every part of the globe where English-speaking communities are found. In Scotland, so far from passing out of fashion, Bowls, along with its winter analogue of curling, may still be considered the national game, and it is estimated that there are no fewer than 700 Bowling clubs in the country. In Glasgow and the immediate neighbourhood there are some thirty clubs, most of which possess two greens. The Queen's Park and Titwood Clubs, however, have each three greens, and as they can quite comfortably play six rinks on each, it is common to see 144 players making their game simultaneously. In Edinburgh and Leith there are at least thirty clubs, and every town of any consequence boasts one green at all events. But it is in London, where it is difficult to obtain suitable pitches, that the revival in Bowls has been most conspicuous. The day when the pastime was looked upon as a mere "pothouse recreation" has gone for ever, for even in those cases where the greens are still in connexion with the public-houses whose names the clubs bear, they are now rented by the clubs for their own use exclusively. Within the metropolitan area the number of clubs exceeds forty, the majority of them having been founded since 1885. Following the lead of Edinburgh, Glasgow, and other Scottish corporations, the London County Council have laid down greens (as the annexed table shows) in several of the public parks under their control, and have it in contemplation to construct others at Sydenham Wells Park, Brockwell Park, and elsewhere.

With regard to the British colonies a similar tale of progress and popularity has to be recorded. In Australia and New Zealand nearly every little town or village has its Bowling-green, and in Melbourne and Sydney—including in both instances the surrounding districts—there are almost as many greens as there are in Glasgow. In Canada the game is being taken up rapidly, although the Dominion is yet a long way behind the Australian Commonwealth in this respect. There is a green in Cape Town, in Port Elizabeth, in Kimberley, and in a few other towns in South Africa. Calcutta and Hong Kong each possesses a green, and there is one in Kumamoto in Japan. The universality of the game in Greater Britain affords interesting evidence of the fact that the pastime is (within the modern period at any rate) distinctly Scottish, for Caledonian colonists, wherever they settle, give early attention to the constructing of a Bowling-green. This circumstance makes it strange that in the United States the number of clubs is still somewhat limited.

Place.	When Opened.	Size in Yards.	Cost.	Daily No. of Games Played (Average).	Greatest No. of Players at One Time.
Battersea Park	1895	48½ × 34	The actual cost in these cases is not known, as part of the labour was performed by the Council's ordinary staff; but it varied probably from £50 to £90	12	28
Clissold Park	1897	30 × 30		25	32
Dulwich Park	1899	30 × 30		Very irregularly used	
Finsbury Park	1900	36 × 36		35	46
Ravenscourt Park	1901	40 × 30	£98 (est.)		
The Island Gardens, Poplar	1901	40 × 30	£105 (est.)		
Victoria Park	1901	36 × 36	£91 (est.)		

There are two kinds of green—one the *crown*, and the other the *level*. The former is confined almost entirely to Lancashire and Yorkshire and one or two more of the North of England counties. This is the type of green on which most of the gate-money contests take place, the prizes having encouraged a good many players to take up the game professionally. The fall from the "crown" of the green to the ditch may be as much as 18 inches, and the ordinary biassed bowls are practically useless on such a pitch. The game upon such a green is of a very sporting character, but its associations must preclude it from ever becoming general. It is the game on the perfectly flat or level green that constitutes the historical game of Bowls, as may be amply proved not only by the hundreds of admirably-kept club greens in Scotland, but also by the fine private greens in connexion with so many of the famous mansions of England, and the beautiful sheets of turf belonging to several of the colleges of Oxford and Cambridge. Subject to the rule as to a *minimum* jack (25 yards, according to the Laws of the Scottish Bowling Association, adopted on 24th April 1893), there is no prescribed size for the green; but 42 yards square would form an ideal green. The Queen's Park Club of Glasgow have one green of about 47 yards square, big enough, that is, to accommodate seven rinks. A really under-sized green is a poor pitch, because it commonly involves playing diagonally instead of up and down—the orthodox direction. The construction of a green scientifically is a heavy undertaking, which only wealthier clubs can face. The ground for the whole of its extent must be excavated to a depth of two feet or so, well drained, and layers of different materials (gravel, cinders, mould, silver sand) laid down before the final covering of turf. Seaside

turf is the best of all. It wears longest, and keeps its "spring" to the last. At one time the clubs in Glasgow and Ayrshire obtained turf from the coast near Ayr or Irvine, but after the shore had been stripped of the most suitable grass, clubs of later date went as far as Islay and the Solway to procure good sea-turf. Much of the latter is under water every tide. It answers its purpose excellently in Glasgow, but possibly does best in some such "soft" climate as the West of Scotland too consistently offers. Turf like this is not generally obtainable, and becomes so costly an item in the contractor's tender that poorer clubs have to be satisfied with much commoner and more ordinary turf. The mere difference in turf, however, measures the difference between a Glasgow green and a London one, or, in other words, between a game of skill and a game largely of luck.

It is the rougher green in many parts of London and the South of England that has necessitated a modification of the Scottish practice of play, which otherwise would unquestionably govern every club in the world. In Scotland the custom is to play rinks of four a-side—the players being called leader, second player, third player, and driver or skip—which gives rise on a fine green to a beautiful display of keen and accurate Bowling. On the inferior greens of the majority of London clubs, though such a system would be quite possible—and is often adopted in friendly games—it cannot be said that the play would be either scientific or satisfactory. In these cases, accordingly, the rule is to play rinks of only two a-side in matches. On the other hand, in the Colonies, where the greens closely approximate the quality of the Scottish greens, the Scottish practice is almost invariably followed.

In theory the game of Bowls is simplicity itself, the aim of the player being to deliver his ball from the "footer" or mat with sufficient strength and bias to cause it to rest nearer to the jack than his opponent's bowl. But in practice there is plenty of scope for skill. The leader's business is to "be up." There is no excuse for short play on the part of the first players; their bowls would be far better in the ditch. It is their plain duty to be on the jack, the ideal position being a bowl at rest immediately behind the tee. It is customary for the skip, or driver, to direct his men from the end that is being played to, and they must do precisely as they are bidden. The player who disobeys orders, whatever his individual merits, will be of little use in a team. The skip, having carefully noted the lie of the different bowls, then takes his place at the footer, and acts according to the position of the "wood" around the jack. It may be that he has to throw away his bowl, or to draw a shot with the utmost nicety, or even to "fire." Judgment and nerve are all-in-all in a skip. When the foe are lying massed around the jack, and the draws are all blocked, it is sometimes the wisest plan for the skip to "fire"—that is, to deliver his bowl almost dead straight, and with enough force to kill the bias for the moment—and scatter his enemies. Ignorant onlookers or irritated players may describe this as "skittles," but there are situations in which it is absolutely the correct thing to do; and the skip who has the pluck to do it deserves to be commended for his indifference to sneers and his desire to win the end.

In a general way the Bowling season runs from May-day till the end of September or the middle of October. When the season is closed the green should be carefully examined. Weeds must be uprooted, worn patches re-turfed, and if the whole can then be laid under a winter blanket of silver sand, by the following spring this will all have been absorbed and the elasticity of the pitch restored. During the season the ground-man will of course be on duty constantly, and in most clubs it is the rule to appoint a "green rota" of members, who undertake a superintendence of the green week by week, and who have, amongst other matters, occasionally to decide whether or not, having regard to the state of the weather, play should be allowed.

Bowls has now been provided with a code of laws as full and as far-reaching as the laws which govern cricket. The rules and regulations of the Scottish Bowling Association, so far at any rate as principles are concerned, have been cordially accepted. In certain details, as has already been indicated, modifications have been introduced which do not, however, imperil the cardinal features of the game. The dimensions of a rink are laid down, the maximum circumference of the bowl is fixed at $16\frac{1}{2}$ inches, and unbiassed bowls are forbidden. A game consists of any number of ends or points agreed upon, or for a specified length of time. In clubs following the Scottish code, 25 ends, or heads, a rink is the ordinary practice; but most of the London and many English provincial clubs prefer 21 points a rink for match play, championships, and handicaps. There are obvious objections to playing matches by time, and this is consequently seldom adopted. In Scotland a full rink consists of four men a-side, each playing two bowls, but in a "pairs" game (two against two) each player uses four bowls. Thus the same aggregate number of bowls (8) is employed in both games. But, as we have said, many London clubs, for good and sufficient reasons in their case, play only two men a-side in matches, and in "friendlies" it is rare indeed to see players use four bowls each on English greens. Probably most difference of opinion has arisen over what constitutes a *minimum* and *maximum* jack. In the Scottish rules the former is fixed at 25 yards, but several English clubs prefer a shorter distance. The latter is usually fixed at six feet from the ditch, but the Scottish rules seem to be singularly lax on the subject, for they declare that "when thrown less than two yards from the ditch it should be *moved out* to that distance," and if it run to the side "it shall be *moved out* and placed in a straight line between the pins numbering the rinks." This handling of the jack by any person but the thrower is, in the view of the South London Association of Bowling Clubs, itself an illegal act, and neither logical nor sportsmanlike, and it is difficult to reject this contention. It is of interest, in this connexion, to note that the Australian Bowlers who visited the United Kingdom in 1901 considered that the practice of bowling to jacks of uniform length was far too common on British greens and did not make for the best possible game. Another question upon which doctors differ is as to the condition of the jack after it has been driven into the ditch. Unless it has been forced clean out of bounds, such a jack is still alive, according to Scottish rules. On nearly all English greens it is a dead jack, and the end "no end." English practice here seems preferable. Nor has the Scottish doctrine of "touchers" proved generally acceptable south of the Cheviots. A bowl which, during its original course, touches the jack, is called a toucher, and counts in the game even should it run into the ditch, or be driven in by another bowl. For the purpose of this and other laws, the Scottish Association holds that the ditch within the limits of the rink is part of the green so far as the jack and touchers are concerned. It is a comparatively easy feat for early players in a rink to touch the jack, and no special reward seems called for by this exhibition of commonplace dexterity. Moreover, the ditch seems to be the ditch and not the green. The last law in the Scottish code might be universally adopted and rigidly enforced. "Persons not engaged in the game," it runs, "must confine themselves to the banks and preserve an attitude of strict

neutrality." On most London greens this rule is more honoured in the breach than in the observance.

All clubs look to the Scottish Bowling Association, the headquarters of which are in Glasgow, as the leading legislative authority. Other important bodies are the London and Southern Counties Bowling Association, the South London Association of Bowling Clubs, and the Imperial Bowling Association, besides numerous county associations, which are nearly all affiliated to one or other of the main bodies. The first-named body was founded in October 1895 at the instigation of Mr Ernest C. Price, the then president of the Brownswood Bowling Club of Finsbury, an enthusiast who thought the time had come for codifying and fixing the laws which should govern the game, at least in the South of England, and already most of the strongest and most representative Southern clubs have joined the Association. Another body which aimed at drawing up common rules for match play was the South London Association of Bowling Clubs, started in 1898 on the suggestion of Mr Joseph Hay, captain of the Temple Bowling Club of Camberwell. The chief question with which this association was confronted was the important point whether or not the Scottish rules should be adopted *en bloc*. It was felt that, in view of the comparatively rough condition of many of the South London greens and the small dimensions of some of them, it was not possible to accept several of the Scottish details of play, and accordingly a separate body was needed to legislate for these special circumstances. Under the rules of this Association, therefore, matches with affiliated clubs are played in rinks of two a-side, 21 points up. The Imperial Association was founded in 1899 with the twofold object, first, of promoting intercolonial matches and tournaments, home and away, and secondly, of codifying the laws of the game, which should be binding on the players in all such matches and tournaments, and which, the hope was cherished, might also become recognized by every club in the British empire and elsewhere as the final laws of Bowls. The earl of Jersey, who had been governor-general of New South Wales from 1890 to 1893, and was himself an expert player, accepted the post of president, and lent the Association efficient support. Laws, mainly based

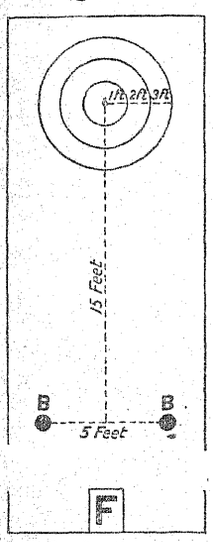


Fig. 1.—Drawing.

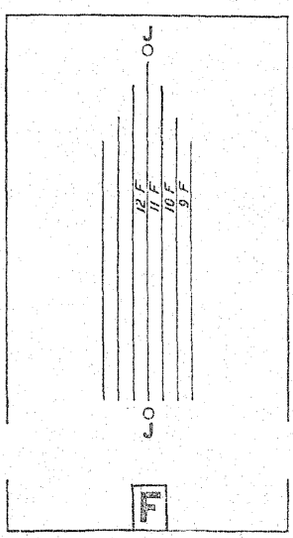


Fig. 2.—Guarding.

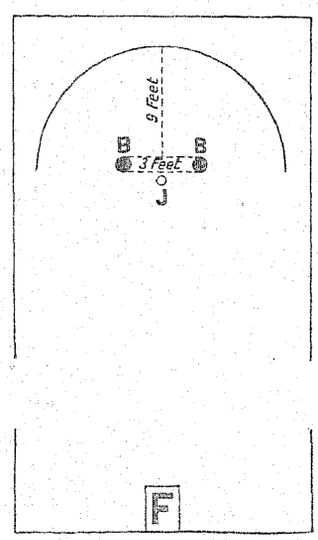


Fig. 3.—Trailing.

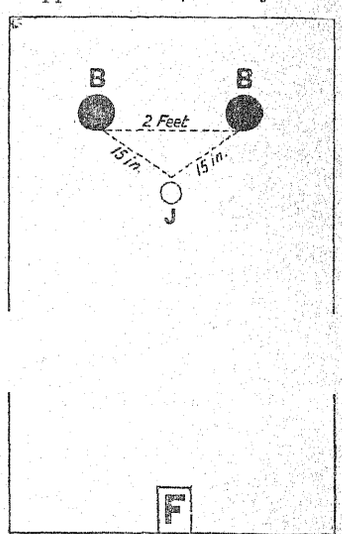


Fig. 4.—Driving.

(In every case F is the Footer, B, the Bowl, J, the Jack.)

upon the Scottish code, were drawn up and submitted to the leading colonial clubs. But the principal difficulty was a practical one, namely, the means of defraying the expenses of visiting teams. Fortunately for the game, gate-money contests have never come into vogue, and consequently funds from this source were not available. Though the question had to be left unsettled, and mainly to be dealt with by the respective clubs, there appeared to be no substantial reason against holding periodically matches of an exceptionally interesting character, in which the best talent of the Colonies and the Mother Country should be pitted against each other. The visit of Bowlers from the States of Australia and New Zealand in 1901, already alluded to, was one outcome of the energies of the Imperial Bowling Association. On broader grounds, the visit was nothing short of a landmark in the history of the game.

On Scottish greens the game of Points is occasionally played, but it is rarely seen on English greens. Its main object seems to be to perfect the proficiency of players in certain departments of Bowls proper. There are four sections in the game, namely, drawing, guarding, trailing, and driving. In *drawing* (Fig. 1), the object is to draw as near as possible to the jack, the player's bowl passing outside of two other bowls placed five feet apart in a horizontal line fifteen feet from the tee, without touching either of them. Three points are scored if the bowl come to rest within one foot of the jack, two points if within two feet, and one point if within three feet. Circles of these radii are usually marked around the jack for convenience' sake. In *guarding* (Fig. 2), two jacks are laid at the far end of the green twelve feet apart in a vertical line. A thread is then pinned down between them, and on each side of this thread three others are pinned down parallel with it and six inches apart from each other. A bowl that comes to rest on the central line, or within six inches of it, counts three points, a bowl twelve inches away two points, and a bowl eighteen inches off one point. In *trailing* (Fig. 3), two bowls are laid on the turf three feet apart, and straight lines are chalked from bowl to bowl across their back and front faces, and a jack is then deposited equidistant from each bowl and immediately before the front line. A semicircle is then drawn behind the bowls with a radius of nine feet from the jack. Three points are given to the bowl that trails the jack over both lines into the semicircle and goes over them itself. If a bowl trail the jack over both lines, but only itself cross the first; or if it pass both lines, but the jack cross only the first, two points are awarded. A bowl passing between the jack and either of the stationary bowls, and passing over the back line; or touching the jack, yet not trailing it past the first line, but itself crossing the back line; or trailing the jack over the front line without crossing it itself, receives one point. In no case must the stationary bowls be touched, or the semicircle crossed by the trailed jack or played bowls. In *driving* (Fig. 4), two bowls are laid down two feet apart, and then a jack is placed in front of them, fifteen inches apart from each, and occupying the position of the apex of an inverted pyramid. The player who drives the jack into the ditch between the two bowls scores three. If he moves the jack, but does not carry it through to the ditch, he scores two. If he pass between the jack and either bowl he scores one, although it is not easy to see what driving he has done. The played bowl must itself run into the ditch without touching either of the stationary bowls. It is obvious that the Points game demands an ideally perfect green.

See W. M. Mitchell. *Manual of Bowl-playing.* Glasgow, 1880. —H. J. Dingley. *Touchers and Rubs.* Glasgow, Thomas Taylor, 1893.—*The Field.* 31st March, 28th July, 15th December 1900; 23rd March, 22nd June 1901 (vols. xcv., xcvi., and xcvii.); and the Laws of the Game as adopted by the Scottish Bowling Association 1893, and also the Code drafted by the Imperial Bowling Association, and published in 1901. (J. A. M.)

Boyaca, a department of the Republic of Colombia, bounded on the N. by the department of Santander and Venezuela, on the S. by Cundinamarca, and on the W. by Cundinamarca, Santander, and Antioquia. Area, 33,300 square miles; population, 508,000. The capital, Tunja, has 6000 inhabitants, and amongst other towns are Chiquinquira, Santa Rosa, Sogamoso, Moreno.

Bozrah, (1) in Edom, now *el-Buseireh*, south-east of the Dead Sea, in the broken country on the west side of the Edomite plateau. (2) In the *Mishor*, or "plain country" of Moab, perhaps Kesûr el-Besheir. Whether *Bostra*, the *Bosora* of 1 Macc. v. 26, now Busrá, in the Haurán south of Damascus, was originally called Bozrah is uncertain. From its position it may be inferred that it was a place of importance at a very early period.

Brabant, North, the northern half of the former duchy of that name (the southern portion of which belongs to Belgium), and the largest province of the Netherlands. The south-eastern part of the province differs in every respect from the north-western, being higher (on the frontier, 85-100 feet), on diluvial sand (with occasional clay and loam in the sub-soil and on the banks of the smaller rivers), covered with heath and fens (the *peel*) and waste grounds (25 per cent. of the province), growing only potatoes, rye, and buck-wheat, and inhabited by a scanty, poor population of Roman Catholics. The north-western portion, on the other hand, consists of flat alluvial land (3-16 feet in altitude), has more and larger rivers (the Maas, Dieze, Mark, and Donge) and towns ('S Bosch, Breda, &c.), more fertile land, growing wheat and beetroot, a denser and Protestant population, and holds commercial communication by river and railway with the provinces of Holland, Zeeland, and Gelderland. Area, 1980 square miles; population (1899), 553,845.

Brabant, South, a central province of Belgium, bordering on the provinces of Antwerp, Limbourg, Liége, Namur, Hainaut, and E. Flanders. It is formed of the southern part of the ancient duchy, which extended to the Lower Meuse north of Bois-le-Duc. In the time of the first kingdom of the Netherlands (1815-30), Northern Brabant was distinguished from Southern Brabant, and separated from it by the province of Antwerp. The surface presents plateaux of more than 300 ft. high (as much as 443 ft. at Waterloo) and ramifications of hills. The soil is generally fertile. The province has important paving- and building-stone quarries, numerous breweries and distilleries, beetroot-sugar refineries, and paper-mills. It is divided into the three administrative arrondissements of Brussels, Louvain, and Nivelles, and covers 1268 square miles; population (1899), 1,281,000 (or 1010·2 per square mile), against 959,800 in 1875. The arrondissement of Brussels alone has a population of 871,000, or 2035·7 to the square mile.

Brachiopoda.—Since the publication of the ninth edition of this Encyclopædia, though much has been written on Brachiopoda, little real advance has been made in our knowledge of the affinities and embryology of the group. On the other hand, our knowledge of the histology and structure of the adult has been materially increased by the researches of van Bemmelen (*Jena Zeitschr.* xvi. 1883), followed by Shipley (*Mt. Stat. Neapel.* iv. 1883), Schulgin (*Zeitschr. wiss. Zool.* xli. 1885), Joubin (*Arch. Zool. exp.* (2) iv. 1886), culminating in the exhaustive papers of Blochmann (*Untersuchungen über den Bau der Brachiopoden*, Th. i., 1892; Th. ii., 1900), which unfortunately at present deal only with *Crania*, *Discinisca*, and *Lingula*. Numerous dredging operations have added to what is known of the distribution and, to some extent, of the habits of the Brachiopoda. In particular François (*Arch. Zool. exp.* (2) ix. 1891) has given a good description of the mode of life of *Lingula*. The works on fossil Brachiopods which have appeared within the period named amount to hundreds, and are far too numerous to mention. American naturalists have been particularly active, and their labours have resulted in the system of classification given below. Beecher (*Amer. Jour. Sci.* Ser. 3, xli. and xliv.) suggested the four orders amongst which in 1893 Schuchert (*Amer. Geol.* xi. and xiii.; *Bull. U.S. Geol. Survey*, No. 87, 1897) arranged all the known genera of Brachiopods. The latest views on the classification are expressed in the latter author's work published in 1897. An excellent summary of this side of the question is presented in Wood's *Palæontology*, and on a more extensive scale in the article "Brachiopoda" by Schuchert in the English edition of von Zittel's *Palæontology*.

Cœlomic Spaces.—With regard to morphology, the chief points in which Davidson's account of the group (see *Ency. Brit.* vol. iv.) has received amplification are the nature of the several cavities in the body and in the arms, the structure of the vascular system and of the nervous system, and the histology of the various tissues. The spaces in the body of a Brachiopod are cœlomic in nature. The cœlom, the walls of which give rise to the reproductive cells and the cavity of which opens to the exterior through the nephridia, is a spacious chamber surrounding the alimentary canal, and is continued dorsally and ventrally into the sinuses of the mantle (Fig. 1). Some of the endothelial cells lining the cœlom are ciliated, the cilia keeping the fluid contents in movement. Others of the endothelial cells show a great tendency to form muscle fibres. Besides this main cœlomic cavity there are certain other spaces which Blochmann regards as cœlomic, but it must be remembered that his interpretation rests largely on histological grounds, and at present embryological confirmation is wanting. These

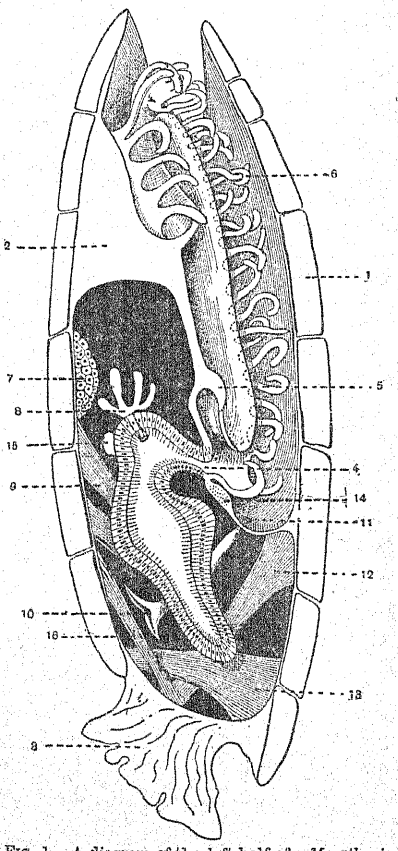


Fig. 1.—A diagram of the left half of a *Megathyris* (*Argiope*), which has been bisected in the median plane. 1, the ventral valve; 2, the dorsal valve; 3, the pedicle; 4, the mouth; 5, lip which overhangs the mouth and runs all round the lophophor; 6, tentacles; 7, ovary in dorsal valve; 8, liver diverticula; 9, occlusor muscle—its double origin is shown; 10, internal opening of left nephridium; 11, external opening of the same; 12, ventral adjustor; 13, divaricator muscle; 14, sub-œsophageal nerve ganglion; 15, the heart; 16, dorsal adjustor muscle.

spaces are as follows:—(i.) the great arm-sinus; (ii.) the small arm-sinus together with the central-sinus and the peri-œsophageal sinus, and in *Discinisca* and *Lingula*, and, to a less extent, in *Crania*, the lip-sinus; (iii.) certain portions of the general body cavity which in *Crania* are separated off and contain muscles, &c.; (iv.) the cavity of the stalk when such exists. The great arm-sinus of each side of the lophophor lies beneath the fold or lip which together with the tentacles forms the ciliated groove in which the mouth opens. These sinuses are completely shut off from all other cavities, they do not open into the main cœlomic space nor into the small arm-sinus, nor does the right sinus communicate with the left. The small arm-sinus runs along the arms of the lophophor at the base of the tentacles, and gives off a blind diverticulum into each of these. This diverticulum contains the blood-vessel and muscle-fibres (Fig. 2). In the region of the mouth where the two halves of the small arm-sinus approach one another they open into a central sinus lying beneath the œsophagus and partly walled in by the two halves of the ventral mesentery. This sinus is continued round the œsophagus as the peri-œsophageal sinus, and thus the whole complex of the small arm-sinus has the relations of the so-called vascular system of a Sipunculid. In *Crania* it is completely shut off from the main cœlom, but in *Lingula* it communicates freely with this cavity. In *Discinisca* and *Lingula* there is further a lip-sinus or hollow system of channels which traverses the supporting tissue of the edge of the mantle and contains muscle-fibres. It opens into the peri-œsophageal sinus. It is better developed and more spacious in *Lingula* than in *Discinisca*. In *Crania*, where only indications of the lip-sinus occur, there are two other closed spaces. The posterior occlusor muscles lie in a special closed space which Blochmann also regards as cœlomic. The posterior end of the intestine is similarly surrounded by a closed cœlomic space known as the peri-anal sinus in which the rectum lies freely, unsupported by mesenteries. All these spaces contain a similar coagulable fluid with sparse corpuscles, and all are lined by ciliated cells. There is further a great tendency for the endothelial cells to form muscles, and this is especially pronounced in the small arm-sinus, where a conspicuous muscle is built up. The mantle-sinuses which form the chief spaces in the mantle are diverticula of the main cœlomic cavity. In *Discinisca* they are provided with a muscular valve placed at their point of origin. They contain the same fluid as the general cœlom. The stalk is an extension of the ventral body-wall, and contains a portion of the cœlom which, in *Discinisca* and *Lingula*, remains in communication with the general body-cavity.

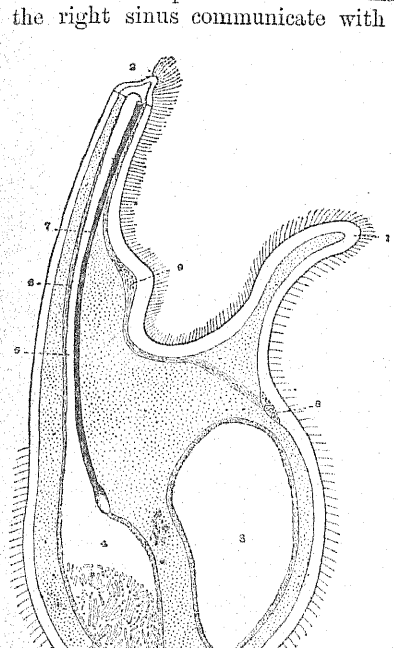


FIG. 2.—Diagrammatic section through an arm of the lophophor of *Crania*. Magnified; after Blochmann. 1, the lip; 2, the base of a tentacle bisected in the middle line; 3, great arm-sinus; 4, small arm-sinus, containing muscle-fibres; 5, tentacular canal; 6, external tentacular muscle; 7, tentacular blood-vessel arising from the cut arm-vessel in the small arm-sinus; 8, chief arm-nerve; 9, secondary arm-nerve; 10, under arm-nerve.

Circulatory System.—The structures mentioned in the article BRACHIOPODA of the ninth edition as pseudo-hearts have been shown by Huxley to be nephridia; the true heart was described and figured by Hancock, but has in many cases escaped the observation of later zoologists. Blochmann in 1884, however, observed this organ in the living animal in species of the following genera:—*Terebratulina*, *Magellania* (*Waldheimia*), *Rhynchonella*, *Megathyris* (*Argiope*), *Lingula*, and *Crania* (Fig. 1). It consists of a definite contractile sac or sacs lying on the dorsal side of the alimentary canal near the œsophagus, and in preparations of *Terebratulina* made by quickly removing the viscera and examining them in sea-water under a microscope, he was able to count the pulsations, which followed one another at intervals of 30-40 seconds.

A vessel—the dorsal vessel—runs forward from the heart along the dorsal surface of the œsophagus. This vessel is nothing but a split between the right and left folds of the mesentery, and its cavity is thus a remnant of the blastocœl. A similar primitive arrangement is thought by Blochmann to obtain in the genital arteries. Anteriorly the dorsal vessel splits into a right and a left half, which enter the small arm-sinus and, running along it, give off a blind branch to each tentacle (Fig. 1). The right and left halves are connected ventrally to the œsophagus by a short vessel which supplies these tentacles in the immediate neighbourhood of the mouth. There is thus a vascular ring around the œsophagus. The heart gives off posteriorly a second median vessel which divides almost at once into a right and a left half, each of which again divides into two vessels which run to the dorsal and ventral mantles respectively. The dorsal branch sends a blind twig into each of the diverticula of the dorsal mantle-sinus, the ventral branch supplies the nephridia and neighbouring parts before reaching the ventral lobe of the mantle. Both dorsal and ventral branches supply the generative organs.

The blood is a coagulable fluid. Whether it contains corpuscles is not yet determined, but if so they must be few in number. It is a remarkable fact that in *Discinisca*, although the vessels to the lophophor are arranged as in other Brachiopods, no trace of a heart or of the posterior vessels has as yet been discovered.

The *nervous system* of Brachiopods has, as a rule, maintained its primitive connexion with the external epithelium. In a few places it has sunk into the connective-tissue supporting-layer beneath the ectoderm, but the chief centres still remain in the ectoderm, and the fibrils forming the nerves are for the most part at the base of the ectodermal cells. Above the œsophagus is a thin commissure which passes laterally into the chief arm-nerve. This latter includes in its course numerous ganglion cells, and forms, according to Blochmann, the immensely long drawn out supra-œsophageal ganglion. The chief arm-nerve traverses the lophophor, being situated between the great arm-sinus and the base of the lip (Figs. 2 and 3); it gives off a branch to each tentacle, and these all anastomose at the base of the tentacles with the second nerve of the arm, the so-called secondary arm-nerve. Like the chief arm-nerve, this strand runs through the lophophor, parallel indeed with the former except near the middle line, where it passes ventrally to the œsophagus. The lophophor is supplied by yet a third nerve, the under arm-nerve, which is less clearly defined than the others, and resembles a moderate aggregation of the nerve fibrils, which seem everywhere to underlie the ectoderm, and which in a few cases are gathered up into

nerves. The under arm-nerve, which lies between the small arm-sinus and the surface, supplies nerves to the muscles of both arm-sinuses (Figs. 2 and 3). Medianly, it has its origin in the sub-œsophageal ganglion, which, like the supra-œsophageal, is drawn out laterally, though not to the same extent. In the middle line the sub-œsophageal nerve mass is small; the ganglion is in fact drawn out into two halves placed on either side of the body. From each of these sub-œsophageal ganglia numerous nerves arise. Passing from the middle line outwards they are—(i.) the median pallial nerve to the middle of the dorsal mantle; (ii.) numerous small nerves—the circum-œsophageal commissures—which pass round the œsophagus to the chief arm-nerve or supra-œsophageal ganglion; (iii.) the under arm-nerve to the lophophor and its muscles; (iv.) the lateral pallial nerve to the sides of the dorsal mantle. Laterally, the sub-œsophageal ganglia give off (v.) nerves to the ventral mantle, and finally they supply (vi.) branches to the various muscles. There is a special marginal nerve running round the edge of the mantle, but the connexion of this with the rest of the nervous system is not clear; probably it is merely another concentration of the diffused sub-ectodermal nervous fibrils.

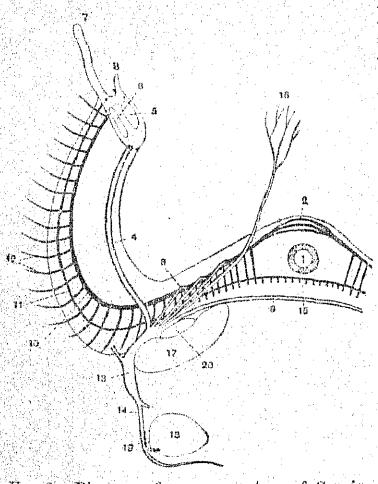


Fig. 3.—Diagram of nervous system of *Crania*; from the dorsal side. The nerves running to the dorsal parts are white, with black edges; those running to the ventral parts are solid black. Magnified; after Blochmann. 1, œsophagus; 2, supra-œsophageal commissure; 3, circum-œsophageal commissures; 4, under arm-nerve; 5, great arm-sinus; 6, small arm-sinus; 7, tentacle; 8, lip of lophophor; 9, infra-œsophageal commissure; 10, chief arm-nerve; 11, secondary arm-nerve; 12, nerves to tentacles; 13, sub-œsophageal ganglion; 14, dorsal lateral nerve; 15, sub-œsophageal portion of the secondary arm-nerve; 16, median pallial nerve of dorsal lobe of mantle; 17, anterior occlusor muscle; 18, posterior occlusor muscle; 19, obliquus superior muscle; 20, levator brachii muscle.

The above account applies more particularly to *Crania*, but in the main it is applicable to the other Inarticulata which have been investigated. In *Discinisca* and *Lingula*, however, the sub-œsophageal ganglion is not drawn out, but lies medianly; it gives off two posteriorly-directed nerves to the stalk, which in *Lingula* unite and form a substantial nerve. Sense organs are unknown in the adult.

The *histology* of Brachiopods presents some peculiar and many primitive features. As a rule the cells are minute, and this has especially stood in the way of embryological research. The plexus of nerve-fibrils which underlie the ectoderm and are in places gathered up into nerves, and the great development of connective tissue, are worthy of notice. Much of the latter takes the form of hyaline supporting tissue, embedded in which are scattered cells and fibres. The lophophor and stalk are largely composed of this tissue. The ectodermal cells are large, ciliated, and amongst the ciliated cells glandular cells are scattered. The chitinous chætæ have their origin in special ecto-dermal pits, at the base of which is one large cell which is thought to secrete the chæta, as in Chætopods. These pits are not isolated, but are connected by an ectodermal ridge, which grows in at the margin of the mantle and forms a continuous band somewhat resembling the ecto-dermal primordium of vertebrate teeth.

In spite of some assertions to the contrary, all the Brachiopods which have been carefully investigated have been found to be male or female. Hermaphrodite forms are unknown.

Embryology.—Little real advance has been made in our knowledge of the embryology of the Brachiopoda within recent years. Kovalevsky's researches (*Izv. Obshch. Moskov.* xiv. 1874) on *Argiope* (*Megathyris*) are still the most complete as regards the earlier stages. Segmentation is complete, a gastrula is formed, the blastopore closes, the archenteron gives off two cœlomic sacs which, as far as is known, are unaffected by the superficial segmentation of the body that divides the larva into three segments. The walls of these sacs give rise at an early stage to muscles which enable the parts of the larva to move actively on one another (Fig. 4, B). About this stage the larvæ leave the brood-pouch, which is a lateral or median cavity in the body of the female, and lead a free swimming life in the ocean. The anterior segment broadens and becomes umbrella-shaped; it has a powerful row of cilia round the rim and smaller cilia on the general surface. By the aid of these cilia the larva swims actively, but owing to its minute size it covers very little distance, and this probably accounts for the fact that where Brachiopods occur there are, as a rule, a good many in one spot. The head bears four eye-spots, and it is continually testing the ground (Fig. 4, A, C). The second segment grows downwards like a skirt surrounding the third segment, which is destined to form the stalk. It bears at its rim four bundles of very pronounced chætæ. After a certain time the larva fixes itself by its stalk to some stone or rock, and the skirt-like second segment turns forward over the head and forms the mantle. What goes on within the mantle is unknown, but presumably the head is absorbed. The chætæ drop off, and the lophophor is believed to arise from thickenings which appear in the dorsal mantle lobe. Recently the Plankton Expedition has brought back, and Simroth (*Ergeb. Plankton Expedition*, ii. 1897) has described, a few larval Brachiopods of undetermined genera, two of which at least were pelagic, or at any rate taken far from the coast. These larvæ, which resemble those described by Fritz Müller (*Arch. Naturg.* 1861-62), have their mantle turned over their head and the larval shell well developed. No stalk has been seen by Simroth or Fritz Müller, but in other respects the larva resembles the stages in the development

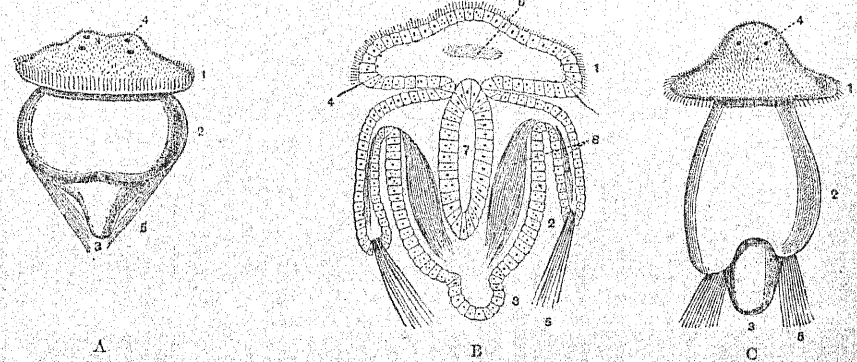


Fig. 4.—Three larvæ stages of *Megathyris* (*Argiope*). A, larva which has just left brood-pouch; B, longitudinal section through a somewhat later stage; C, the fully-formed embryo just before fixing—the neo-embryo of Beecher. Highly magnified. 1, anterior segment; 2, second or mantle-forming segment; 3, third or stalk-forming segment; 4, eye-spots; 5, setæ; 6, nerve mass (?); 7, alimentary canal; 8, muscles.

of *Megathyris* and *Terebratulina* which immediately precede fixation. The cirri or tentacles, of which three or four pairs are present, are capable of being protruded, and the minute larva swims by means of the ciliary action they produce. It can retract the tentacles, shut its shell, and sink to the bottom.

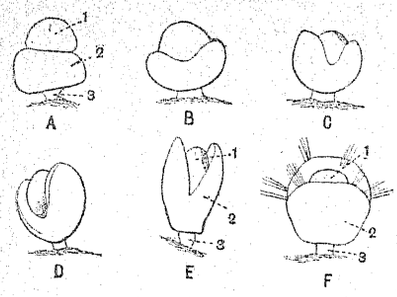


FIG. 5.—Stages in the fixing and metamorphosis of *Terebratulina*. Highly magnified; from Morse. A, larva (neo-embryo) just come to rest; B, C, D, stages showing the turning forward of the second or mantle segment; E, completion of this; F, young Brachiopod. 1, 2, 3, the first, second, and third segments.

Beecher (*Amer. Jour. Sci., loc. cit.*) has classified with appropriate names the various stages through which Brachiopod larvæ pass. The last stage, that in which the folds of the second segment are already reflected over the first, he calls the Typembryo. Either before or just after turning, the mantle develops a larval shell termed the protegulum, and when this is completed the larva is termed the Phylembryo. By this time the eyes have disappeared, the four bundles of chætæ have dropped off, and the lophophor has begun to appear as an outgrowth of the dorsal mantle-lobe. The protegulum has been found in members of almost all the families of Brachiopod, and it is thought to occur throughout the group. It resembles the shell of the Cambrian genus *Paterina*, and the Phylembryo is frequently referred to as the *Paterina* stage. In some orders the Phylembryo is succeeded by an *Obolella* stage with a nearly circular outline, but this is not universal. The larva now assumes specific characters and is practically adult.

Classification.—Beecher's division of the Brachiopoda into four orders is based largely on the character of the aperture through which the stalk or pedicle leaves the shell. To appreciate his diagnoses it is necessary to understand certain terms, which unfortunately are not used in the same sense by all authors. The triangular pedicle-opening seen in *Orthis*, &c., has been named by Hall and Clarke the delthyrium. In some less primitive genera, *e.g.*, *Terebratula*, that type of opening is found in the young stages only; later it becomes partly closed by two plates which grow out from the sides of the delthyrium. These plates are secreted by the ventral lobe of the mantle, and were named by von Buch in 1834 the "deltidium." The form of the deltidium varies in different genera. The two plates may meet in the middle line, and leave only a small oval opening near the centre for the pedicle, as in *Rhynchonella*; or they may meet only near the base of the delthyrium forming the lower boundary of the circular pedicle-opening, as in *Terebratula*; or the right plate may remain quite distinct from the left plate, as in *Terebratella*. The pro-deltidium, a term introduced by Hall and Clarke, signifies a small embryonic plate originating on the dorsal side of the body. It subsequently becomes attached to the ventral valve, and develops into the pseudo-deltidium, in the Neotremata and the Protremata. The pseudo-deltidium (so named by Brown in 1862) is a single plate which grows from the apex of the delthyrium downwards, and may completely close the aperture. The pseudo-deltidium is sometimes reabsorbed in the adult. In the Telotremata neither pro-deltidium nor pseudo-deltidium is known. In the Atremata the pro-deltidium does not become fixed to the ventral valve, and does not develop into a pseudo-deltidium. The American use of the term deltidium for the structure which Europeans call the pseudo-deltidium makes for confusion. The development of the brachial supports has been studied by Friele, Fischer, and Oehlert. A summary of the results is given by Beecher (*Trans. Connect. Acad.* ix., 1893).

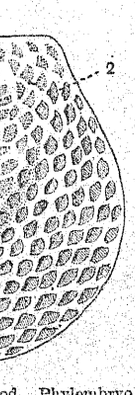


FIG. 6.—Shell of larval Brachiopod. Phylembryo stage. × 90; from Simroth. 1, protegulum; 2, permanent shell.

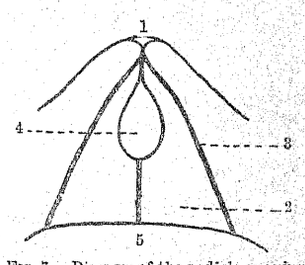


FIG. 7.—Diagram of the pedicle-opening of *Rhynchonella*. Magnified. 1, umbo of ventral valve; 2, deltidium; 3, margin of delthyrium; 4, pedicle-opening; 5, dorsal valve.

The orders Atremata and Neotremata are frequently grouped together, as the sub-class Inarticulata or Ecardines—the Tretenterata of Davidson—and the orders Protremata and Telotremata, as the Articulata or Testicardines—the Clistenterata of Davidson. The following scheme of classification is based on Beecher's and Schuchert's. Most of the families mentioned are described by Davidson. Recent families are printed in italic type.

ORDER I. Atremata (Beecher).—Inarticulate Brachiopoda, with the pedicle passing out between the umbones, the opening being shared by both valves. Pro-deltidium attached to dorsal valve. FAMILIES.—PATERINIDÆ, OBOLIDÆ, TRIMERELLIDÆ, LINGULELLIDÆ, *LINGULIDÆ*, LIGULASMATIDÆ.

ORDER II. Neotremata (Beecher).—More or less circular, cone-shaped inarticulate Brachiopoda. The pedicle passes out at right angles to the plane of junction of the valves of the shell; the opening is confined to the ventral valve, and may take the form of a slit, or may be closed by the development of a special plate called the listrium, or by a pseudo-deltidium. Pro-deltidium attached to ventral valve. FAMILIES.—ACROTRETIDÆ, SIPHONOTRETIDÆ, TREMATIDÆ, *DISCINIDÆ*, *CRANIIDÆ*.

ORDER III. Protremata (Beecher).—Articulate Brachiopoda, with pedicle-opening restricted to ventral valve, and either open at the hinge line or more or less completely closed by a pseudo-deltidium, which may disappear in adult. The pro-deltidium originating on the dorsal surface later becomes anchylosed with the ventral valve. FAMILIES.—KUTORGINIDÆ, EICHWALDIIDÆ, BILLINGSELLIDÆ, STROPHOMENIDÆ, *THECIDIIDÆ*, PRODUCTIDÆ, RICHTHOFENIDÆ, ORTHIDÆ, CLITAMBONITIDÆ, SYNTROPHIIDÆ, PORAMBONITIDÆ, PENTAMERIDÆ.

ORDER IV. Telotremata (Beecher).—Articulate Brachiopoda, with the pedicle-opening, confined in later life to the ventral valve, and placed at the umbo or beneath it. Deltidium present, but no pro-deltidium. Lophophor supported by calcareous loops, &c. FAMILIES.—PROTORHYNCHIDÆ, *RHYNCHONELLIDÆ*, CENTRONELLIDÆ, *TEREBRATULIDÆ*, STRINGOCEPHALIDÆ, MEGALANTERIDÆ, *TEREBRATELLIDÆ*, ATRYPIDÆ, SPIRIFERIDÆ, ATHYRIDÆ.

Affinities.—Little light has been thrown on the affinities of the Brachiopoda by recent research, though speculation has not been wanting. Brachiopods have been at various times placed with the Mollusca, the Chætopoda, the Chætognatha, the Phoronidea, the Polyzoa, the Hemichordata, and the Urochordata. None of these alliances have borne close scrutiny. The suggestion to place Brachiopods with the Polyzoa, *Phoronis*, *Rhabdopleura*, and *Cephalodiscus* in the Phylum Podaxonia made in volume xix. of the ninth edition (pp. 440-41) has not met with acceptance, and until we have a fuller account of the embryology of some one form, preferably an Inarticulate, it is wiser to regard the group as a very isolated one.

It may, however, be pointed out that Brachiopods seem to belong to that class of animal which commences life as a larva with three segments, and that tri-segmented larvæ have been found now in several of the larger groups.

Distribution.—Brachiopods first appear in the Lower Cambrian, and reached their highest development in the Silurian, from which upwards of 2000 species are known, and were nearly as numerous in the Devonian period; at present they are represented by some 140 recent species. The following have been found in the British area, as defined by Norman, *Terebratulina caput-serpentis* L., *Terebratula* (*Gwynia*) *capsula* Jeff., *Magellania* (*Macandrevia*) *cranium* Müll., *M. septigera* Lovén, *Terebratella spitzbergenensis* Dav., *Megathyris decollata* Chemn., *Cistella cistellula* S. Wood, *Cryptopora gnomon* Jeff., *Rhynchonella* (*Hemithyris*) *psittacea* Gmel., *Crania anomala* Müll., and *Discinisca atlantica* King.

Undue stress is often laid on the fact that *Lingula* has come down to us apparently unchanged since Cambrian times, whilst *Crania*, and forms very closely resembling *Discina* and *Rhynchonella*, are found from the Ordovician strata onwards. The former statement is, however, true of animals from other classes at least as highly organized as Brachiopods, *e.g.*, the Gasteropod *Capulus*, whilst most of the invertebrate classes were represented in the Ordovician by forms which do not differ from their existing representatives in any important respect.

A full bibliography of Brachiopoda (recent and fossil) is to be found in Davidson's Monograph of British Fossil Brachiopods, *Pal. Soc. Mon.* vi. 1886. The Monograph on Recent Brachiopoda, by the same author, *Tr. Linn. Soc. London*, Zool. Ser. ii.-iv. 1886-1888, must on no account be omitted. (A. E. S.)

Braddock, a borough of Allegheny county, Pennsylvania, U.S.A., situated in south-western Pennsylvania, on the Monongahela river, 10 miles S.E. of Pittsburg, at an altitude of 828 feet. It is entered by the Baltimore and Ohio, the Pennsylvania, and the Pittsburg and Lake Erie railways. It is the site of extensive ironworks. Population (1880), 3310; (1890), 8561; (1900), 15,654.

Braddon, Mary Elizabeth (1837-——), English novelist, daughter of Henry Braddon, solicitor, of Skirdon Lodge, Cornwall, and sister of Sir Edward Braddon, prime minister of Tasmania, was born in Soho, in 1837. She began at an early age to contribute to periodicals, and in 1861 produced her first novel, *The Trail of the Serpent*. In the same year appeared *Garibaldi*, accompanied by *Olivia*, and other poems, chiefly narrative, a volume of extremely spirited verse, deserving more notice than it has received. In 1862 her reputation as a novelist was made by a favourable review in the *Times* of *Lady Audley's Secret*. *Aurora Floyd*, a novel with a strong affinity to *Madame Bovary*, followed, and achieved equal success. Its immediate successors, *Eleanor's Victory*, *John Marchmont's Legacy*, *Henry Dunbar*, remain with her former works the best known of her novels, but all her numerous works have found a large and appreciative public. They give, indeed, the great body of readers of fiction exactly what they require; melodramatic in plot and character, conventional in their views of life, they are yet distinguished by constructive skill and opulence of invention. Her popularity in the British colonies is especially extensive. For a considerable time Miss Braddon conducted *Belgravia*, in which several of her novels appeared. In 1874 she married the late Mr John Maxwell, publisher.

Bradford, a municipal, county, and parliamentary borough and city of the West Riding of Yorkshire, England, on an affluent of the Aire, 9 miles W. by S. of Leeds, 192 miles by rail N.N.W. of London. It has a station on seven railways, and communicates by water with the Mersey and the Humber. It has adopted almost every public act conducive to its improvement. The old town has been re-modelled. A new central electric light station, just finished, is the completest of its kind. Additional waterworks, tapping the river Nidd 40 miles distant, are in process of construction. There are seven public parks. Recreation grounds, besides, cover 30 acres; and 670 acres of moorland, near the city, have been acquired as an additional recreation ground. Educational establishments include a girls' grammar school (1875), a technical college (1881), acquired by the municipality in 1899, and the United Independent College (1888). Amongst recent institutions are a conditioning-house (1891), for which a new building has been constructed (1900); the post office (1886); the children's hospital (1890); a home for incurables (1893); and a boys' orphanage. The trade of Bradford, according to an official estimate, advanced between 1836 and 1884 from a total of five to at least thirty-five millions sterling, and from not more than five or six to at least fifty leading staple articles. The exports to the United States alone in 1895 amounted to the value of £5,549,000; owing to the McKinley tariffs, the exports in 1899 figure at £1,810,770. This decline is, however, much more than compensated by enhanced trade in the home market. The largest foreign customer for the worsted yarns is Germany, which imports ten times as much as Russia, the next greatest importer. The annual turn-over in the staple trade of Bradford, according to a recent estimate, is not less than £100,000,000. The Saltaire works for alpaca and mohair goods employ about 2500 hands, while silk works at Manningham cover 20 acres and employ 4500 to 5000 people. Furniture-making is a business in rapid growth. In 1891, 13,837 males and 21,670 females were engaged in the worsted; 5040 males and 2954 females in the woollen; 1491 males and 2187 females in the silk; 1135 males and 1096 females in the cotton; and 2380 persons in the iron manufactures. There are three daily newspapers. In 1885 the parliamentary borough was made co-extensive with the municipal and divided into three districts, each of them to return one member to parliament; in 1888 the municipal borough was constituted a county borough, and in 1897 it was created a city; in 1899, whilst the parliamentary borough remained as before, the municipal, county, and city boundaries were extended so as to include the township of Idle. Area of municipal and county borough and city, before extension, and of present parliamentary borough, 10,791 acres; population (1881), 194,495; (1891), 216,361. Extended area of municipal and county borough and city, 22,720 acres. Population (1891), 265,728; (1901), 279,809.

Bradford, a city of M'Kean county, Pennsylvania, U.S.A., situated in the northern part of the state, at an altitude of 1427 feet. It is in the petroleum region, and its industries consist mainly in the production and refining of mineral oil. It is entered by four railways. Population (1880), 9197; (1890), 10,514; (1900), 15,029.

Bradford-on-Avon, a market town in the Westbury parliamentary division of Wiltshire, England, on the rivers Avon and Kennet, the Avon canal, 6 miles S.E. of Bath, and the Great Western railway. There is still standing a small church, built about 705, and described by Freeman as "the only perfect surviving church of its kind in England, if not in Europe." At the summit of the hill on which the town stands is an ancient chapel, and on one of the central piers of the bridge a small chapel, much modernized, used in ancient times for mass. The parish church—Norman, Early English, and Perpendicular—has been restored, and contains interesting monu-

ments and brasses. There is another Anglican church, and Baptist, Congregational, and Wesleyan chapels. Kingston House, built in the beginning of the 17th century, was long a seat of the dukes of Kingston. There are a town hall, free school (founded 1712), temperance hall, technical institute (containing the county day school), and public baths. Water-works have been constructed. Woollen manufactures, for which Bradford was long famous, have declined, and the principal industries now are the manufacture of india-rubber goods, iron-founding, brewing, and quarrying. Area of urban district, 1962 acres; population (1881), 4922; (1901), 4514.

Bradlaugh, Charles (1833-1891), English politician and freethinker, was born at Hoxton, London, on 26th September 1833. After enlisting as a soldier, he found employment as a lawyer's clerk, and by and by became widely known as a freethought lecturer, under the title of "Iconoclast." He also conducted the *National Reformer* for several years. His Radicalism in religion and politics commended him to the electors of Northampton, by whom he was returned to parliament in 1880. He claimed to be allowed to affirm under the Parliamentary Oaths Act, and the rejection of this pretension, and the refusal to allow Mr Bradlaugh to take the oath on his professing his willingness to do so, involved the House in a series of most unedifying conflicts, terminating in the victory of Mr Bradlaugh, who was permitted to take the oath in 1886. The law was altered two years subsequently. Bradlaugh did not, like so many successful agitators, sink into obscurity upon being deprived of the immediate cause of his notoriety, but gained a very general respect by his transparent honesty and courageous contempt for mere popularity. Experience of public life in the House of Commons seemed to give him a more balanced view of things; and before he died, on 30th January 1891, it was beginning to be said of him that he was in a fair way to grow into something almost akin to a Conservative. Hard, arrogant, and dogmatic, he yet possessed many sterling qualities; his great defect was a lack of imagination.

Bradley, George Granville (1821-1903), dean of Westminster, was born 11th December 1821, being the son of the Rev. Charles Bradley, vicar of Glasbury, Brecon. He was educated at Rugby under Dr Arnold, and at University College, Oxford, of which he became a fellow in 1844. He was an assistant master at Rugby from 1846 to 1858, when he succeeded Dr Cotton as headmaster at Marlborough. He occupied this post with great success until December 1870, when he was elected master of his old college at Oxford. In August 1881 he was made dean of Westminster in succession to Dean Stanley, whose pupil and intimate friend he had been. He published his recollections of Dean Stanley, originally delivered in the form of lectures, in 1883; and afterwards took up the biography of Stanley left unfinished by the death of Mr Theodore Walrond, which was ultimately completed by Mr R. E. Prothero. His other publications include *Aids to Latin Prose*, and *Lectures on Job and Ecclesiastes*. One of his daughters, Mrs Margaret Louisa Woods, wife of the ex-president of Trinity College, Oxford, has achieved distinction as a poetess and novelist.

Bradshaw, Henry (1831-1886), librarian of the University of Cambridge, was born on 2nd February 1831, and educated at Eton. He became a fellow of King's College, Cambridge, then a close foundation for Etonians, and was largely instrumental in throwing it open to others. After a short scholastic career in Ireland, and some preliminary work in the Cambridge University Library, he was appointed to this institution as an extra assistant, and soon showed an unexampled faculty for investigations respecting rare books and curious MSS. In addition to his achievements in black-letter bibliography he threw great light on the life and works of Chaucer, and on ancient Celtic language and literature. Unfortunately he allowed his attention to be too much distracted among a multiplicity of subjects, and the strain upon him was increased by his election in 1867 to the post of university librarian, to which indeed no one else had equal pretensions, but which overwhelmed him with routine duties. He thus left little behind him except a number of brilliant isolated discoveries in bibliography and early literature, besides the fame of having given a marvellous impulse to the former pursuit and impressed it with a more scientific character than had previously belonged to it. As a man he was much respected and beloved. He died very suddenly on 10th February 1886. (R. G.)

Braga, a city and archiepiscopal see of Portugal, in respect of population the third city of the kingdom, capital of the district of Braga, 3 miles S. of the river Cávado. Mount Sameiro is crowned by a colossal monument of the Virgin of the Conception. Population, 28,089. The district of BRAGA, with an area of 1057 sq. miles and population 338,308, giving 320 inhabitants to the sq. mile, is one of the best cultivated regions of Portugal. The principal production is wine, the yield for 1898 having been 7,589,063 gallons, valued at £351,333. Cattle-breeding is an important industry, as also is dairy-farming. The other chief industries are the manufacture of hats, cutlery, linen, and woollens.

Bragança, a city and episcopal see of Portugal, formerly capital of the province of Traz-os-Montes, and now capital of the district of the same name, is situated near the north-east corner of the kingdom. Population, 5840. The district of BRAGANÇA has an area of 2574 sq. miles, and a population of 179,678, giving 70 inhabitants to the sq. mile. Large tracts are uncultivated, and the roads are defective. Silkworms are bred, the annual produce of cocoons amounting to 48,400 lb.

Bragg, Braxton (1817-1876), American soldier, was born in Warren county, North Carolina, on 22nd March 1817. He graduated with high rank at the United States military academy in 1837, and as an artillery officer gained renown during the Mexican war at Fort Brown, Monterey, and Buena Vista. He resigned from the regular army on 3rd January 1856, with the rank of brevet lieutenant-colonel, and retired to his plantation in Louisiana. When in 1861 the Civil War began, he joined the Southern side as brigadier-general, and was sent to command at Pensacola, Florida. In February 1862 he went, as major-general, to the Mississippi army, took part at Shiloh, and was promoted to general on the death of General Albert S. Johnston. In August of that year he led a formidable force into Kentucky, but was checked by Buell, and forced to retreat after the battle of Perryville on 8th October. He was worsted by General Rosecrans in the stubborn contest of Murfreesboro (31st December 1862-2nd January 1863); he defeated Rosecrans at Chickamauga on 19th and 20th September 1863, but was routed by Grant at Chattanooga on 23rd-25th November. Relieved from western command and called to Richmond, he acted there for a time as military adviser to President Davis. In the autumn of 1864 he unsuccessfully led an inferior force from North Carolina to Georgia to oppose Sherman's march. After the war he became chief engineer to the state of Alabama, and supervised improvements in Mobile harbour. He died in Galveston, Texas, on 27th September 1876.

Brahmaputra River, The, rises in 30° 30′

N. lat. and 82° E. long. under the watershed of the Mariam La (15,500 feet), which separates its sources from the eastern affluents of the Mansarowar lake (the sources of the Sutlej), at least 100 miles south-east of those of the Indus. It flows in a south-easterly direction for 170 miles, and then adheres closely to a nearly easterly course for 500 miles more, being at the end of that distance in 29° 10′ N. lat. It then bends north-east for 150 miles before finally shaping itself southwards towards the plains of Assam. Roughly speaking, the river may be said so far to run parallel to the main chain of the Himalaya at a distance of 100 miles therefrom. Its early beginnings are cradled amidst a mighty mass of glaciers which entomb the northern slopes of the watershed, separating them from the sources of the Gogra on the south; and there is evidence that two of its great southern tributaries, the Shorta Tsanpo (which joins about 150 miles from its source), and the Nyang Chu (the river of Shigatsi and Gyantsi), are both of them also of glacial origin. From the north it receives five great tributaries, namely, the Chu Nago, the Chachu Tsanpo, and the Charta Tsanpo (all within the first 200 miles of its course), and the Raka Tsanpo and Ky-i-chu (or river of Lhasa) below. The Chachu and the Charta are large clear streams, evidently draining from the great central lake district. Both of them measure more than 100 yards in width at the point of junction, and they are clearly non-glacial. The Raka Tsanpo is a lateral affluent, flowing for 200 miles parallel to the main river course and some 20 to 30 miles north of it, draining the southern slopes of a high snowy range. It is an important feature as affording foothold for the "Janglam" (the great high road of Southern Tibet connecting Ladak with China), which is denied by the actual valley of the Brahmaputra. The great river itself is known in Tibet by many names, being generally called the Nari Chu, Maghang Tsanpo, or Taro Tsanpo, above Lhasa; the word "tsanpo" meaning (according to Waddell) the "pure one," and applying to all great rivers. At 50 miles from its source the river and the Janglam route touch each other, and from that point past Tadum (the first important place on its banks) for another 130 miles, the road follows more or less closely the left bank of the river. Then it diverges northwards into the lateral valley of the Raka, until the Raka joins the Brahmaputra below Janglache. The upper reaches are nowhere fordable between Tadum and Lhasa, but there is a ferry at Likche (opposite Tadum on the southern bank), where wooden boats covered with hide effect the necessary connexion between the two banks and ensure the passage of the Nipal trade. From Janglache (13,800 feet) to Shigatsi the river is navigable, the channel being open and wide and the course straight. This is probably the most elevated system of navigation in the world. From Shigatsi, which stands near the mouth of the Nyang Chu, to the Ky-i-chu, or Lhasa river, there is no direct route, the river being unnavigable below Shigatsi. The "Janglam" takes a circuitous course southwards to Gyantsi and the Tamdok Cho before dropping again over the Khambala pass to the ferry at Khamba barje near Chushul. Thence the valley of the Ky-i-chu (itself navigable for small boats for about 30 miles) leads to Lhasa northwards. At Chushul there is an iron chain-and-rope suspension bridge over the deepest part of the river, but it does not completely span the river, and it is too insecure for use. The remains of a similar bridge exist at Janglache; but there are no wooden or twig suspension bridges over the Tsanpo. At Tadum the river is about one half as wide again as the Ganges at Hardwar in December, *i.e.*, about 250 to 300 yards. At Shigatsi it flows in a wide extended bed with many channels, but contracts again at Chushul, where it is no wider than it is at Janglache, *i.e.*, from 600 to 700 yards. At Chushul (below the Ky-i-chu) the discharge of the river is computed to be about 35,000 cubic feet per second, or seven times that of the Ganges at Hardwar.

For about 250 miles below Ky-i-chu to a point about 20 miles below the great southerly bend (in 94° E. long.) the course of the Brahmaputra has been traced by native surveyors. Then it is lost amidst the jungle-covered hills of the wild Mishmi and Abor tribes to the east of Bhutan for another 100 miles, until it is again found as the Dihong emerging into the plains of Assam. About the intervening reaches of the river very little is known except that it drops through 7000 feet of altitude, and that in one place, at least, there exist some very remarkable falls. These are placed in 29° 40′ N. lat., between Kongbu and Pema-Koi. Here the river runs in a narrow precipitous defile along which no path is practicable. The falls can only be approached from below, where a monastery has been erected, the resort of countless pilgrims. Their height is estimated at 70 feet, and by Tibetan report the hills around are enveloped in perpetual mist, and the Sangdong (the "lion's face"), over which the waters rush, is demon-haunted and full of mystic import. From the north-eastern extremity of Assam where, near Sadya, the Lohit, the Dibong, and the Dihong unite to form the wide placid Brahmaputra of the plains—one of the grandest rivers of the world—its south-westerly course to the Bay of Bengal is sufficiently well known. It still retains the proud distinction of being unbridged, and still the River Flotilla Company appoints its steamers at regular intervals to visit all the chief ports on its banks as far as Dibrugarh. Here, however, a new feature has been introduced in the local railway, which extends for some 80 miles to Sadya, with a branch to the Buri Dihing river at the foot of the Patkoi range. The Patkoi border the plains of Upper Assam to the south-east, and across these hills lies the most reasonable probability of railway extension to Burma.

The following are the "lowest level" discharges of the principal affluents of the Brahmaputra in Upper Assam, estimated in cubic feet per second:—

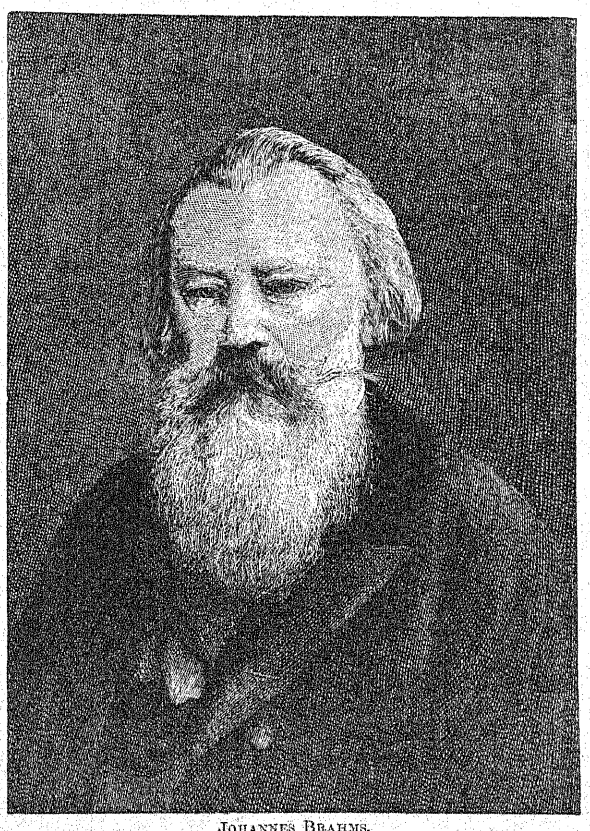
Lohit river, 9 miles above Sadya . . .	38,800
Dibong, 1 mile above junction with Dihong .	27,200
Dihong ,, ,, Dibong .	55,400
Subansiri	16,900

The basins of the Dibong and Subansiri are as yet very imperfectly known. That of the Lohit has been fairly well explored. Near Goalpara the discharge of the river in January 1828 was computed to be 140,000 cubic feet, or nearly double that of the Ganges. The length of the river is 700 miles to the Dihong junction, and about 1000 in Tibet and Eastern Bhutan, above the Dihong. The Brahmaputra, therefore exceeds the Ganges in length by about 400 miles. The bed of the great river maintains a fairly constant position between its extreme banks, but the channels within that bed are so constantly shifting as to require close supervision on the part of the navigation authorities; so much detritus is carried down as to form a perpetually changing series of obstructions to steamer traffic.

An enormous development of agricultural resources has taken place within the Brahmaputra basin of late years, chiefly in the direction of tea cultivation, as well as in the production of jute and silk. Gold is found in the sands of all its upper tributaries, and coal and petroleum are amongst the chief mineral products which have been brought into economic prominence.

See Reports of the native explorers of the Indian Survey, edited by MONTGOMERY and HARMAN. (T. H. H.*)

Brahms, Johannes (1833-1897), German composer, was born in Hamburg on 7th May 1833. He was the son of a double-bass player in the Hamburg city theatre, and received his first musical instruction from his father. After some lessons from a certain O. Cossel, he betook himself to Cossel's master, Eduard Marxsen of Altona, whose experience and artistic taste directed the young man's genius into the highest paths. A couple of public appearances as a pianist were hardly an interruption to the course of his musical studies, and these were continued nearly up to the time when Brahms accepted an engagement as accompanist to a once-famous Hungarian violinist, Remenyi, for a concert-tour in 1853. At Göttingen there occurred a famous *contretemps* which had a most important though indirect influence on the whole after-life of the young player. A piano on which he was to play the "Kreutzer" sonata of Beethoven with Remenyi turned out to be a semitone below the required pitch; and Brahms played the part by heart, transposing it from A to B flat, in such a way that the great violinist, Joachim, who was present and discerned what the feat implied, introduced himself to Brahms, and laid the foundation of a life-long friendship. Joachim gave him introductions to Liszt at Weimar and to Schumann at Düsseldorf; the former hailed him for a time as a member of the advanced party in music, on the strength of his E flat minor scherzo, but the misapprehension was not of long continuance. The introduction to Schumann impelled that master, now drawing near the tragic close of his career, to write the famous article "Neue Bahnen," in which the young Brahms was proclaimed to be the great composer of the future, "he who was to come." The critical insight in Schumann's article is all the more surprising when it is remembered how small was the list of Brahms's works at the time. A string quartet, the first pianoforte sonata, the scherzo already mentioned, and the earliest group of songs, containing the dramatic "Liebestreu," are the works which drew forth the warm commendations of Schumann. In December 1853 Brahms gave a concert at Leipzig, as a result of which the firms of Breitkopf and Haertel and of Senff undertook to publish his compositions. In 1854 he was given the post of choir-director and music-master to the prince of Lippe-Detmold, but resigned it after a few years, going first to Hamburg, and then to Zürich, where he enjoyed the friendship and artistic counsel of Theodor Kirchner. The unfavourable verdict of the Leipzig Gewandhaus audience upon his pianoforte concerto in D minor op. 15, and several remarkably successful appearances in Vienna, where he was appointed director of the Singakademie in 1863, were the most important external events of Brahms's life, but again he gave up the conductorship after a few months of valuable work, and for about three years had no fixed place of abode. Concert tours with Joachim or Stockhausen were undertaken, and it was not until 1867 that he returned to Vienna, or till 1872 that he chose it definitely as his home, his longest departure from the Austrian capital being between 1874 and 1878, when he lived near Heidelberg. From 1871 to 1874 he conducted the concerts of the "Gesellschaft der Musikfreunde," but after the latter date he occupied no official position of any kind. With the exception of journeys to Italy in the spring, or to Switzerland in the summer, he rarely left Vienna. He refused to come to England to take the honorary degree of Mus.D. offered by the University of Cambridge; the University of Breslau made him Ph.D. in 1881; in 1886 he was created a knight of the Prussian order *Pour le mérite*, and in 1889 was presented with the freedom of his native city. He died in Vienna on the 3rd of April 1897.



JOHANNES BRAHMS.
(From a photograph by C. Brasch, Berlin.)

The works of Brahms may be summarized as follows:—Various *sacred compositions for chorus*, op. 12, 13, 22, 27, 29, 30, 37, leading up to op. 45, the "German Requiem" first performed at Bremen in 1868, and subsequently completed by a soprano solo with chorus; the "Triumphlied" in commemoration of the German victories of 1870-71; and some choral songs and motets, op. 74, 109, and 110. *Secular choral works*, op. 17, 41, 42, 44, 50 ("Rinaldo" for tenor solo and male choir), 53 ("Rhapsodie," alto solo and male choir), 54 ("Schicksalslied"), 62, 82 (Schiller's Nänie), 89, "Gesang der Parzen") 93, 104, 113. *Concerted vocal works*, op. 20, 28, 31, 52 ("Liebeslieder-Walzer") 61, 64, 65 ("Neue Liebeslieder"), 75, 92, 103, 112. *Solo songs*, nearly 300. *Orchestral works:* four symphonies, op. 68, 73, 90, and 98; two serenades, op. 11 and 16; two pianoforte concertos, op. 15 and 83, one violin concerto, op. 77; concerto for violin and violoncello, op. 102; variations on a theme by Haydn, op. 56; two overtures, "Academische Festouvertüre," op. 80, and "Tragic Overture," op. 81. *Chamber music:* two sextets, op. 18 and 36; quintet, piano and strings, op. 34, strings, op. 88 and 111, clarinet and strings, op. 115; three string quartets, op. 51 and 67, three quartets for piano and strings, op. 25, 26, and 60. Three trios for piano and strings, op. 8, 87, and 101; trio for piano, violin, and horn, op. 40; piano, clarinet, and violoncello, op. 114. Duet sonatas, three for piano and violin, op. 78, 100, and 108; two for piano and violoncello, op. 38 and 99; two for piano and clarinet, op. 120. *Pianoforte solos;* three sonatas, op. 1, 2, and 5; scherzo, op. 4; variations, op. 9, 21, 23, 24, 35; 4 ballads, op. 10; waltzes, op. 39; two rhapsodies, op. 79; caprices and intermezzi, op. 76, 116, 117, 118, and 119. 5 *studies* and 51 *Uebungen* without opus-number, and a *chorale-prelude and fugue* for organ, besides

four books of *Hungarian Dances* arranged for pianoforte duet.

Brahms has been often called the last of the great classical masters, in a sense wider than that of his place in the long line of the great composers of Germany. Though only the most superficial observers could deny him the possession of the qualities which distinguish the masters of the romantic school, such as warm imagination, originality of thought and expression, deep emotional tenderness, and the like, it is as a classicist that he must be ranked among modern musicians. From the beginning of his career until its close, his ideas were clothed by preference in the forms which had sufficed for Beethoven, and the instances in which he departed from structural precedent are so rare that they might be disregarded, were they not of such high value that they must be considered as the signs of a logical development of musical form, not as indicating a spirit of rebellion against existing modes of structure. His practice, more frequent in later than in earlier life, of welding together the "working-out" and the "recapitulation" sections of his movements in a closer union than any of his predecessors had attempted, is an innovation which cannot fail to have important results in the future; and if the skill of younger writers is not adequate to such a display of ingenuity as occurs in the finale of the fourth symphony, where the "passacaglia" form has been used with an effect that is almost bewildering to the ordinary listener, that at least stands as a monument of inventiveness finely subordinated to the emotional and intellectual purport of the thoughts expressed. If Brahms's music is not appreciated by every one on a first hearing, this, if it be a defect, is one in which it has been anticipated by the work of every great master since music was a conscious and definite art. His themes are always noble, and even from the point of view of emotional appeal their deep intensity of expression is of a kind which grows upon all who have once been awakened to their beauty, or have been at the pains to grasp the composer's characteristics of utterance. His vocal music, whether for one voice or many, is remarkable for its fidelity to natural inflexion and accentuation of the words, and for its perfect reflexion of the poet's mood. His songs, vocal quartets, and choral works abound in passages that prove him a master of effects of sound; and throughout his chamber music, in his treatment of the piano, of the strings, or of the solo wind instruments he employs, there are numberless examples which sufficiently show the irrelevance of a charge sometimes brought against his music, that it is deficient in a sense of what is called "tone-colour." It is perfectly true that the mere acoustic effect of a passage was of far less importance to him than its inherent beauty, poetic import, or logical fitness in a definite scheme of development; and that often in his orchestral music the casual hearer receives an impression of complexity rather than of clearness, and is apt to imagine that the "thickness" of instrumentation is the result of clumsiness or carelessness. Such instances as the introduction to the finale of the first symphony, the close of the first movement of the second, what may be called the epilogue of the third, or the whole of the variations on a theme of Haydn, are not only marvels of delicate workmanship in regard to structure, but are instinct with the sense of the peculiar beauty and characteristics of each instrument. The "Academic Festival" overture proves Brahms a master of musical humour, in his treatment of the student songs which serve as its themes; and the companion piece, the "Tragic" overture, reaches a height of sublimity which is in no way lessened because no particular tragedy has ever been named in conjunction with the work.

As with all creative artists of supreme rank, the work of Brahms took a considerable time before it was very generally appreciated, but the number of his admirers has been constantly increasing, and nowhere has his music found a warmer welcome than in England. The change in public opinion is strikingly illustrated in regard to the songs, which, once voted ineffective and unvocal, have now taken a place in every eminent singer's repertory. In the other branches of music in which he worked, the structure of the composition is of such enormous importance that its appreciation by the general mass of musical amateurs is of necessity slow. The outline in his greater works must be grasped with some definiteness before the separate ideas can be properly understood in their true relation to each other; and while it is his wonderful power of handling the recognized classical forms, so as to make them seem absolutely new, which stamps him as the greatest musical architect since Beethoven, the necessity for realizing in some degree what musical form signifies has undoubtedly been a bar to the rapid acceptance of his greater works by the uneducated lovers of music. These are of course far more easily moved by effects of colour than by the subtler beauties of organic structure, and Brahms's attitude towards tone-colour was scarcely such as would endear him to the large number of musicians in whose view tone-colour is pre-eminent. His mastery of form, again, has been attacked as formalism by certain superficial critics, blind to the real inspiration and distinction of his ideas, and to their perfection in regard to style and the appropriateness of every theme to the exact emotional state to be expressed. In his larger vocal works there are some which treat of emotional conditions far removed from the usual stock of subjects taken by the average composer; to compare the ideas in the "German Requiem" with those of the "Schicksalslied" or "Nänie" is to learn a lesson in artistic style which can never be forgotten. In the songs, too, it is scarcely too much to say that the whole range of human emotion finds expression in noble lyrics that yield to none in actual musical beauty. The four "Ernste Gesänge," Brahms's last composition, must be considered as his supreme achievement in dignified utterance of noble thoughts in a style that perfectly fits them. The choice of words for these as well as for the "Requiem" and others of his serious works reveals a strong sense of the vanity and emptiness of human life, but at least as strong a confidence in the divine consolations.

It is the misfortune of the musical world in Germany that every prominent musician is ranged by critics and amateurs in one of two hostile camps, and it is probably due in the main to the misrepresentations of the followers of Wagner that the idea is so generally held that Brahms was a man of narrow sympathies and hard, not to say brutal manners. The latter impression was fostered, no doubt, by the master's natural detestation of the methods by which the average lionizer seeks to gain his object, and both alike are disproved in the *Recollections* of J. V. Widmann, an intimate friend for many years, which throw a new light on the master, revealing him as a man of the widest artistic sympathies, neither intolerant of excellence in a line opposed to his own, nor weakly enthusiastic over mediocre productions by composers whose views were in complete sympathy with him. His admiration for Verdi and Wagner is enough to show that the absence of any operatic work from his list of compositions was simply due to the difficulty of finding a libretto which appealed to him, not to any antagonism to the lyric stage in its modern developments. How far he stood from the prejudices of the typical pedant may be seen in the passionate love he showed throughout his life for national

music, especially that of Hungary. Not only were his arrangements of Hungarian dances the first work by which his name was known outside his native land, but his first pianoforte quartet, op. 25 in G minor, incurred the wrath of the critics of the time by its introduction of some characteristics of Hungarian music into the finale. His arrangement of a number of children's traditional songs was published without his name, and dedicated to the children of Robert and Clara Schumann in the earliest years of his creative life; and among the last of his publications was a collection of forty-nine German Volkslieder, arranged with the utmost skill, taste, and simplicity. His well-known admiration for the waltzes of Strauss is referred to in all the biographies, and in many passages of his works the *entrain* that is characteristic of the Viennese dance-writers is present in a striking degree. Within so short a time of the completion of his work, it is impossible to determine the exact place in the hierarchy of music which Brahms will ultimately fill; but the more closely his music is studied, the more strongly will the conviction grow that the last in the illustrious line of German composers is to be ranked with the greatest of all. (J. A. F. M.)

Braidwood, a city of Will county, Illinois, U.S.A., situated in the eastern part of the state, 58 miles S. of Chicago, on the Chicago and Alton railway. Its principal industry is the mining of coal. Population (1880), 5524; (1890), 4641; (1900), 3279.

Braila, a town in Rumania, on the left bank of the Danube, about 10 miles S. of Galatz, 100 miles from Sulina on the Black Sea, and 145 miles from Bucarest. As the grain trade of the Danube has been gradually usurped by Braila, so has the town grown and been improved. The main streets are paved, and there is a regular supply of filtered water. Large docks and dependencies identical to those at Galatz have been constructed, and extensive quays face the river bank. Braila is essentially commercial, and has an exchange and chamber of commerce; the Bank of Rumania is represented by a branch office. An electric tramway has been laid down, and, besides the lines running in the town, conveys passengers to Lacul Sarat (Salt Lake), whose iodine waters are held in much repute. Population (1900), 58,392, of whom 10,811 are Jews.

The total imports in 1898 were 137,169 tons, value £1,812,490; total exports, 621,906 tons, value £2,624,258. Of these the principal articles of import were:—Cotton yarn, £178,932; machinery, £161,440; jute cloth, £103,719; coal, £75,084; textiles, £115,000; heavy ironmongery, £71,422; sheet-iron, £70,344. The principal articles of export were:—Maize, £769,646; barley and malt, £445,936; wheat, £397,745; dried vegetables, £273,295; flour, £178,144; oleaginous seeds, £160,230; oats, £153,483; rye, £123,144; millet, £41,028. Braila was visited in 1880 by 172 vessels of 194,919 tons; in 1890 by 474 vessels of 516,065 tons; and in 1899 by 121 vessels of 165,842 tons.

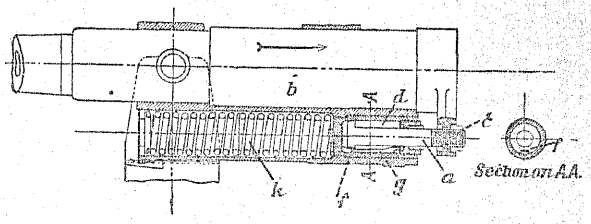
Many events connected with the history of Wallachia took place in the neighbourhood of this city. In 1475 Stephen the Great, having dethroned the Voïvode Radu, burned the town. In 1573 another Moldavian prince took the city by storm, and massacred the Turkish garrison. In the year 1659 it was again burned by the Wallachian prince Mircea, and for the time the Turks were expelled, but afterwards returned and possessed it almost without interruption from 1544 to 1828. In the latter year the Russians captured it after a long and sanguinary siege, when the Turks displayed courage and military virtue almost as extraordinary as they showed half a century later at the siege of Plevna. By the treaty of Adrianople, however, it was stipulated that the Wallachian fortresses on the Danube should be restored to the principality. Before carrying out this stipulation, the Grand Duke Michael razed the citadel of Braila, and in this ruinous condition it was handed over to the Wallachians. On the banks of Danube, a little above the city, are observable some remains of the piles of a bridge said to have been built by Darius.

Braine l'Alleud (Flemish, *Eigen-Brakel*), a town of Belgium, in the province of Brabant, 12 miles S. of Brussels by rail. Its industries are numerous, and include the manufacture of woollen and cotton fabrics, dye-works, tan-yards, and breweries. In the district are the Waterloo Lion and Hougomont. Population (communal) (1880), 6370; (1897), 7885.

Brainerd, capital of Crow Wing county, Minnesota, U.S.A., situated in the central part of the state, on Mississippi river, at the junction of two branches of the Northern Pacific railway, at an altitude of 1209 feet. Population (1880), 1865; (1890), 5703; (1900), 7524.

Brakes.—(1) Hydraulic Military.—The hydraulic principle is almost universally adopted in brakes for controlling the recoil of guns. As the recoil energy may be very high, while for the purpose of facilitating the working of the gun and keeping a high rate of fire the length of recoil is kept short, the strains on the structures carrying the gun are severe, and it is necessary to equalize the strain through the recoil stroke to keep the stresses to a minimum.

The hydraulic brake, or pump brake, used for this purpose consists of a cylinder with piston and piston rod, the liquid being forced at high velocity through an orifice formed in the piston head. This arrangement is illustrated in the figure. The piston rod, *a*, of the hydraulic brake is firmly attached to the gun, *b*, by the lug, *c*, and on recoil of the gun in the direction of the arrow, the liquid in the space, *d*, is forced at constant velocity



through the orifice, *f*. The area of this orifice is regulated by the valve key, *g*, which is so shaped longitudinally that the orifice contracts as the recoil velocity falls off, and the resistance is in consequence approximately uniform throughout the stroke. When recoil ceases the gun is returned to firing position by the spring, *k*. The velocity of movement of the gun during recoil is not uniform, but varies from a maximum, shortly after recoil commences, to rest at the end of the stroke. As it is necessary, to obtain uniform resistance, that the velocity of flow should be preserved constant, a valve key to the cylinder is generally employed to produce the desired result by automatically closing the orifice as the speed falls off during recoil.

(2) Electric.—The adoption of electricity for the purpose of operating cranes or lifts has led to the introduction of electrically-controlled frictional brakes. In the case of cranes for lifting weights, the object sought is to prevent the load from taking charge and lowering itself when the current is cut off from the motor; and the arrangement adopted usually consists of a frictional brake, normally applied by spring pressure, but held off by an electro-magnet actuated by the electric current for the motor, or by a shunt current, when the motor is in action.

On electric elevators or lifts a somewhat similar arrangement is adopted. The brake is usually a strap passing round a drum carried on the motor shaft; the strap is fixed at one end and applied by a spring at the other, which is connected also to the armature of a compound wound electro-magnet, which working against the spring releases the brake when the current passes. One winding of the magnet is in series with the motor, releasing the brake when the current is actuating the motor in hoisting, and the other is a shunt winding used for descending, and controlled by a centrifugal governor on the motor, which automatically cuts out the shunt circuit if the speed of descent becomes too great. An electric brake to control the speed of the cage when lowering is obtained also by use of the driving motor as a dynamo generating electricity, which is passed through an electrical resistance. In this case the weight of the cage is utilized to back-drive and rotate the motor connected up as a dynamo, the power absorbed by the motor in generating its

current furnishing the brake resistance. The current generated varies in potential from zero to a maximum, and the speed of fall of the cage is regulated by varying the electrical resistance. Electric lifts similarly operated are used also on warships for supply of ammunition to the guns. (G. H. BA.)

(3) RAILWAY.—From the very beginning of steam railways, hand-brakes of various forms have been employed, and they are still largely used on goods trucks. Each hand-brake is independent of all others, and the time required to bring a number of them into operation depends upon the activity of the brakemen. The necessity for prompt and effective application of brakes in an emergency led to the invention of means to operate them with power superior to muscular force. Such brakes are known as power brakes. These may be divided into four classes:—(1) Mechanical brakes, worked by springs, by friction wheels on the axle, by chains wound on drums, and other mechanical devices, or by the force produced when, by reason of a sudden checking of the speed of the locomotive, the momentum of the cars causes pressure on draw-bars or buffing devices. All such momentum or buffer brakes were proved radically defective by tests made by a committee of the Master Car Builders' Association of the United States at Burlington, Iowa, in 1886. (2) Hydraulic brakes, worked by means of water forced through pipes into proper mechanism for transmitting its force to the brake-shoes. (3) Electric brakes, worked by magnets acting on discs or similar appliances fastened to the wheels or axles; or, more recently, by magnets using the rail as a keeper and utilizing the drag thus produced to force ordinary brake-shoes against the wheels. (4) Air- and vacuum-brakes, worked by compressed air, or by air at atmospheric pressure operating on a vacuum. To these might be added brakes worked by steam or water from the boiler of the engine, operating by means of a cylinder, the use of which is generally limited to the locomotive. Prominent among these is the Le Chatelier or water-brake so called, in which a pipe is led from the boiler below the water line to the locomotive cylinder exhaust ports, the cylinders acting as compressors. The arrangement also prevents hot gases and cinders from being drawn into the cylinders from the smoke-box.

Power brakes may be either continuous or independent—continuous if connected throughout the train and with the locomotive by pipes, wires, &c., as the compressed air, vacuum and electric brakes; independent if not so connected, as the buffer-brakes and hand-brakes. Continuous brakes may be divided into two other great classes—automatic and non-automatic. The former are so arranged that they are applied automatically on all the coaches of the train if any important part of the apparatus is broken, or the couplings between cars are ruptured; in an emergency they can be put on by the guard, or (in some cases) by a passenger. Non-automatic brakes can be applied only by the person (usually the engine-driver) to whom the management of them is given. They may become inoperative on all the coaches, and always on those which have become detached, if a coupling or other important and generally essential part is broken. Many mechanical and several hydraulic and electrical continuous brakes have been invented and tried. Experience has shown them so inadequate in practice that they have all practically disappeared, leaving the field to the air- and the vacuum-brakes. At first these were non-automatic, but in 1872 the automatic air-brake was invented by Mr George Westinghouse, the many advantages of which over the non-automatic brake quickly led to its wide adoption. An automatic vacuum-brake, invented a few years later, is used largely in the United Kingdom and the British colonies.

Simple air-brake.

The Westinghouse non-automatic air-brake consists in its simplest form of a direct-acting, steam-driven air-pump, carried on the locomotive, which forces compressed air into a reservoir, usually placed under the foot-plate of the locomotive. From the reservoir a pipe is led through the engine cab, where it is fitted with a three-way cock, to the rear of the locomotive tender, where it terminates in a flexible hose, on the end of which is a coupling. The coaches are furnished with a similar pipe, having hose and coupling at each end, which is connected to one end of a cylinder containing a piston, to the rod of which the brake-rods and levers are connected. The application of the brakes is effected by the engine-driver turning the three-way cock, so that compressed air flows through the pipe and acting against one side of the brake-cylinder piston, applies the brake-shoes to the wheels by the movement of this piston and the rods and levers connected to it. To release the brakes the three-way cock is turned to cut off communication between the main reservoir and the train-pipe, and to open a port permitting the escape of the compressed air in the train-pipe and brake-cylinders. This brake was soon found defective and inadequate in many ways. An appreciable time was required for the air to flow through the pipes from the locomotive to the car-cylinders, and this time increased quickly with the length of the trains. Still more serious, however, was the fact that on detached coaches the air-brakes could not be applied, the result being sometimes serious collisions between the front and rear portions of the train. Those respects in which the non-automatic brake is inadequate will be understood from the following summary of the requirements most important in a train-braking apparatus. (1) It must be capable of application to every wheel throughout the train. (2) It must be so prompt in action that the shortest possible time shall elapse between its first application and the moment when the full power can be exerted throughout the train. (3) It must be capable of being applied by the engine-driver or by any of the officials in charge of the train, either in concert or independently. (4) The motion of the train must be arrested in the shortest possible distance. (5) The failure of a vital part must declare itself by causing the brake to be applied and to remain applied until the cause of failure is removed. (6) The breaking of the train in two or more parts must cause immediate automatic application of the brakes on all the coaches. (7) When used in ordinary service stops it must be capable of gradual and uniform application (followed, if necessary, by a full emergency application at any part of the service application) and of prompt release under all conditions of application. (8) It must be simple in operation and construction, not liable to derangement, and inexpensive in maintenance.

Automatic vacuum-brake.

In the automatic vacuum-brake, the exhausting apparatus generally consists of a combined large and small ejector, worked by steam and under the control of the driver, though in some forms of the vacuum-brake, such as are used on the Great Western and London and North-Western railways, an air-pump, driven from the main axle of the locomotive, is substituted for the small ejector. These ejectors, of which the small one is at work continuously while the large one is only employed when it is necessary to create vacuum quickly, *e.g.*, to take off the brakes after a short stop, produce a vacuum of 18 or 20 inches in the train-pipe, which extends the whole length of the train and communicates under each vehicle with a cylinder, to the piston of which, by suitable rods and levers, the brake-shoes are connected. The communication between the train-pipe and the cylinder is controlled by a ball-valve, which consists merely of a

half-inch brass ball, having a rolling action in a horizontal direction (see Figs. 1 and 2). The spindle with the release

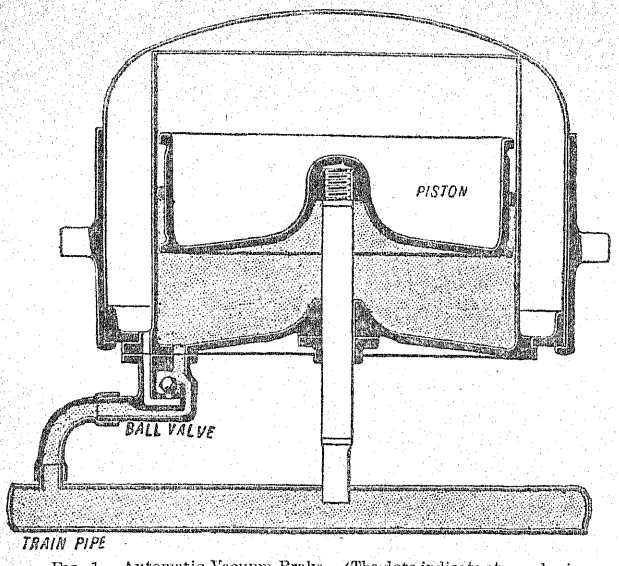


Fig. 1.—Automatic Vacuum-Brake. (The dots indicate atmospheric pressure.)

valve is added for the purpose of withdrawing the ball from its seat when it is necessary to take off the brakes by hand; it is made air-tight by a small diaphragm, the pressure on which, when there is vacuum in the pipe, pulls in the spindle and allows the ball to fall freely into its seat. When air is exhausted through the train-pipe it travels out from the top of the cylinder direct, and from the bottom past the ball, which is thus forced up the incline of the spindle, to roll back again to its seating when the exhaustion is complete. In this state of affairs the piston is held in equilibrium and the brake-blocks are free of the wheels. To apply them, air is admitted to the train-pipe, either purposely by the guard or driver, or accidentally by the rupture of the train-pipe or coupling hose between the vehicles. The air passes to the lower side of the piston, but is prevented from gaining access to the upper side by the ball valve which blocks the passage; hence the pressure becomes different on the two sides of the piston, which in consequence is forced upwards and thus applies the brakes (see Fig. 1). They are released by the re-establishment of equilibrium (by the use of the large ejector if necessary); when this is done the piston falls and the brakes drop off. The general arrangement of the apparatus is shown in Fig. 2. To render the application of the brakes nearly simultaneous throughout a long train, the valve in the guard's van is arranged to open automatically when the driver suddenly lets in air to the train-pipe. This valve has a small hole through its stem and is secured at the top by a diaphragm to a small dome-like chamber, which is exhausted when a vacuum is created in the train-pipe. A gradual application destroys the vacuum in the chamber as quickly as in the pipe, but

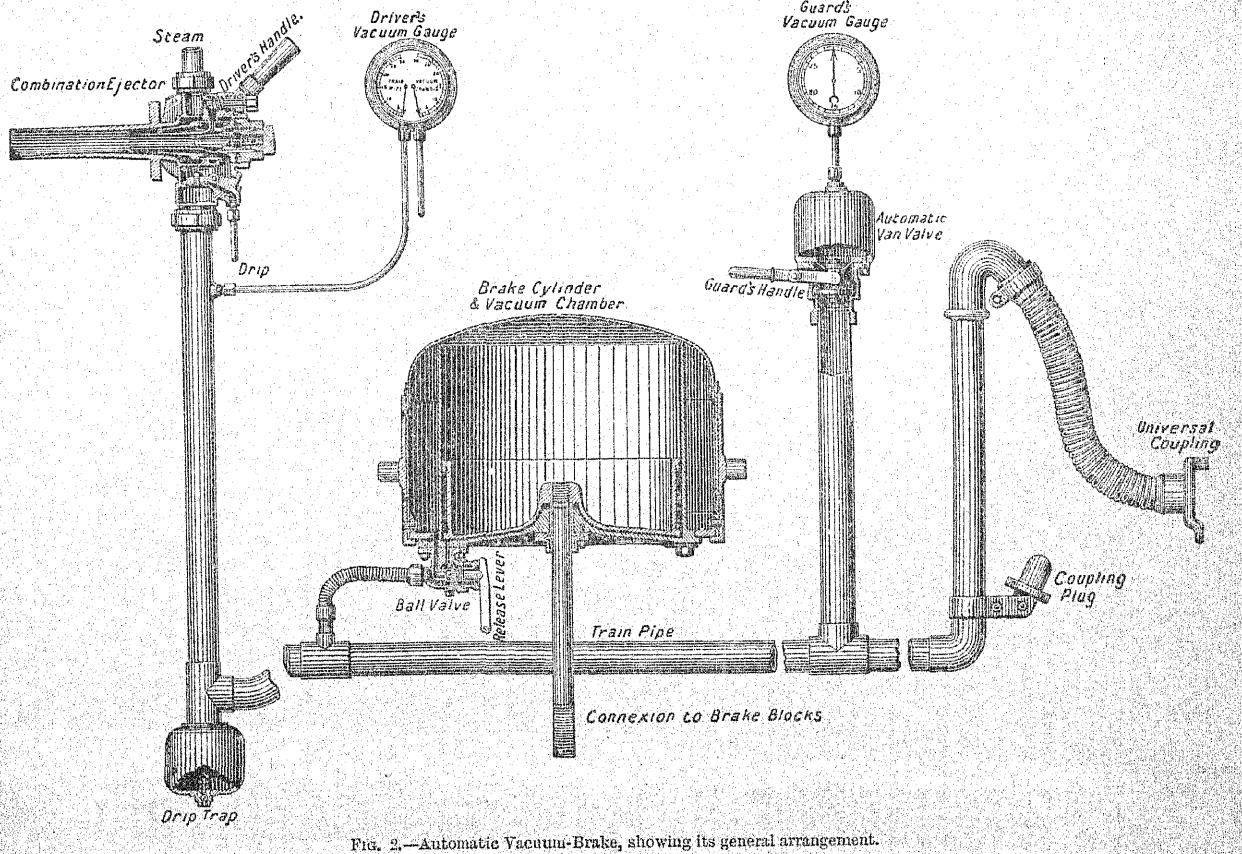


Fig. 2.—Automatic Vacuum-Brake, showing its general arrangement.

with a sudden one the vacuum below the valve is destroyed more quickly, and so the pressure of the atmosphere on the diaphragm lifts the valve and admits air.

In the Westinghouse automatic quick-action air-brake a main air reservoir on the engine is kept charged with compressed air at 90 lb per square inch by means of the pump, controlled by an automatic governor. Conveniently placed on the locomotive is a valve called the driver's valve, which is connected by a pipe with the main reservoir; by means of this the driver controls the flow of air from the main reservoir to the train-pipe, or from the train-pipe to the

Automatic air-brake.

atmosphere. Attached to it is a reducing valve, which, in the normal or running position of the former, reduces the pressure of the air flowing from the main reservoir to the train-pipe to 70 lb per square inch, or 20 lb per square inch less than the pressure in the main reservoir. A train-pipe runs the whole length of the train. In addition to the brake-cylinder each vehicle is supplied with an air reservoir, called the auxiliary reservoir, and an automatic valve called a triple valve. The auxiliary reservoir receives air from the train-pipe and stores it for use in the brake-cylinder of its own vehicle, and both the auxiliary reservoir and triple valve are connected directly or indirectly with the train-pipe. The general arrangement of the brake apparatus on a passenger coach is shown in Fig. 3. The brake-cylinder is in section disclosing the piston and release spring.

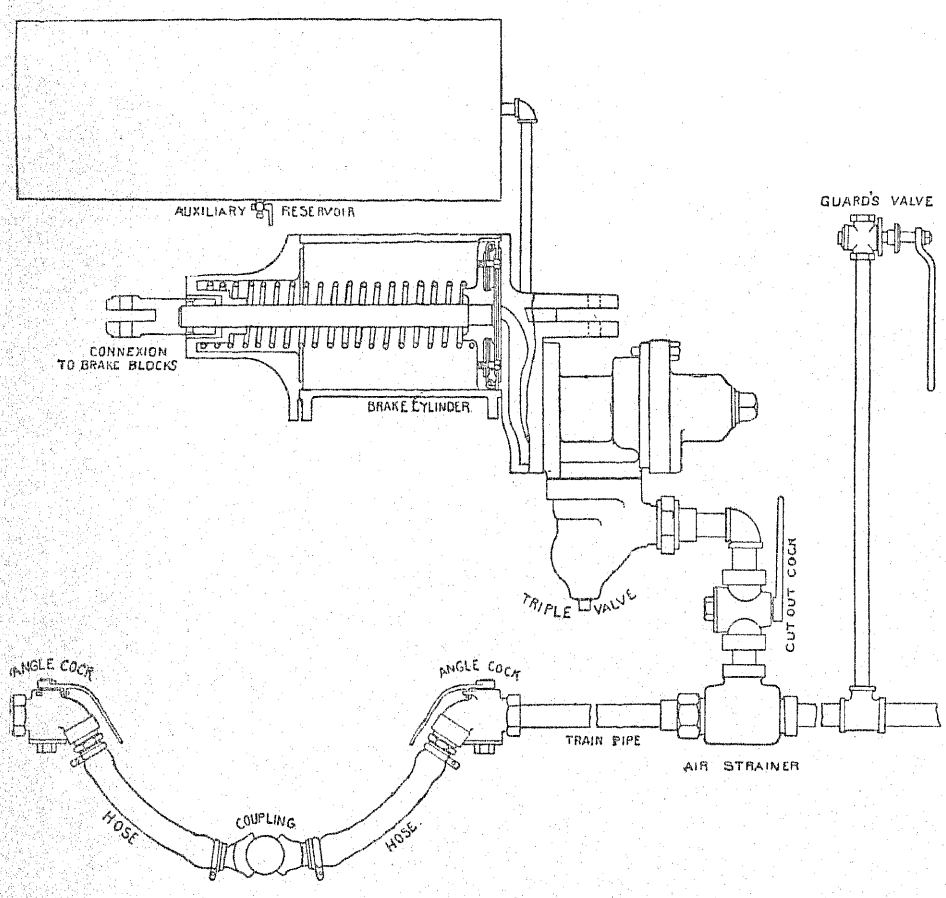


FIG. 3.—Diagram of the principal parts of an Air-Brake on one car.

The automatic action of the brake is due to the construction of the triple valve, the principal parts of which are a piston and slide valve so arranged that the air in the auxiliary reservoir acts at all times on the side of the piston to which the slide valve is attached, while the air in the train-pipe exerts its pressure on the opposite side. A moderate reduction of air pressure in the train-pipe causes the greater pressure remaining stored in the auxiliary reservoir to force the piston of the triple valve with its slide valve to a position which will allow the air in the auxiliary reservoir to pass directly into the brake-cylinder and apply the brake. A sudden or violent reduction of the air in the train-pipe produces the same effect, and in addition causes supplemental valves in the triple valve to be opened, permitting the pressure in the train-pipe also to enter the brake-cylinder, augmenting the pressure derived from the auxiliary reservoir about 20 per cent. This causes practically instantaneous action of the brakes to their highest efficiency throughout the entire train. The same effect is produced should the train break in two or a hose or any part of the train-pipe burst. Sometimes the passengers are provided with the means of thus arresting the train on an emergency, a cord running along the inside or outside of the coaches, which on being pulled opens a valve connected to the train-pipe; this arrangement is applicable both to the vacuum and compressed-air brakes. When the pressure in the brake-pipe is again restored to an amount in excess of that remaining in the auxiliary reservoir, the piston and slide valve are forced in the opposite direction to their normal position, communication is opened from the train-pipe to the auxiliary reservoir, and the air in the brake-cylinder escapes to the atmosphere, thus releasing the brakes.

The quick-action triple valve is shown in section in Fig. 4. It consists essentially of two mechanisms: first, a piston and slide valve, 5 and 3, which, properly arranged, constitute the automatic feature; and second, the piston, 8, puppet valve, 10, and check valve, 15, by means of which quick action is obtained. The latter feature is only essential when stops are to be made in the shortest distance possible, and therefore this part of the mechanism does not come into action during ordinary or "service" stops. The train-pipe is connected at 18, admitting compressed air to chamber 13, thence to chamber 19, underneath piston 5, which is forced to the position shown in the diagram, there admitting air through feed ports I and K, above the slide valve 3 to the auxiliary reservoir at B, in which pressure soon equals that in the train-pipe and the flow stops. In this position port G, which communicates with a conduit leading to the brake-cylinder, is in communication with the atmosphere through ports N and P and the brakes are released. If a slight or gradual reduction of pressure is made in the train-pipe, piston 5 moves to the left until it is arrested by graduating stem 21. Its first movement opens graduating valve 7 to port Z. When in the position against graduating stem 21 communication between ports G and P is cut off, and port Z is open to G, causing a flow of air from the auxiliary reservoir to the brake-cylinder, which continues until the pressure on the reservoir side of piston 5 is slightly less than that on the train-pipe side, when the piston 5 is moved far enough to the right to close port Z, by graduating valve 7. The resistance of the slide valve 3 is too great to be overcome by this slight difference in pressure, so its position is unchanged and the brakes are held applied. A further reduction in the train-pipe pressure will admit more air through port Z, by moving the piston again to the left, increasing the force of the application, which, if allowed to continue, will cause an equalization of pressure between the auxiliary reservoir and the brake-cylinder when the brakes are fully applied. To release, the full pressure in the train-pipe and consequently underneath piston 5 is restored, which restores all parts to position shown in the diagram, permitting the air in the brake-cylinder to escape to the atmosphere through ports r, N, and P. When the shortest stop is desired, a quick and considerable reduction in pressure is made in the train-pipe. The result is that the piston 5 moves its full traverse, compresses spring 22, bringing port s in register with port r, and allowing the auxiliary

reservoir air to flow into the brake-cylinder. At the same time air admitted through port *t* moves piston 8, which unseats valve 10, and allows train-pipe air to lift check valve 15 and charge the brake-cylinder with air from the train-pipe, in addition to that from the auxiliary reservoir. In this way not only is a very sudden application of the brakes brought about, but also an increased force of application of about 20 per cent. over the greatest force of an ordinary application. This sudden venting of the train-pipe into each brake-cylinder gives an extremely rapid serial action of the brakes on a train of vehicles by means of which the various brakes throughout the train are successively applied almost with the rapidity of sound.

It is well known that brake-shoes can be applied,

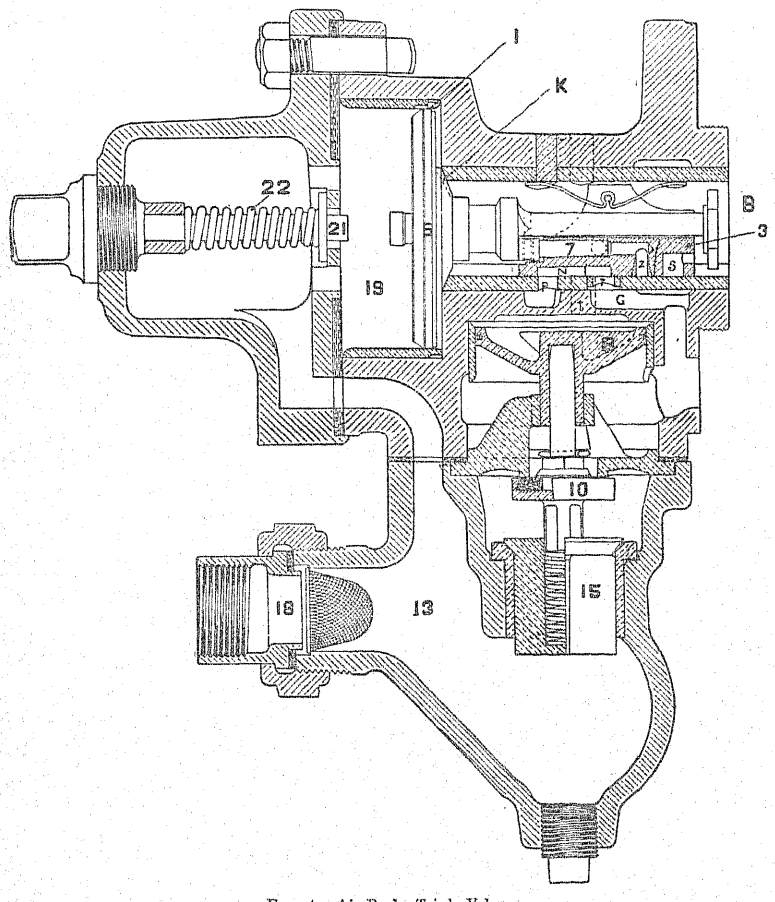


Fig. 4.—Air-Brake Triple Valve.

without skidding the wheels, with greater pressure at high speeds than at low. Advantage is taken of this fact in the design of the high-speed brake, invented in 1894, which consists of attachments, by means of which the pressure in the train-pipe and reservoirs can be increased at the will of the driver. The increased pressure acting in the brake-cylinder increases in the same proportion the pressure of the brake-shoes against the wheels. Attached to the brake-cylinder is a valve for automatically reducing the pressure therein proportionately to the reduction in speed, until the maximum pressure under which the brakes are operated in making ordinary stops is reached, when this valve closes, and the maximum safe pressure for operating the brakes at ordinary speeds is retained until a stop is made.

High-speed air-brake.

Famous tests of railway brakes were those made by the late Sir Douglas Galton, K.C.B. (then Capt. Galton, R.E.), and Mr Westinghouse on the London, Brighton, and South Coast railway, in England, in 1878, and by a committee of the Master Car Builders' Association, near Burlington, Iowa, in 1886 and 1887.

Brake tests.

The object of the former series was to determine the co-efficient of friction between the brake-shoe and the wheel, and between the wheel and rail at different velocities when the wheels were revolving and when skidded, *i.e.*, stopped in their rotation and caused to slide. These experiments were the first of their kind ever undertaken, and for many years their results furnished most of the trustworthy data obtainable on the friction of motion. It was found that the co-efficient of friction between cast-iron shoes and steel-tired wheels increased as the speed of the train decreased, varying from 0·111 at 55 miles an hour to 0·33 just moving. It also decreased with the time during which the brakes were applied; thus at 20 miles an hour the co-efficient was at the beginning 0·182, after ten seconds 0·133, after twenty seconds 0·099. Generally speaking, especially at moderate speeds, the decrease in the co-efficient of friction due to time is less than the increase due to decrease of speed, although when the time is long the reverse may be true. When the wheels are skidded the retardation of the train is always reduced; therefore, for the greatest braking effect, the pressures on the brake-shoes should never be sufficient to cause the wheels to slide on the rails. The Burlington brake tests were undertaken to determine the practicability of using power brakes on long and heavy freight trains. In the 1886 tests there were five competitors — three buffer-brakes, one compressed-air-brake, and one vacuum-brake. The tests comprised stops with trains of twenty-five and fifty vehicles, at 20 and 40 miles an hour, on the level and on gradients of 1 in 100. They demonstrated that the buffer-brakes were inadequate for long trains, and that considerable improvements in the continuous brakes, both compressed-air and vacuum, would be needed to make them act quickly enough to avoid excessive shocks in the rear vehicles. In 1887 the trials of the year before were repeated by the same committee, and at the same place. Trains of fifty vehicles fitted with each brake were again provided, and there were again five competitors, but they all entered continuous brakes — three compressed-air-brakes, one vacuum, and one electric. The results of the first day's test of the train equipped with Westinghouse brakes are shown in Table I., the distances in which are the feet run by the train after the brakes were set, and the times the seconds that elapsed from the application of the brakes to full stop.

Table I.—*Stops of a Train of Fifty Empty Cars*, 1887—*Automatic Air-Brakes.*

Speed in Miles per Hour.	Distance in Feet.	Time in Seconds.	Equivalent Distance at 20 Miles and 40 Miles.	
19½	186	9¾	196	...
19¼	215	11	233	...
36½	588	17	...	693

The remarkable shortness of these stops is the more evident when they are compared with the best results obtained in 1886, as shown in Table II.

TABLE II.—*Stops of a Train of Fifty Empty Cars*, 1886—*Automatic Air-Brakes.*

Speed in Miles.	Distance in Feet.	Time in Seconds.	Equivalent Distance at 20 Miles and 40 Miles.	
23·5	424	17½	307	...
20·3	354	16	340	...
40	922	22⅓	...	922
40	927	22¾	...	927

The time that elapsed between the application of the brakes on the engine and on the fiftieth vehicle was almost twice as great in 1886 as in 1887, being in the latter tests only five to six seconds, and in 1887 the stops were made in less than two-thirds the distance required in 1886. Still, violent shocks were caused by the rear vehicles running against those in front, before the brakes on the former were applied with sufficient force to hold them, and these shocks were so severe as to make the use of the brakes in practice impossible on long trains. When the triple valves were actuated electrically, however, the stops were still further improved, as shown in Table III.

TABLE III.—*Stops of a Train of Fifty Empty Cars—Electric Application of Air-Brakes.*

Speed in Miles.	Distance in Feet.	Time in Seconds.	Equivalent Distance at 20 Miles and 40 Miles.	
21½	160	7	139	...
23	183	8	138	...
38	475	14½	...	519
36½	460	14	...	545

Although the same levers, shoes, rods and other connexions were used, there were no shocks in the fiftieth car of the train on any stop, whether on the level or on a gradient. The committee in charge reported that the best type of brake for long freight trains was one operated by air, in which the valves were actuated by electricity, but they expressed doubt of the practicability of using electricity on freight trains. The Westinghouse Company then proceeded to quicken the action of the triple valve, operated by air only, so that stops with fifty-car trains could be made without shock, and without electrically operated valves; and they were so successful in this respect that, towards the end of the same year, 1887, with a train of fifty vehicles, stops were made without shock, fully equalling in quickness and shortness of distance run any that had been made at the trials by the electrically operated brakes.

In 1889 some further tests were made by Sir Douglas Galton with the automatic vacuum-brake, on a practically level portion of the Manchester, Sheffield, and Lincolnshire railway (now the Great Central). The train was composed of an engine, tender, and forty carriages, the total length over buffers being 1464 feet, and the total weight 574 tons, of which 423 tons were braked. At a speed of about 32 miles an hour this train was brought to a standstill in twelve seconds after the application of the brakes, in a distance of 342 feet. (E. M. He.; H. M. R.)

Brambanan (better PRAMBANAN), a village in Java, south of the Merapi (Mir-Api), in the territory of the sultan of Surakarta, near the frontier of Jokjokarta (Djogjakarta). Among the most remarkable of the Hindu temples (Tjandis or Chandis) are Kalasa or Kali-bening, a twelve-sided pyramid, 70 feet high, and near it Sari, a quadrilateral building, Chandi China, and Lårå Jorgran, the last the temple, *par excellence*, of Prambanan, comprising a group of eleven, of which two are of large size.

For recent descriptions (since 1875) of the monuments, the inscriptions, and the history of Hinduism, as connected with these ruins, see TIJDSCHRIFT VOOR IND. *Taal-Land en Volkenkunde*, xxxi. and xxxii. Batavia, 1886 and 1887.—YZERMAN. *Beschryving der ondheden nàby de greus der residenties Soerakarta a Djogjakarta.* Batavia, 1891. With photos and atlas.—GRONEMAN. *Tjandi Parambanan op Midden-Java.* La Haye, 1893.—VERBEEK. *Lijst der Ondheden van Java.* Verhand v/h Bat. Genootschap, xlvi., and *Onheidkundige Kaart van Java.—Guide à travers l'exposition coloniale des Pays Bas* (La Haye, 1900). No. 174 *seqq.* (Réproductions des Temples civaïtiques à Parambanan.)

Brampton, a market town and railway station in the Eskdale parliamentary division of Cumberland, England, 9 miles E.N.E. of Carlisle. Of the ancient parish church only the interesting chancel is left, but there are a modern parish church, a Presbyterian church (1662), and Methodist chapel; also a moot hall, and two other halls. Roman remains are frequently found in the neighbourhood. There are cattle and sheep markets. Area of civil parish, 6466 acres; population (1881), 3438; (1901), 2494.

Brampton, a township in the Chesterfield parliamentary division of Derbyshire, England, 3 miles W. by N. of Chesterfield. A parish church contains ancient memorials, and has been restored. The industries of the parish are agriculture and quarrying. Area, 8156 acres; population (1881), 6383; (1901), 2185. In 1892 the borough of Chesterfield was enlarged so as to include a portion of this parish. The urban district of Brampton and Walton has an area of 10,102 acres; population (1891), 2532; (1901), 2698.

Brampton, Henry Hawkins, 1st BARON (1817-——), English judge, was born at Hitchin, on 14th September 1817. He received his education at Bedford school. The son of a solicitor, he was early familiarized with legal principles, a training which stood him in good stead throughout his long forensic career. Called to the bar by the Middle Temple in 1843, he at once joined the old home circuit, and after enjoying a lucrative practice as a junior, took silk in 1858. His name is identified with many of the famous trials of the reign of Queen Victoria. He was successfully engaged as junior to Mr Edwin James in the Simon Bernard case (of the Orsini plot celebrity), as junior to Mr (afterwards Lord Chief Justice) Bovill in that of *Roupell* v. *Waite*, and appeared together with Sir John Karslake (Solicitor-General), Mr Hardinge Giffard (afterwards Earl Halsbury), and Serjeants Ballantyne and Parry on behalf of the several defendants in the Overend-Gurney prosecutions, which resulted in the acquittal of the accused. The two *causes célèbres*, however, in which Lord Brampton attained his highest legal distinction, were the Tichborne trials and the great will case of *Sugden* v. *Lord St Leonards*. In both of these he was victorious. In the first his masterly cross-examination of the witness Baigent was one of the great features of the trial. He did a lucrative business in references and arbitrations, and acted for the royal commissioners in the purchase of the site for the new law courts. Election petitions also formed another branch of his extensive practice. Mr Hawkins was raised to the bench in 1876, and was assigned to the then Exchequer division of the High Court, not as baron (an appellation which was being abolished by the Judicature Act), but with the title of Sir Henry Hawkins. He was a great advocate rather than a great lawyer. His searching voice, his manner, and the variety of his facial expression, gave him an enormous influence with juries, and as a cross-examiner he was seldom, if ever, surpassed. He was an excellent judge in chambers, where he displayed a clear and vigorous grasp of details and questions of fact. His knowledge of the criminal law was extensive and intimate, the reputation

he gained as a "hanging" judge making him a terror to evil-doers; and the Court for Crown Cases Reserved was never considered complete without his assistance. In 1898 he retired from the bench, and was raised to the peerage under the title of Baron Brampton. He has frequently taken part in determining House of Lords appeals, and his judgments have been distinguished by their lucidity and grasp. He held for many years the office of counsel to the Jockey Club, and as an active member of that body found relaxation from his legal and judicial duties at the leading race meetings, and has been considered a capable judge of horses. In 1898 he was received into the Roman Catholic Church.

Bramwell, George William Wilshere, BARON (1808-1892), English judge, was born in London on 12th June 1808, being the eldest son of George Bramwell, of the banking firm of Dorrien, Magens, Dorrien and Mello, 22 Finch Lane, E.C. (died 1851). He was educated privately, first at Dr. Reddy's school at Camberwell, where W. F. Channell (afterwards, like himself, a Baron of the Exchequer) was one of his schoolfellows, and later he went to Palace school, Enfield, kept by Dr May. At the age of sixteen he entered Dorriens' bank, where he gained a practical knowledge of commercial and particularly of banking matters of great use to him in his legal career. In 1830 he gave up business for the law, becoming a pupil in the chambers of Fitzroy Kelly, then a barrister of six years' standing, and afterwards successively Solicitor-General, Attorney-General, and, ten years after Bramwell himself had been raised to the bench, chief baron of the Exchequer. At first Bramwell was content to take out the certificate of a special pleader, and practised as such for some years at 3 Serjeants' Inn. The work of special pleaders (now obsolete) was confined to drawing the pleadings (preliminary documents which precede a trial), which in those days had to be drawn subject to rigid rules, so as to state with the strictest accuracy the issues to be raised at the hearing of the cause. Bramwell had been admitted as a student at Lincoln's Inn in 1830, and at the Inner Temple in 1836, and he was eventually called to the bar at both Inns in 1838. He soon worked his way into a good practice both in London and the home circuit, his knowledge of law and procedure being so well recognized that in 1850 he was appointed a member of the Common Law Procedure Commission, which resulted in the Common Law Procedure Act of 1852. This Act he drafted jointly with his friend Mr (afterwards Mr Justice) Willes, and thus began the abolition of the system of special pleading. In 1851 Lord Cranworth made Bramwell a Queen's counsel, and the Inner Temple elected him a bencher,—he had ceased to be a member of Lincoln's Inn in 1841. In 1853 he served on the Royal Commission to inquire into the assimilation of the mercantile laws of Scotland and England and the law of partnership, which had as its result the Companies Act of 1862. It was he who, during the sitting of this Commission, suggested the addition of the word "limited" to the title of companies that sought to limit their liability, in order to prevent the obvious danger to persons trading with them in ignorance of their limitation of liability. This danger had apparently seemed insuperable to some members of the Commission, and its removal by a single word affords a typical instance of Bramwell's hard-headed business-like common sense. As a Queen's counsel Bramwell enjoyed a large and steadily increasing practice. Of his methods at the bar and his attitude towards the law, it has been said that where other distinguished lawyers of his day would read a client's story in a brief, and then turn at once to find a case "on all fours" with it, Bramwell's way was, after mastering the facts, to make up his mind as to what principles were involved, and what the law must be in order that justice might be done, and then seek for authority in support of his view. It is interesting to note the steady progress of Bramwell in his profession as shown by his fee-book, and also to compare the income of an English barrister with a good commercial practice in the 'forties and 'fifties, with those of men in similar circumstances in other generations. Mr Bramwell made, in the sixth year after his call £850, in the seventh year £1187, in the eighth £1533—a friend betting him in the last-named year that in three years he would confess to having passed all the other juniors on his circuit. In the first year after he "took silk" he made £3414, in the three following years, £4549, £5846, and £7107 respectively. In his last year at the bar he nearly reached £8000, a large sum in those days for his class of practice; but he had no opportunity of raising his income higher, as in 1856 Baron Parke (afterwards Lord Wensleydale) resigned his seat in the Court of the Exchequer after occupying it for twenty-two years, and Lord Cranworth invited Mr Bramwell, Q.C., to fill his place.

As a baron of the Exchequer he sat for twenty years, earning a high reputation in the trial both of civil causes and of criminal charges, although his previous personal experience of crime was said to be limited to a single brief in a criminal case. In 1867, with Mr Justice Blackburn and Sir John Coleridge, he was made a member of the Judicature Commission. In 1871 he was one of the three judges who refused the seat on the Judicial Committee of the Privy Council to which Sir Robert Collier, in evasion of the spirit of the Act creating the appointment, was appointed; and in 1876 he was raised to the Court of Appeal, where he sat till the autumn of 1881. As a puisne judge he had been conspicuous as a sound lawyer, with a strong logical mind unfettered by technicalities, but endowed with considerable respect for the common law. His rulings were always clear and decisive, while the same clearness and decision marked his dealings with fact, and, coupled with a straightforward, unpretentious manner, gave him great influence with juries. In the Court of Appeal he was perhaps not so entirely in his element as at Nisi Prius, but the same combination of sound law, strong common sense, and clear expression, characterized his judgments, marked as they are by a tendency to recall and refute the arguments of counsel, rather than to be expositions of the law applicable to the matter in hand, delivered irrespective of such arguments. His decisions during the three stages of his practical career are too numerous to be referred to particularly, although *Ryder* v. *Wombwell* (L.R. 3 Ex. 95); *R.* v. *Bradshaw* (14 Cox C. C. 84); *Household Fire Insurance Company* v. *Grant* (4 Ex. Div. 216); *Stonor* v. *Fowle* (13 App. Cas. 20), have been cited as examples. A quaint instance is recorded of his candour. Having sat all day with two Chancery Lords Justices hearing an appeal involving points of equity only, he gave his judgment in these terms:—"Having listened all day to things which I don't think I ever heard of before, I can safely say I am of the same opinion, and for the same reasons." In the course of another judgment (9 Chy. Div. 28) he said, "If juries had to give reasons for their verdict trial by jury would not last five years." He was a staunch upholder on the bench, and as a controversial writer, of the common law both in civil and criminal matters, believing that the less it was interfered with by legislation the better. "Please govern me as little as possible," he was wont to say. In particular he strenuously defended, wherever possible, the principle involved in the words "freedom of contract," diminished (whether rightly or wrongly is a matter of opinion) by modern legislation,

such as that limiting the relations of landlord and tenant, or master and servant. He earned the reputation of regarding rich corporations with undue favour through his resentment at seeing them unjustly "bled" by juries that sympathized with plaintiffs; and in the case of railway companies he further refused to recognize the effect on their position of the extraordinary powers and privileges given them by Parliament. Reference in this connexion may be made to *Vaughan* v. *The Taff Railway Company* (3 & 5 Hurlston and Norman's Reports); and the *Hammersmith Railway Company* v. *Brand* (Law Reports 4 H.L.), in which the decisions were adverse to the companies, and in which the tendencies last referred to may be traced.

Throughout his legal career Bramwell was constantly in friendly communication with American lawyers, the common law being the bond between them. An expression of his feeling towards American lawyers is to be found in the case of *The Attorney-General* v. *Sillem* (2 H. & C. 540). In addition to his other qualities as a judge, and particularly his honesty and love of justice, Lord Bramwell's courtesy and consideration towards those practising before him (although he could be peremptory at times when rendered impatient) had won him their personal affection and esteem, so that upon his retirement, which was announced in the long vacation of 1881, exceptional honour was accorded to him, twenty-six judges and a huge gathering of the bar entertaining him at a memorable banquet in the Inner Temple hall. Shortly afterwards, on 8th December, Mr Gladstone wrote to him offering him a peerage, which he accepted, taking the title Baron Bramwell of Hever, from his home in Kent. Thus he had not wholly said good-bye to judicial life, and many of his decisions are to be found in the reports of the House of Lords, notably that in *Vagliano* v. *The Bank of England* (App. Ca. 1891), in which he and Lord Field differed from the majority. In private life Bramwell had simple tastes and enjoyed simple pleasures. He lived, when not in London, at Four Elms, near Edenbridge. He was extremely fond of music, and himself played the piano. He was fond also of his garden and of animals, particularly dogs. He rode a little at one time, but never shot. He was fond of walking and of swimming, and he played billiards. He was twice married: (1) 1830, to Jane, daughter of Bruno Silva, who died in 1836, and by whom he had one daughter; (2) 1861, to Miss Martha Sinden. He died at Four Elms on 9th May 1892.

At all times Lord Bramwell had been fond of controversy and controversial writing. He had written from time to time upon many topics principally of legal interest in the *Times*, the *Economist*, and elsewhere, but as a peer he had more leisure and also greater freedom than he had had as a judge to deal with the wide variety of questions which interested him, particularly those involving politics (although personally he acknowledged allegiance to no party), and he did so with characteristic vigour, with shrewd insight into the weak parts of his adversary's case, and a still keener appreciation of the strong points of his own. Without being ever intentionally unfair in controversy, he lost nothing by ignoring at times the full meaning of his adversary unless it was expressed in terms that prevented him from doing so. Still the great majority of his letters to the *Times* over his well-known signature B. (he also signed himself at different times Bramwell, G.B. and L.L.), will always afford good reading, and it is interesting to trace the fulfilment or non-fulfilment of his predictions in the light of subsequent events. He joined in 1882 the Liberty and Property Defence League, and some of his writings after that date took the form of pamphlets published by that society. As examples of Lord Bramwell's controversial style may be cited his letters to the *Times*, 24th April 1878 (Employers' Liability and Freedom of Contract); 3rd June 1880 (Hares and Rabbits Bill and Freedom of Contract); 16th and 24th May 1883 (Unearned Increment); for replies see 22nd and 28th May); 12th November 1885 (Mr Joseph Chamberlain and the Enclosure of Commons). Pamphlets, *Laissez Faire*; "Nationalization of Land," a reply to Henry George's *Progress and Poverty*; "Drink" (for "Drink" see also the *Times*, 10th April 1885), published by the Liberty and Property Defence League; "Drink, a Rejoinder," *Nineteenth Century Magazine*, June 1885; letters to the *Economist* (Railways), 2nd August 1884, 13th and 20th March 1886; letter on Employers' Liability to Sir Henry Jackson, published as a pamphlet. "The letter of Mr. Baylis exhibits a crass ignorance of the subject on which he writes and a proportionate confidence" (*Times*, 11th November 1886), written by him in reply to a young barrister who had differed from him with regard to the precise status of Serjeants' Inn, may be quoted as an instance of the hard hitting and somewhat intolerant style that he frequently adopted.

AUTHORITIES.—*Some Account of George William Wilshere, Baron Bramwell*, by CHARLES FAIRFIELD.—*Times*, 10th May 1892.—*Law Journal*, 14th May 1892.—Master MACDONELL, in *Temple Bar*, 1896.—MANSON'S *Bramwelliana* and *Builders of our Law*; and private information. (E. A. AR.)

Brand, Sir John Henry (1823-1888), President of the Orange Free State, was the son of Sir Christoffel Brand, Speaker of the House of Assembly of the Cape Colony. He was born at Cape Town, 6th December 1823, and was educated at the South African College. Continuing his studies at Leyden, he took the degree of D.C.L. in 1845. He was called to the English bar from the Inner Temple in 1849, and practised as an advocate in the Supreme Court of the Cape of Good Hope from that year until 1863. In 1858 he was appointed professor of Law in the South African College. He was elected president of the Orange Free State in 1863, and subsequently re-elected for five years in 1869, 1874, and 1879. In 1864 he resisted the pressure of the Basutos on the Free State boundary, and after vainly endeavouring to induce Moshesh, the Basuto chief, to keep his people within bounds, he took up arms against them in 1865. This first war ended in the treaty of Thaba Bosigo, 3rd April 1866; and a second war, caused by the treachery of the Basutos, ended in the treaty of Aliwal North, 12th February 1869. In 1871 Brand was solicited by a large party to become president of the South African Republic, and thus unite the two republics; but as the project was hostile to Great Britain he declined to do so, and maintained his constant policy of friendship towards the latter country, where his merits were recognized in 1882 by the well-deserved honour of the G.C.M.G. His watchfulness for the interests of the Orange Free State was sufficiently shown in his despatches on the question of the Diamond Fields in 1872. A fluent speaker, a far-sighted politician, and endowed with great firmness and independence of character, President Brand was respected throughout South Africa. He died on 14th July 1888. (See ORANGE RIVER COLONY.)

Brandenburg, a central province of Prussia, with an area of 15,381 sq. miles, and population of 2,821,695 (1895), the second in point of area and the third in point of population of the provinces of the kingdom. The crops chiefly grown are potatoes, hay, rye, beetroot, oats, barley, wheat, and some tobacco (£138,750 in 1897). In 1897 the live stock embraced 898,298 sheep, 885,487 pigs, 806,066 cattle, and 280,512 horses. In the same year the mines yielded 7,941,632 tons of lignite, valued at £730,900, and the foundries and furnaces produced 27,698 tons of materials, valued at £228,600. In 1898-99 the sugar factories produced 56,693 tons of sugar; the breweries, 146,300,000 gallons of beer; and the distilleries, 6,724,718 gallons of pure alcohol. For further particulars, see under PRUSSIA.

Brandenburg, a town of Prussia, on the Havel, 38 miles W.S.W. of Berlin, capital of the circle of Brandenburg, government-district of Potsdam, province of Brandenburg; station on the Berlin-Magdeburg railway. The town has 8 churches and a synagogue, a high school (Ritterakademie), a gymnasium, 13 *real*-gymnasia, and 2 higher-grade girls' schools. On Marienberg, to the north-

west of the town, is a tower (1880) to the memory of about 4000 Brandenburgers who fell in the wars of 1864, 1866, and 1870-71. There is considerable shipping and fishing on the river. Population (1880), 28,685; (1890), 37,817; (1900), 49,263.

Brandes, Georg Morris Cohen (1842-——), Danish critic and literary historian, generally known as GEORG BRANDES, was born in Copenhagen on 4th February 1842. He became a student in the university in 1859, and first studied jurisprudence. From this, however, his maturer taste soon turned to philosophy and æsthetics. In 1862 he won the gold medal of the university for an essay on *The Nemesis Idea among the Ancients*. Before this, indeed since 1858, he had shown a remarkable gift for verse-writing, the results of which, however, were not abundant enough to justify separate publication. Brandes, indeed, did not collect his poems until so late as 1898. At the university, which he left in 1864, Brandes was much under the influence of the writings of Heiberg in criticism and Sören Kierkegaard in philosophy, influences which have continued to leave traces on his work. From 1865 to 1871 Brandes travelled much in Europe, acquainting himself with the condition of literature in the principal centres of learning. His first important contribution to letters was his *Æsthetic Studies* of 1868, in which, in several brief monographs on Danish poets, his maturer method is already foreshadowed. In 1870 he published several important volumes, *The French Æsthetics of Our Days, Criticisms and Portraits*, and a translation of *The Subjection of Women* of John Stuart Mill, whom he had met that year during a visit to England. Brandes now took his place as the leading critic of the north of Europe, applying to local conditions and habits of thought the methods of Taine. He became *docent* or reader in Belles Lettres at the university of Copenhagen, where his lectures were the sensation of the hour. The professor of Æsthetics was the poet Carsten Hauch, a very aged man; when he died in 1872, it was taken as a matter of course that Brandes would succeed him. But the young critic had offended many susceptibilities by his ardent advocacy of modern ideas; he was known to be a Jew, he was convicted of being a Radical, he was suspected of being an atheist. The authorities refused to elect him, but his fitness for the post was so obvious that the chair of Æsthetics remained vacant in the university of Copenhagen, no one else daring to take a post from which Brandes had been rejected. In the midst of these polemics the critic began to issue the most ambitious of his works, the *Main Streams in the Literature of the Nineteenth Century*, of which four volumes appeared between 1872 and 1875. The brilliant novelty of this criticism, as well as the tumult which gathered round the person of the critic, combined to give it unbounded success, and the reputation of Brandes grew apace, not only in his own country, but in Germany and Russia. His subsequent writings have been too numerous to be chronicled here in detail. But among them must be mentioned the monographs on *Sören Kierkegaard* (1877), on *Esias Tegner* (1878), on *Lord Beaconsfield* (1878), and on *Henrik Ibsen* (1899). Brandes has written with great fulness on the main contemporary poets and novelists of his own country and of Norway, and he and his disciples have long been the arbiters of literary fame in the north. His *Danish Poets* (1877), his *Men of the Modern Transition* (1883), and his *Essays* (1889), are volumes essential to the proper study of modern Scandinavian literature. In 1877 Brandes left Copenhagen and settled in Berlin, taking a considerable part in the æsthetic life of that city; he speaks and writes German like a native. His political views, however, made Prussia uncomfortable for him, and he returned in time to Copenhagen, where he found a whole new school of writers and thinkers eager to receive him as their leader. The most important of his recent works has been his study of Shakespeare, 1897-98, which was translated into English by Mr Archer, and at once took a high position. It is, perhaps, the most authoritative work on Shakespeare, not principally intended for an English-speaking audience, which has hitherto been published in any country. Dr Brandes has recently been engaged on a history of modern Scandinavian literature. In his critical work, which is extended over a wider field than that of any other living writer, Brandes has been aided by a singularly charming style, lucid and reasonable, enthusiastic without extravagance, brilliant and coloured without affectation. In 1900 he collected his works for the first time in a complete and popular edition.

Brandon, a city and port of entry of Manitoba, Canada, on the Assiniboine river, and the Canadian Pacific and Canadian Northern railways, situated in 99° 57′ W. and 49° 50′ N., 1184 feet above the sea. It is in one of the finest agricultural sections of Manitoba, and contains grain elevators, saw-mills, and grist-mills. It was first settled in 1881, and incorporated as a city in 1882. Population (1891), 3778; (1901), 5380.

Brandywine Creek, a small stream rising in Chester county, in South-east Pennsylvania, and flowing into Christiana Creek in Northern Delaware. Its banks in Pennsylvania were the scene of an engagement in 1777, during the American revolution, between the American forces under Washington and a British army under General Howe, in which the former were defeated.

Brantford, a city and port of entry of Ontario, Canada, situated 22 miles S.S.W. of Hamilton, on the Grand river, and on the Grand Trunk and Toronto, Hamilton, and Buffalo railways. Agricultural implement, plough, engine, bicycle, and stove works and potteries, constitute the most important industrial establishments. It contains an institute for the education of the blind, maintained by the provincial Government, and a ladies' college. The total value of the exports for 1899-1900 was $993,346, and imports $1,413,950. Incorporated as a city in 1877, the population in 1881 was 9616; in 1891, 12,753; and in 1901 it was 16,621.

Brasseur de Bourbourg, Charles Étienne (1814-1874), Belgian ethnographer, was born at Bourbourg, near Dunkirk, 8th September 1814. He entered the Roman Catholic priesthood, was professor of ecclesiastical history in the Quebec seminary in 1845, vicar-general at Boston in 1846, and from 1848 to 1863 travelled as a missionary, chiefly in Mexico and Central America. He gave great attention to Mexican antiquities, published in 1857-59 a history of Aztec civilization, and edited a collection of documents in the indigenous languages from 1861 to 1864. In 1863 he announced the discovery of a key to Mexican hieroglyphic writing, but its value is very questionable. In 1864 he was archæologist to the French military expedition in Mexico, and his *Monumens anciens du Mexique* was published by the French Government in 1866. Perhaps his greatest service was the publication of the *Popol Vuh*, a sacred book of the Indians in the Quichel language, in 1861, along with a Quichel Grammar, and an essay on Central American mythology. In 1871 he brought out his *Bibliothèque Mexico-Guatemalienne*, and in 1869-70 gave the principles of his decipherment of Indian picture-writing in his *Manuscrit Troano, études sur le système graphique et le langue des Mayas*. He died at Nice on 8th January 1874.

His chief merit is his diligent collection of materials; his interpretations are generally fanciful.

Braunau (Czech, *Broumov*), the chief town of a government-district in Bohemia, Austria, near the frontier of Prussian Silesia. It has an imposing Benedictine abbey (1321), and a church (1683) which played an important part in the events leading to the Thirty Years' War still stands. In 1618 the attempt to build a Protestant church was forcibly prevented, an act which was regarded as the immediate occasion of the Protestant insurrection in Bohemia. After the battle of the White Hill, near Prague, the town was deprived of all its privileges, which were, however, in great part restored nine years later. It is now a manufacturing centre (cloth, woollen and cotton stuffs, &c.), and has a considerable trade. Population (1890), 7052; (1900), 7622, chiefly German.

Braunsberg, a town of Prussia, province of East Prussia, 38 miles by rail S.W. of Königsberg, and 5 miles from the shore of the Frisches Haff. Braunsberg has manufactures of soap, yeast, carriages, bricks, and an active trade in flax, corn, flour, timber, &c. Population (1885), 10,759; (1895), 11,856; (1900), 12,497.

Bray, a maritime town, urban sanitary district, and watering-place in the county of Wicklow, Ireland, on the Dublin, Wicklow, and Wexford railway, 12 miles S.S.E. of Dublin. Formerly the town was situated partly in Wicklow and partly in Dublin, but under the Local Government (Ireland) Act, 1898, the portion in Dublin was added to Wicklow. It is known as the "Irish Brighton," and is the chief watering-place in Ireland. A sea wall and promenade, erected at a cost of £25,000, was opened in 1885, and has since been enlarged. A commodious harbour has been constructed by the Urban District Council, who are also the harbour authority, at a cost of £45,000, which is capable of accommodating steamers and ships of 400 tons burden. The town is lighted by electricity, and is rapidly increasing in size. Population (1881), 6535; (1901), 7284, a number which doubles in the season.

BRAZIL.

1. Geography and Statistics.

BRAZIL, a country of South America, extends from about 4° N. lat. to 35° 41′ S. lat., and from 35° to about 73° W. long. On the north the greater part of the frontier is undefined, but by agreement of 1883 the watershed between the Amazon and Orinoco rivers was accepted as portion of the Venezuelan boundary. The dispute concerning the boundary towards French Guiana was, under a convention of April 1897, referred to a Swiss court of arbitration, which gave its award on 1st December 1900. The boundary follows the Oyapoc river from its mouth to its source, and thence the watershed of the Tumuc Humac mountains to the frontier of Dutch Guiana. Towards Peru the Javary river is regarded as the boundary. The frontier line towards Bolivia is still a matter of dispute. The Acré region, claimed by Bolivia, contains rich rubber forests and has attracted many Brazilians, who refuse to acknowledge the Bolivian claim. On 30th October 1899 a protocol was signed on behalf of the two republics providing for the demarcation of the frontier. Farther south the boundary of Brazil is not disputed, the frontier towards the Argentine Republic having been settled in 1895 by arbitration.

Boundaries.

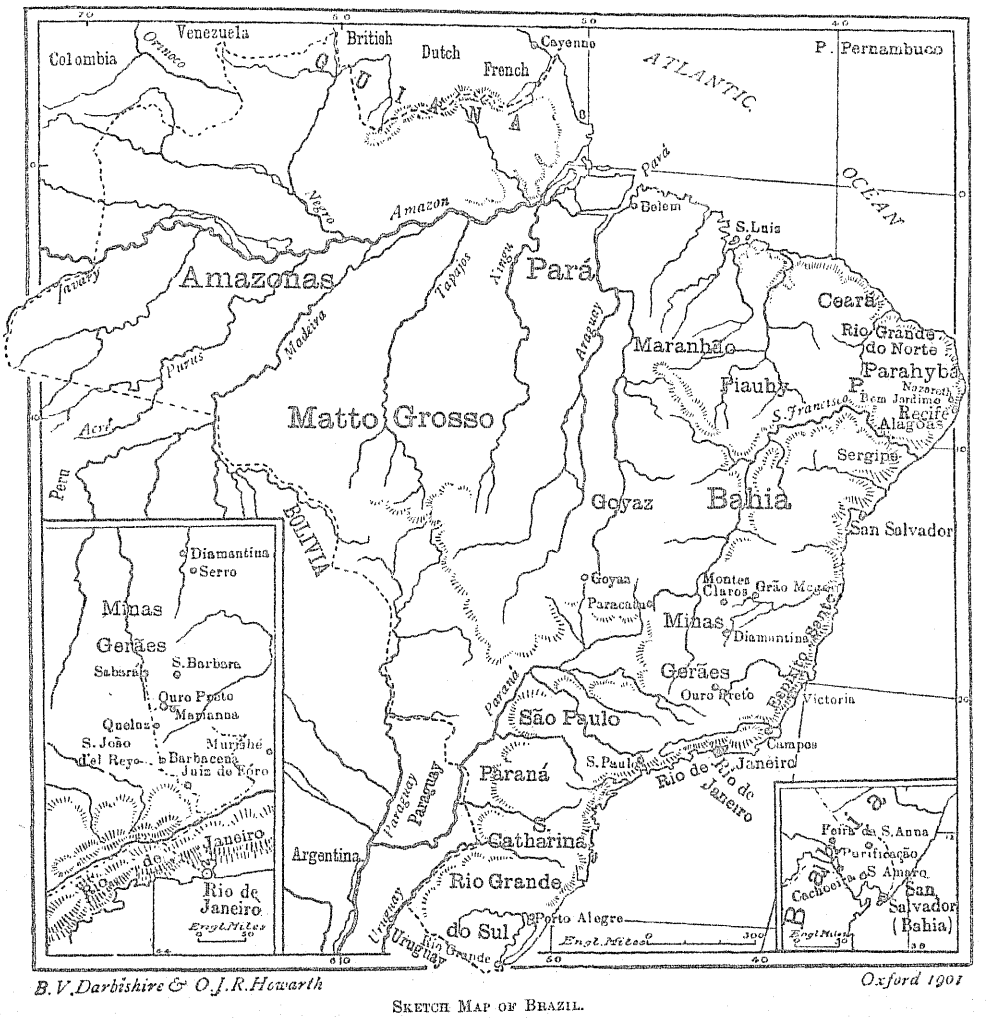
Climate and Topography.—Within the vast area of Brazil are comprised very varied conditions of climate and widely-diversified topographical features. In the south is Rio Grande do Sul, a state consisting, for the most part, of fertile prairie land, suitable for pastoral and agricultural industries, with a temperate, healthy climate, admirably adapted for European settlement. The adjoining state of Santa Catharina has similar characteristics, but is intersected by broken country and low mountain ranges. Farther north lies the state of Paraná with a climate, at the sea-level, humid and almost tropical in summer, but on the grassy, well-watered plateau, some 50 miles from the coast, at a height of 3000 feet, temperate and healthy. In the states of São Paulo, Rio de Janeiro, and Espiritu Santo, the coast-level is tropical and unhealthy, while the highlands of the interior are temperate and pleasant. Inland to the west and north of Rio de Janeiro is the state of Minas, possessing fertile valleys and bold mountain ranges, interspersed with grass-clad tablelands and great areas of forest. Northwards as far as the delta of the Amazon the country, having a fertile soil and a heavy rainfall, is clothed with dense vegetation and forest growth; but towards the interior the land rises to a height of some 4000 feet, and spreads out into a fairly open plateau with a temperate climate. From the delta of the Amazon inland, for many hundreds of miles, there are low, heavily-wooded lands, intersected by innumerable swamps and streams. To the west and north of the Amazon the territories are practically unexplored, but many of these forest districts are rich in india-rubber trees.

The only important waterways in Brazil are the Pará and the Amazon, with its tributaries in the north, the San Francisco in the east, the Uruguay in the south-west, and the Paraguay in the west, the last giving access to the state of Matto Grosso. The Amazon is navigable as far as Iquitos in Peru, about 350 miles from the Pacific. All the inhabited districts of Brazil are well watered, and rain falls abundantly.

Area and Population.—Brazil, with an area of 3,218,100 square miles, had in 1890 a population of 14,333,915, the average density being thus 4·5 inhabitants per square mile. Of the population, 7,237,932 were males and 7,095,983 were females. The area and population of the twenty states and of the Federal District are given in the subjoined table:—

States.	Area in Square Miles.	Population, 1890.	Pop. per Square Mile.
Alagôas	22,580	511,440	22
Amazonas	732,250	147,915	...
Bahia	164,600	1,919,802	12
Ceará	40,240	805,687	20
Espiritu Santo	17,310	135,997	8
Goyaz	288,460	227,572	...
Maranhão	177,510	430,854	2
Matto Grosso	532,550	92,827	...
Minas Gerães	221,890	3,184,099	...
Pará	443,790	328,455	...
Parahyba	28,840	457,232	16
Paraná	85,430	249,491	3
Pernambuco	49,560	1,030,224	21
Piauhy	116,490	267,609	2
Rio de Janeiro	26,630	876,884	33
Rio Grande do Norte	22,190	268,273	12
Rio Grande do Sul	91,310	897,455	10
Santa Catharina	28,620	283,769	10
São Paulo	112,280	1,384,753	12
Sergipe	15,090	310,926	20
Federal District	540	522,651	970
Total	3,218,160	14,333,915	4

In these numbers, however, the population is probably much understated, for the great extent of territory and difficulty of communication render a complete enumeration impracticable. An official estimate, supplementing the census returns, puts the total number of inhabitants at 16,330,216. About 25 per cent. of the population are whites, mostly undersized and puny, living in the coast regions; the remainder are mulattoes, negroes, and Indians. There is, however, a large immigration, which is eagerly encouraged by the Government, free passes from Europe, assistance on arrival, and grants of land being provided for settlers. During the twenty-eight years, 1871-98, 1,497,064 immigrants entered Brazil. In the last five years of this period the numbers were:—1894, 63,294; 1895, 164,371; 1896, 157,948; 1897, 112,495; 1898, 53,822. The new-comers in 1898 comprised 33,272 Italians, 11,662 Portuguese, 5943 Spaniards, 669 Austrians and Hungarians, 477 Germans, 247 French, 137 Russians (Jewish), and 129 Swiss. The Italian immigrants betake themselves in great numbers to the coffee plantations in São Paulo, Espiritu Santo, and Minas Geräes. In São Paulo alone, in 1899, the Italian population was returned at 1,020,000. Spaniards and Portuguese usually settle in the northern states, where sugar, cotton, and tobacco are grown, or in cities, where they engage in minor trades and industries. The German settlements are mainly in the southern states, Rio Grande do Sul and Santa Catharina, where the German colonists are estimated to number more than 300,000.



B. V. Darbishire & O. J. R. Howarth *Oxford 1901*

SKETCH MAP OF BRAZIL.

The principal towns, with their population as given in the census of 1890, are:—

Towns.	Population.	Towns.	Population.
Rio de Janeiro	522,651	Juiz de Fóro (Min. Ger.)	74,136
San Salvador (Bahia)	174,412	Queluz ,,	68,270
Recife (Pernambuco)	111,556	São Paulo (S. Paulo)	64,934
San Amaro (Bahia)	79,220	Nazareth (Pernambuco)	63,746
Campos (R. Janeiro)	78,036	S. Barbara (Min. Ger.)	62,423
Sabará (Minas Geräes)	77,754	Grão Mogol ,,	62,136
Serro ,,	75,270	Feira de S. Anna (Bahia)	61,758
Montes Claros (Min. Ger.)	61,555	Muriahé (Min. Ger.)	50,189
Ouro Preto (Min. Ger.)	59,249	Belem (Para)	50,064
Barbacena ,,	57,850	S. João d'El Rey (Min. Ger.)	48,722
Mariana ,,	56,404	Cachoeira (Bahia)	48,352
Porto Alegre (R. G. do Sul)	52,421	Bom Jardim (Pernamb.)	46,742
Purificacão (Bahia)	51,602	Paracatu (Min. Ger.)	46,621

Constitution.—On 15th November 1889 the Emperor Dom Pedro II. was dethroned and a Federal Republic proclaimed, under the title of the United States of Brazil. A Congress, convoked by a Provisional Government and elected by popular vote, met on 15th November 1890, and adopted, on 24th February 1891, the constitution now in force. Each of the old provinces forms a state, administered at its own expense without interference from the Federal Government, except for defence, the maintenance of order (with the consent of the state), and the execution of the federal laws; but fiscal arrangements, in such matters as import duties, stamps, postage, and bank-note circulation, belong to the union. The legislative power is vested in a National Congress of two chambers. The Senate consists of sixty-three members (three for each state and the Federal District), elected for nine years, one-third of the number retiring every three years. Members must be over thirty-five years of age. The Chamber of Deputies contains 212 representatives, chosen for three years; the number sent by any one state must not be less than four, and must not exceed the proportion of one for every 70,000 inhabitants, as determined by a decennial census. Senators and deputies are elected by direct popular vote, every registered Brazilian over twenty-one years of age, not disqualified for special reasons, being an elector. Members of both chambers are paid. The president and vice-president of the republic are likewise elected by direct vote of the people. The term of office is four years, and the retiring president is not eligible for the succeeding term. The election is held on 1st March in the last year of each presidential period, and the new president assumes office on 15th November following. The president is the head of the executive; he sanctions and promulgates laws, issues decrees, and makes treaties (subject to ratification by Congress). He has supreme command of the army and navy, and (with the consent of Congress) appoints federal judges and diplomatic ministers. He is assisted by a cabinet of ministers, who

are nominated and may be dismissed by himself. The ministers are heads of the various departments of Government, but have not seats in either chamber and are not responsible to Congress for advice given to the president of the republic.

Local Government.—Each state has its own constitution, which must be republican, and each has its own legislative and administrative authorities, with whom the central Government cannot interfere, except through the supreme federal tribunal. The Federal District is administered by a council elected by the citizens of the district, the municipal executive authority being exercised by a prefect appointed for a term of four years by the president of the republic. The number of municipal districts in Brazil is stated to be 892, and of parishes with administrative machinery 1886.

Justice.—The administration of justice is entrusted to a federal supreme court of fifteen judges holding office for life, and to inferior federal courts distributed through the country. The states have also their own tribunals, with which the federal courts may not interfere. Justice, however, both civil and criminal, as administered in Brazil, has fallen into reproach. Judicial appointments in the early years of the republic were made with little regard to fitness for office, and so little confidence is placed in the tribunals that many rather submit to flagrant wrong than seek the redress to which they are entitled.

Education.—Education is in a backward condition, and probably 80 per cent. of the population can neither read nor write. According to the constitution, instruction at all its stages is under lay management. Elementary education is free, but not compulsory. Primary schools are under the care of the states and municipalities. In 1891 the number of such schools was returned at 8793 and of pupils 376,399, but the states do not supply complete information concerning their educational work. Secondary and higher education are under both federal and state control. In the capital the former is given in the National Gymnasium and the Benjamin Constant Institute, which confer degrees, and in the states there are institutions of similar purpose. Higher education is mostly of a professional nature. There are law schools at Pernambuco and São Paulo; medical schools at Rio de Janeiro and Bahia; a polytechnic at Rio de Janeiro; a school of mining at Ouro Preto, and a school of fine arts at Rio de Janeiro, all maintained by the Federal Government. There are also free schools of law, engineering, &c., granting diplomas and degrees; but such institutions must obtain Government recognition, must have a fixed endowment, and must have a Government official present when examinations are held. Private schools of all grades are numerous.

Finance.—The national revenue is derived largely from duties on imports; but an inland revenue stamp duty has been imposed on tobaccos, wines, boots and shoes, candles, and several other classes of merchandise. Formerly customs duties were payable entirely in currency; but a decree of 1899 required that 10 per cent. should be paid in gold, practically increasing the duty on many articles. The greater portion of the expenditure passes through the Department of Finance. The annual revenue and expenditure over a series of years, when stated in currency, show a large increase from year to year, but when stated in sterling they exhibit a remarkable decrease. This discrepancy is explained by the rapid depreciation of the inconvertible paper currency. The revenue and expenditure for 1889 and for each of the years 1894-98, stated in sterling, and the value of the paper milreis in pence, were as follows:—

	Exchange.	Revenue.	Expenditure.
	Pence.	£	£
1889	27	18,094,535	20,943,616
1894	10	11,014,384	15,189,594
1895	10	12,820,378	14,370,098
1896	9	12,523,841	14,021,025
1897	8	9,033,253	10,417,460
1898	7	9,429,720	10,911,560

For 1899 the revenue was estimated at 351,114,000 milreis (or, at 7d., £10,182,300), and the expenditure at 328,623,257 milreis (or £9,530,100); for 1900, revenue, 53,975,543 milreis gold and 312,958,000 paper, and expenditure, 36,974,000 milreis gold and 263,162,000 paper; for 1901, revenue, 58,869,000 milreis gold and 278,565,000 paper; expenditure, 35,799,000 milreis gold and 241,125,000 paper.

In 1888, a year before the establishment of the republican *régime*, the internal and external national debts amounted to £74,000,000 sterling, with the currency at par. At the end of 1898 the national debt was stated to consist of: external loans, £38,359,200; internal gold loans, 179,268,500 milreis; internal currency loans, 426,813,100 milreis. There were, in addition, a floating debt of 300,000,000 milreis; Treasury bonds to the amount of £1,000,000, and paper money amounting to 780,000,000 milreis. In 1898 the Government, unable to meet the cost of service of the debt and the payment for railway guarantees, had entered into an arrangement for the issue of a 5 per cent. funding loan to the amount of £10,000,000; the suspension of all amortization for thirteen years; and the withdrawal and incineration of the paper currency *pari passu* with the issue of the loan, the milreis being counted at 18d. The scheme was put in operation in June 1898; by the end of May 1900 the loan emissions amounted to £5,519,982, and paper currency had been destroyed to the amount of 84,672,610 milreis (or 11,091,260 milreis more than the arrangement required). Within the same period the £1,000,000 of Treasury bonds had been paid off, and of the internal gold debt (the service of which, in gold, had disturbed the market) 22,807,000 milreis (£2,534,000) was redeemed and the remainder converted into currency debt. Interest is paid on the external debt at 4, 4½, and 5 per cent.; on the currency debt at 4, 5, and 6 per cent.

Besides the national debt there are Brazilian state debts of considerable importance. In 1899, sixteen states had internal debts amounting, in all, to 81,708,627 milreis; four had floating debts reaching, on the aggregate, 10,311,182 milreis; and five had external debts amounting to £9,168,000 sterling; but of this amount £1,930,750 was due to the Federal Government. The external debts of states were those of São Paulo, £3,224,600; Bahia, £2,013,200, of which £1,300,000 was due to the Federal Government; Minas Geraes, £2,600,000; Espiritu Santo, £700,000; Pernambuco, £630,750, due to the Federal Government.

Defence.—The *army* consisted in 1899 of 2300 officers and 28,160 non-commissioned officers and men, organized in 40 battalions of infantry, 14 regiments and 1 corps of cavalry, 6 regiments of field, and 6 regiments of garrison artillery, and 2 battalions of engineers. Military service is nominally but not actually compulsory. The organization of an effective National Guard has been proposed. The rifle used is the Mannlicher for all the land forces. In addition to the regular troops there are the armed police, numbering 20,000 men. These are used as soldiers when occasion demands, and for all practical purposes form part of the military organization. Brazil is divided into seven military districts. In the military schools there are 1400 students.

The *navy* has been largely reinforced in recent years by the purchase of modern vessels, and the rearming and partial reconstruction of several of the older ships. The list of ships available for service now includes 2 armoured and 2 partly armoured turret ships; 6 first-class and 2 second-class cruisers; 1 guard ship; 3 monitors for river work, besides 2 building; 37 torpedo craft of various kinds.

For service afloat there are 4000 seamen, 1000 firemen, 400 marines, and 3000 cadets and boys in the naval schools and training ships. The school at Rio de Janeiro, from which the cadets graduate to the rank of midshipmen, is one of the best of the Brazilian educational establishments; it is selected by many of the prominent Brazilians for their sons, and, as a consequence, many representatives of the leading families of Brazil are found in the naval service. There are four naval arsenals, the principal one at Rio de Janeiro, the others at Bahia, Pernambuco, and Pará. At Rio de Janeiro there is a dry-dock in the naval yard on Cobras Island capable of receiving any of the vessels now on the navy list. There is also a slip for the use of torpedo boats and other craft of smaller dimensions. In the navy the small-arm in use is the Mauser rifle.

Products.—Brazil has exceptional natural resources; and with settled government, and necessary protection for life and property, this wealth must sooner or later be developed. The most important agricultural product is coffee, the cultivation of which has largely extended. When slavery was abolished in 1888 the owners of coffee plantations were brought face to face with two serious difficulties. The freeing of the slaves without compensation inflicted on the owners an enormous monetary loss, for the money laid out in the purchase of negroes had formed a large portion of their working capital, and, moreover, it was doubtful whether the former slaves would work at all after having obtained their freedom. Fortunately for Brazil, the prices for coffee in Europe at this crisis were high, and became abnormally so in 1889 and 1890. Money to work the plantations was easily obtained by mortgage of properties, although the rates of interest charged were very high. At first the negroes were not inclined to work; but after the novelty of the change had passed, large numbers of them returned to the plantations as labourers. To make up the deficiencies, immigration from Italy and Portugal was encouraged and supplied labour more satisfactory than that of the former slaves.

Of late years the wealthier coffee-growers, instead of investing their profits in Government bonds as formerly, have made use of them to extend their plantations. A considerable amount of foreign capital, especially British, has been invested in the industry, and improved methods of cultivation and preparation have come into use. The total coffee production of Brazil in the year 1879-80 and in the eleven years ending 1898 is estimated to have been as follows (in bags of 132 lb):—

Year.	Bags.	Year.	Bags.
1879-80	3,172,000	1892-93	6,193,000
1887-88	3,006,000	1893-94	4,307,000
1888-89	6,735,000	1894-95	6,689,000
1889-90	4,220,000	1895-96	6,250,000
1890-91	5,308,000	1896-97	8,680,000
1891-92	7,376,000	1897-98	11,110,000

For 1898-99 the yield was estimated at 9,280,000, and for 1899-1900 at about 11,500,000 bags.

Next in importance to coffee culture is the production of rubber. The trees from the milky juice of which rubber is manufactured are of several kinds. The *Manihot Glaziovii*, or manicoba, is worked in the state of Ceará, and its propagation is being tried also in the state of Rio de Janeiro. The *Hancornia speciosa*, or mangabeira, is the rubber plant of Maranhão, and it is also being planted in Bahia. The tree which is most productive, however, is the *Hevea brasiliensis*, or seringueira, growing in the valley of the Amazon. It is found sparsely scattered over the forests on the Amazon and its tributaries, the region of the Purus in Bolivia being regarded as the richest. During five months of the year, August-December, the juice of this tree is gathered by labourers who, for the whole extent of the valley, are estimated to number about 120,000, the number of trees annually tapped being put at about 24,000,000. From the whole valley, including its upper portions in Peru and Bolivia, the rubber is sent down the river to Pará, whence it is shipped under the name of "Pará rubber" to Europe and the United States. The quantity shipped to foreign countries in 1897 amounted to 22,180 tons; in 1898, to 21,880 tons; in 1899, to 25,030 tons. Of the shipments in 1899, 13,660 tons went to the United States of America, and the remainder to Europe.

Apart from coffee and rubber, there has not been remarkable development in the agricultural and forest industries of Brazil. Tobacco, cocoa, and cotton cultivation have slightly extended, but sugar-growing has decreased. The centres of the sugar industry are Bahia and Pernambuco. Food-stuffs, which might be grown abundantly in the country, are imported, the local production of maize, beans, and many other articles of common use being insufficient for local demands.

Cattle-breeding is carried on to a large extent in the states of Minas Geraes, Paraná, Santa Catharina, and Rio Grande do Sul. The southern states have been so greatly disturbed by revolutionary outbreaks that the number of cattle has decreased, in spite of the natural advantages of the country. In Rio Grande do Sul the *saladero* establishments prepare the meat into *tasajo*, or jerked beef.

Minerals.—Mining enterprise may possibly offer attractions for the investment of capital on a large scale. The diamond fields, far from being exhausted, have hardly been prospected. Difficulties of transport have proved a great obstacle; but a French syndicate has undertaken a thorough investigation of the Diamantina district, where the bulk of the stones hitherto exported from Brazil have been found. Gold-mining is also becoming an important industry, especially in the state of Minas. The output is annually increasing, and the required capital is slowly coming forward. Low grade ores are to be found in many districts; but the machinery necessary to work the mines is expensive, and investors are cautious. Iron ore exists in large quantities in several of the states, but no attempt has hitherto been made to work it. Coal has been found in different parts of Southern Brazil, and is regularly mined in Rio Grande do Sul. The output in 1895 was 11,012 tons, and in 1896 18,300 tons. Difficulties of transport have stood in the way of any rapid expansion in the coal-mining industry.

Commerce.—The commerce during recent years has suffered from the effects of the inflation of prices and over-trading which took place in 1890 and 1891; from fluctuation in the value of the currency; from the fall in the price of coffee, the main article of export, and from the additional taxation imposed by the Government in the beginning of 1899. There are no complete or trustworthy statistics of the trade of the republic, such general statements as are published being merely estimates. In 1899 a Commercial Statistical Department was established, a journalist statistician having offered gratuitous service; and hereafter more exact information, at least as regards imports, will probably be supplied. The estimated value in sterling of the imports and exports from 1893 onwards are given as follows:—

Year.	Imports.	Exports.
1893	£17,789,570	£32,827,826
1894	15,653,886	27,547,944
1895	15,420,292	29,015,000
1896	17,023,012	26,027,137
1897	21,567,660	26,752,224
1898	24,486,000	27,442,450
1899	20,000,000	24,500,000

The imports are mainly textiles, food-stuffs, coal, iron, machinery, and hardware; while the exports consist of coffee, rubber, hides and skins, cocoa, the precious metals, manganese ore, sugar, and tobacco. The coffee shipments in 1898 were valued at £15,500,000, and the rubber at £4,600,000. The export of hides in the same year amounted to £450,000, and of cocoa, to £400,000. As to the distribution of the trade of the republic, there are no sufficient data. At the port of Rio de Janeiro in 1899 the imports were stated to amount to the value of 229,207,000 milreis, which at 8d. per milreis would be equivalent to £7,640,230. Of this amount 41 per cent. came from Great Britain, 11 from Germany, 10 from France, 9 from the Argentine Republic, 8 from the United States, 6 from Uruguay, and 5 from Portugal. According to British statistics, the imports from Brazil into the United Kingdom in 1899 amounted to the value of £3,959,854, of which £3,089,499 was for rubber. The exports from the United Kingdom to Brazil in the same year amounted to £5,389,540. According to American statistics, the value of the imports from Brazil into the United States in 1899 amounted to $57,875,747 (£12,038,150), of which $35,253,010 (£7,332,600) was for coffee, and $16,999,345 (£3,535,860) for rubber. The exports from the United States to Brazil in the same year amounted to $12,239,036 (£2,545,720).

The import customs receipts of the republic in 1898 amounted to 245,909,405 milreis; in 1899 to 271,203,228 milreis (or about £8,196,900 in 1898, and £9,040,100 in 1899). Export duties are not levied by the Federal Government, but by the governments of the separate states. In some states taxes on exports are the chief source of revenue. The state of Pará in 1897-98 had a revenue of £568,000, of which £476,000 was derived from export duties, £437,000 being from rubber exports alone.

Foreigners take a large share in the commerce of Brazil, both in high finance and regular trading. The British and German banks practically control the exchange market; and the Banco da Republica, the Brazilian state bank, in spite of many attempts, has not yet proved strong enough to change the existing condition of affairs. As merchants and importers the British element is well represented in most branches of trade, but numerically the Portuguese are stronger. In São Paulo the trade is mostly in the hands of Italians; in Bahia, Santa Catharina, and Rio Grande do Sul, the German influence is very strong.

Manufactures.—Of the manufacturing industries the most important is the production of cotton goods, such as sheetings, ginghams, and prints from cotton grown in the northern states, chiefly Pernambuco. There were, in 1899, altogether 134 cotton factories within the republic. In or near Rio de Janeiro were 19, with a total of 288,066 spindles and 10,100 looms, turning out 132,228,000 yards annually. There are several woollen factories in South Brazil. At Rio de Janeiro (Petropolis) there are two silk-mills and two large flour-mills. Other industries more or less prosperous are distilling, brewing, the manufacture of boots and shoes, hats, cord and twine, saddlery, and coarse hempen cloth for coffee sacks.

Shipping.—In 1898 the merchant marine consisted of 229 steamers, with an aggregate net tonnage of 94,262 tons; and 344 sailing vessels, with a total tonnage of 88,000 tons. In recent years the number of vessels engaged in the foreign trade entering and clearing at the port of Rio de Janeiro has considerably declined. In 1896, 1535 vessels of 2,469,628 aggregate tonnage entered, and 1404 of 2,282,999 tons cleared. In 1899, 1077 vessels of 1,916,949 tons entered, and 1019 of 1,859,707 tons cleared. Of the vessels entered in 1899, 482 of 956,362 aggregate tonnage were British; 153 of 330,784 tons were French, 136 of 242,774 were German; and 79 of 166,887 were Italian. The number of vessels engaged in the coasting trade that entered the port in 1899 was 1085, with a total tonnage of 395,498; and the number that cleared was 1085, with a tonnage of 370,447. Since December 1896 the coasting and river trade has been exclusively under the Brazilian flag. The principal steamship company engaged in the coastwise trade was, for ten years, the Lloyd Brazillero with 22 steamers; but the company was not financially successful, and in April 1900 its property was sold for the benefit of creditors. The Government pays an annual subsidy, amounting to 1,476,240 milreis, to the Maranhão and the Pernambuco companies which run between Pernambuco, Ceará, and Sergipe and the island of Fernando de Noronha. For river navigation, including the Amazon, its tributaries, Lakes Norte and Manguaba (state of Alagôas), the Rio das Velhas, and the San Francisco, the Government pays an annual subsidy of 13,334,000 milreis.

Railways.—Railway enterprise has made some progress, but the disordered financial condition of the country has acted as a bar to the free investment of foreign capital. In 1899 the number of miles open to traffic and in construction was—

	Miles.	
	Open.	In Construction.
Property of the Federal Government	2004	...
Subsidized	2445	3720
Without subsidy	995	387
Worked or conceded by State Governments	3279	885
Total	8723	4992

The railway system connects Rio de Janeiro with Santos and São Paulo to the south, and with the states of Minas and Espiritu Santo to the north. The remaining railways are in isolated sections at Pernambuco, Bahia, Paranagua, Santa Catharina, and the eastern and western districts of Rio Grande do Sul. The intention originally was to link these various sections together, and form a trunk line from Pernambuco to Rio Grande, thence making connexion with the Uruguayan railway system. Various definite schemes are in hand for connecting and extending railways and tramways (electric and other); but, between judicial embargo and Government imposts, success in such enterprises is difficult to attain.

Posts and Telegraphs.—The postal service of Brazil shows a large annual deficit, on account of the vastness of the country, the difficulties of communication, and the great abuse of the franking privilege. In 1893 there were 2826 post offices, and the mails carried 33,441,000 letters and post-cards, and 37,674,000 samples and printed packets. The telegraph system of Brazil extends over nearly all the country, and is under Government control (some cable lines only excepted). At the close of 1896 the trunk lines were 4250 miles long, with 14,520 miles of wire; the branch lines, 8300 miles, with 10,620 miles of wire; or a total of 12,550 miles, with 25,140 miles of wire. There were also 1770 miles of line along the railways. At the same date there were 376 telegraph stations (45 of which had telephone service) and 17 cable stations. The service, notwithstanding the transmission of more than 1,300,000 telegrams, showed a deficit of 5,000,000 milreis, due to too low rates and privileges to officials and the press.

Money and Credit.—The standard of value is gold, the monetary unit being the gold milreis, worth 2s. 2½d. at par. The 10-milreis gold piece weighs 8·9648 grammes, ·916 fine, and thus contains 8·2178 grammes of pure gold. The 2-milreis silver piece weighs 25·25 grames, ·916 fine. The existing currency, however, is almost entirely paper, which, owing to the large emissions made in the earlier years of the republic, is of depreciated value. The lowest point was reached in April 1898, when the paper milreis was worth only 5·81 pence. In June 1898 the scheme for the withdrawal of the paper money was put in force, and by the end of May 1900 the amount had been reduced from 785,941,758 milreis to 701,269,148 milreis. In addition to this arrangement two funds have been established—one for the redemption of the paper currency, the other for guaranteeing the notes continuing to circulate. Into the latter fund will be paid 5 per cent. of the import duties payable in gold, and moneys from other sources, including the amount received or to be received from the Bank of the Republic. When this bank was reorganized in 1897 it was agreed that its debt due to the Treasury should be extinguished within twenty years. But early in 1900 an arrangement was made whereby the whole amount of 186,000,000 milreis, comprising 66,000,000 milreis due from the bank itself, 80,000,000 from the industrial *bonuses* account, and 40,000,000 from the mortgage bank account, should be extinguished by a present payment of 25,000,000 milreis (at 8d.), and further payments in four instalments amounting to another 25,000,000 milreis within two years.

The metric system of weights and measures was made compulsory in 1874, but the old system has lingered on.

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(W. W. R.; I. P. A. R.)

2. RECENT HISTORY.

Under the long reign of Dom Pedro II. progress and material prosperity made steady advancement in Brazil. Occasional political outbreaks occurred, but none of very serious nature except in Rio Grande do Sul, where a long guerilla warfare was carried on against the imperial authority. The emperor occupied himself to a far greater extent with the economic development of his people and country than with active political life. Unostentatious in his habits, Dom Pedro always had at heart the true interests of the Brazilians. Himself a highly-educated man, he sincerely desired to further the cause of education, and devoted a large portion of his time to the study of this question. His extreme Liberalism prevented his opposing the spread of Socialist doctrines preached far and wide by Benjamin Constant. Begun about 1880, this propaganda took deep root in the educated classes, creating a desire for change and culminating in the military conspiracy of November 1889, by which monarchy was replaced by a Republican form of government.

At first the revolutionary propaganda produced no personal animosity against the emperor, who continued to be treated by his people with every mark of respect and affection, but this state of things gradually changed. In 1864 the Princess Isabella, the eldest daughter of the emperor and empress, had married the Comte d'Eu, a member of the Orleans family. The marriage was never popular in the country, owing partly to the fact that the Comte d'Eu was a reserved man who made few intimate friends and never attempted to become a favourite. Princess Isabella was charitable in many ways, always ready to take her full share of the duties falling upon her as the future empress, and thoroughly realizing the responsibilities of her position; but she was greatly influenced by the clerical party and the priesthood, and she thereby incurred the hostility of the Progressives. When Dom Pedro left Brazil for the purpose of making a tour through Europe and the United States he appointed Princess Isabella to act as regent, and she showed herself so swayed in political questions by Church influence that Liberal feeling became more and more anti-dynastic. Another incident which gave strength to the opposition was the sudden abolition of slavery without any compensation to slave-owners. The planters, the principal possessors of wealth, regarded the measure as unnecessary in view of the Act which had been passed in 1885 providing for the gradual freeing of all slaves. The arguments used were, however, of no avail with the regent, and the decree was promulgated on 13th May 1888. No active opposition was offered to this measure, but the feelings of unrest and discontent spread rapidly.

Towards the close of 1888 the emperor returned and was received by the populace with every demonstration of affection and esteem. Even among the advocates of Republicanism there was no intention of dethroning Dom Pedro, excepting a few extreme members of the party, who now gained the upper hand. They argued that it would be much more difficult to carry out a successful *coup d'état* when the good-natured, confiding emperor had been succeeded by his more suspicious and energetic daughter. Discontented officers in the army and navy rallied to this idea, and a conspiracy was organized to depose the emperor and declare a republic. On 14th November 1889 the palace was quietly surrounded, and on the following morning the emperor and his family were placed on board ship and sent off to Portugal. A Provisional Government was then formed and a proclamation issued to the effect that the country would henceforth be known as the United States of Brazil, and that in due time a republican constitution would be framed. The only voice raised in protest was that of the minister of war, and he was shot at and severely wounded as a consequence. Dom Pedro, completely broken down by the ingratitude of the people whom he had loved so much and laboured for so strenuously, made no attempt at resistance. The Repub-

lican Government offered to compensate him for the property he had held in Brazil as emperor, but this proposal was declined. His private possessions were respected, and were afterwards still held by Princess Isabella.

The citizen named as president of the Provisional Government was General Deodoro da Fonseca, who owed his advancement to the personal friendship and assistance of Dom Pedro. Second in authority was placed General Floriano Peixoto, an officer also under heavy obligations to the deposed monarch, as indeed were nearly all of those who took active part in the conspiracy.

Though the overthrow of the imperial dynasty was totally unexpected throughout, the new *régime* was accepted without any disturbances. Under the leadership of General Deodoro da Fonseca a prætorian system of government, in which the military element was all-powerful, came into existence, and continued till February 1891, when a National Congress assembled and formulated the constitution for the United States of Brazil. The former provinces were converted into states, the only right of the Federal Government to interfere in their administration being for the purposes of national defence, the maintenance of public order, or the enforcement of the federal laws. Under the terms of the constitution the legislative authority is exercised by the National Congress, with the assent of the president of the republic. Congress consists of the senate and the chamber of deputies, and meets annually on 3rd May unless specially convoked for another day. The ordinary sessions last for four months, but may be prorogued beyond that period. No member of congress, after his election, can make any contract with the executive power, or accept any commission or paid office, except such as are diplomatic, military, or imposed by law, nor can any member be a director of any company receiving a subsidy from the Federal Government. Deputies and senators are paid; they cannot be ministers of state and retain their seats in congress. The president of the republic, in whom is vested the executive authority, is elected by the direct vote of the people, as is also the vice-president. The election is held on 1st March, and the term of office is four years. The outgoing president is not eligible for election for the succeeding term. All citizens over 21 years of age, properly inscribed and not being beggars, "illiterates," soldiers serving in the army or members of monastic orders under vows of obedience, have the franchise. The fiscal arrangements of the constitution provide that import duties, stamps, post office revenue, and bank-note circulation are the property of the Federal Government; but export duties, formerly an imperial source of revenue, belong to the states. The Constitution of the United States of America was taken as a model for drawing up that of Brazil, and the general terms were as far as possible adhered to.

General da Fonseca and General Floriano Peixoto were elected to fill the offices of president and vice-president until 15th November 1894. This implied the continuance of prætorian methods of administration. The older class of more conservative Brazilians, who had formerly taken part in the administration under the emperor, withdrew altogether from public life. Many left Brazil and went into voluntary exile, while others retired to their estates. In the absence of these more respectable elements, the government fell into the hands of a gang of military adventurers and unscrupulous politicians, whose only object was to exploit the national resources for their own benefit. As a consequence, deep-rooted discontent rapidly arose. A conspiracy, of which Admiral Wandenkolk was the prime instigator, was discovered, and those who had taken part in it were banished to the distant state of Amazonas. Disturbances then broke out in Rio Grande do Sul, in consequence of disputes between the official party and the people living in the country districts. Under the leadership of Gumercindo Saraïva the country people broke into open revolt in September 1891. This outbreak was partially suppressed, but afterwards it again burst into flame with great vigour. In view of the discontent, conspiracies, and revolutionary movements, President da Fonseca declared himself dictator. This act, however, met with such strong opposition that he resigned office on 23rd November 1891, and Vice-President Floriano Peixoto assumed the presidency.

Floriano Peixoto had been accustomed all his life to use harsh measures. For the first year of his term of office he kept seditious attempts in check, but discontent grew apace. Nor was this surprising to those who knew the corruption in the administration. Concessions and subsidies were given broadcast for worthless undertakings in order to benefit the friends of the president. Brazilian credit gave way under the strain, and evidences were not wanting at the beginning of 1893 that an outburst of public opinion was not far distant. Nevertheless President Peixoto made no effort to reform the methods of administration. Meanwhile, the revolution in Rio Grande do Sul had revived; and in July 1893 the Federal Government was forced to send most of the available regular troops to that state to hold the insurgents in check.

On 6th September prevailing discontent took definite shape in the form of a naval revolt in the Bay of Rio de Janeiro. Admiral Custodio de Mello took command of the naval forces, and demanded the resignation of the president. General Peixoto replied by organizing a defence against any attack from the squadron. Admiral Mello, finding that his demands were not complied with, began a bombardment of the city, but did not effect his purpose of compelling Peixoto to resign. The foreign ministers then arranged a compromise between the contending parties, to the effect that President Peixoto should place no artillery in the city, on condition that Admiral Mello should refrain from bombarding the town, provided the president did not place in it heavy artillery. Shortly afterwards the cruiser *Republica* and a transport ran the gauntlet of the Government forts at the entrance of the bay, and proceeded south to the province of Santa Catharina, taking possession of Desterro, its capital. A Provisional Government was proclaimed by the insurgents, with headquarters at Desterro, and communication was opened with Gumercindo Saraïva, the leader of the insurrection in Rio Grande do Sul. It was proposed that the army of some 10,000 men under his command should advance northwards towards Rio de Janeiro, while the insurgent squadron threatened the city of Rio. In November Admiral Mello left Rio de Janeiro in the armoured cruiser *Aquidaban* and went to Desterro, the naval forces in Rio Bay being left in charge of Admiral Saldanha da Gama, an ardent Monarchist, who had thrown in his lot with the insurgent cause. All was, apparently, going well with the revolt, Saraïva having invaded the states of Santa Catharina and Paraná, and defeated the Government troops in several encounters. Meanwhile, President Peixoto had fortified the approaches to the city of Rio de Janeiro, bought vessels of war in Europe and the United States, and organized the National Guard.

Early in 1894 dissensions occurred between Saraïva and Mello, which prevented any advance of the insurgent forces, and allowed Peixoto to perfect his plans. Admiral da Gama, unable to leave the Bay of Rio de Janeiro on account of lack of transport for the sick and wounded and the civilians claiming his protection, could do no more than wait for Admiral Mello to return from Desterro.

In the meantime the ships bought by President Peixoto arrived off Rio de Janeiro and prevented da Gama from escaping. On 15th March 1894 the rebel forces evacuated their positions on the islands of Villegaignon, Cobras, and Enxadas, abandoned their vessels, and were received on board two Portuguese warships then in the harbour, whence they were conveyed to Montevideo. The action of the Portuguese commander was prompted by a desire to save life, for, had the rebels fallen into the hands of Peixoto, they would assuredly have been executed.

When the news of the surrender of Saldanha da Gama reached Gumercindo Saraïva, then at Curitiba in Paraná, he proceeded to retire to Rio Grande do Sul. Government troops were despatched to intercept his retreat, and in one of the skirmishes which followed Saraïva was killed. The rebel army then dispersed. Admiral Mello made an unsuccessful attack on the town of Rio Grande, and then sailed to Buenos Ayres, there surrendering the rebel squadron to the Argentine authorities, by whom it was immediately delivered to the Brazilian Government. After six months of civil war peace was once more established, but there still remained some small rebel groups in Rio Grande do Sul. These were joined by Admiral da Gama and a number of the naval officers, who had escaped from Rio de Janeiro; but in June 1895 the admiral was killed in a fight with the Government troops. After the cessation of hostilities, the greatest barbarities were practised upon those who, although they had taken no part in the insurrection, were known to have desired the overthrow of President Peixoto. The Baron Cerro Azul was shot down without trial; Marshal de Gama Eza, an old imperial soldier of eighty years of age, was murdered in cold blood, and numerous executions of men of lesser note took place, among these being two Frenchmen for whose death the Brazilian Government was subsequently called upon to pay heavy compensation.

General Peixoto was succeeded as president on 15th November 1894 by Dr Prudente de Moraes Barros. It was a moot question whether Peixoto, after the revolt was crushed, would not declare himself dictator; certainly many of his friends were anxious that he should follow this course, but he was broken down by the strain which had been imposed upon him, and was glad to surrender his duties. He did not recover his health, and died shortly afterwards.

From the first day that he assumed office, President Moraes showed that he intended to suppress prætorian systems and reduce militarism to a minimum. This policy received the approval and sympathy of the majority of Brazilians, but naturally met with bitter opposition from the military element. The president gradually drew to him some members of the better Conservative class to assist in his administration, and felt confident that he had the support of public opinion. Early in 1895 murmurings and disorderly conduct against the authorities began to take place in the military school at Rio de Janeiro, which had always been a hotbed of intrigue. Some of the officers and students were promptly expelled, and the president closed the school for several months. This salutary lesson had due effect, and no more discontent was fomented from that quarter. Two great difficulties stood in the way of steering the country to prosperity. The first was the chaotic confusion of the finances resulting from the maladministration of the national resources since the deposition of Dom Pedro II., and the corruption that had crept into every branch of the public service. Much was done by President Moraes to correct abuses, but the task was of too herculean a nature to allow of accomplishment within the four years during which he was at the head of affairs. The second difficulty was the war waged by religious fanatics under the leadership of Antonio Maciel, known as "Conselheiro," against the constituted authorities of Brazil.

The story of Conselheiro is a remarkable one. A native of Pernambuco, when a young man he married against the wishes of his mother, who took a violent dislike to the bride. Shortly after the marriage the mother assured her son that his wife held clandestine meetings with a lover, and stated that if he would go to a certain spot not far from the house that evening he would himself see that her assertion was true. The mother invented some plea to send the wife to the trysting-place, and then, dressing herself in male clothing, prepared to come suddenly on the scene as the lover, trusting to be able to make her escape before she was recognized. The three met almost simultaneously. Conselheiro, deeming his worst suspicions confirmed, shot and killed his wife and his mother before explanations could be offered. He was tried and allowed to go at liberty after some detention in prison. From that time Conselheiro was a victim of remorse, and to expiate his sin became a missionary in the *sertao* or interior of Brazil among the wild Jagunço people. He built places of worship in many different districts, and at length became the recognized chief of the people among whom he had thus strangely cast his lot. Some few years ago Conselheiro formed a settlement near Canudos, situated about 400 miles inland from Bahia. Difficulty arose between the governor of Bahia and this fanatical missionary, with the result that Conselheiro was ordered to leave the settlement and take away his people. This order was met with a sturdy refusal to move. Early in 1897 a police force was sent to eject the settlers, but encountered strong resistance, and suffered heavy loss without being able to effect the purpose intended. In March 1897 a body of 1500 troops, with four guns, was despatched to bring the Jagunçoes to reason, but was totally defeated. An army comprising some 5000 officers and men was then sent to crush Conselheiro and his people at all costs. Little progress was made, the country being difficult of access and the Jagunçoes laying ambuscades at every available place. Finally strong reinforcements were sent forward, the minister of war himself proceeding to take command of the army, now numbering nearly 13,000 men. Canudos was besieged and captured in September 1897, Conselheiro being killed in the final assault. The expense of these expeditions was very heavy, and prevented President Moraes from carrying out many of the retrenchments he had planned.

Soon after the Canudos affair a conspiracy was hatched to assassinate the president. He was watching the disembarkation of some troops when a shot was fired which narrowly missed him, and killed General Bitencourt, the minister of war. The actual perpetrator of the deed, a soldier, was tried and executed, but he was apparently ignorant of the persons who procured his services. Three other men implicated in the conspiracy were subsequently sentenced to imprisonment for a term of thirty years. The remainder of the presidency of Dr Moraes was uneventful; and on 15th November 1898 he was succeeded by Dr Campos Salles, who had previously been governor of the state of São Paulo. President Salles publicly promised political reform, economy in the administration, and absolute respect for civil rights, and speedily made efforts to fulfil these pledges.

Brazil lacks to-day the first principles of Republican government. The people have no real voice in the election of congress or president. Political representation is governed by groups forming miniature oligarchies in the different states, and these autocratically determine how the elections shall result. Only a small proportion of the population entitled to vote can be induced to attend the

ballot, those who do so only coming forward because of influence brought to bear upon them, and not of their own free will. The great mass of the population is not at present capable of understanding the meaning of political freedom, and of the responsibility which such a state of affairs entails upon the inhabitants of any country where universal suffrage is granted. (C. E. A.)

Brazil, capital of Clay county, Indiana, U.S.A., situated in the western part of the state, 16 miles E. of Terre Haute, at an altitude of 648 feet. It is a coal-mining town of some importance, and the point of intersection of four railways. Population (1880), 3441; (1890), 5905; (1900), 7786.

Brazza, an island in the Adriatic, off the coast of Dalmatia. Population (1900), 24,465. It is the largest of the Dalmatian islands as well as the most thickly populated and fertile. The port of Milná is now a station of the Austrian Lloyd, and is provided with shipwrights' wharves. There are some twenty-five hamlets in the island. The cultivation of the silkworm is now included among the resources of the inhabitants.

Brazza, Pierre Paul François Camille de, Count de Savorgnan (1852-——), French explorer and administrator, of Italian extraction, was born on 26th January 1852, on board a vessel in the harbour of Rio de Janeiro. He was educated at the Jesuits' College at Paris, and, although a foreigner, served in the French navy. In 1874 he was naturalized as a Frenchman, and in 1875 was sent on a mission to explore the basin of the river Ogowe, in the neighbourhood of the French colony of the Gaboon river in Western Africa. The exploration occupied him three years, in which, notwithstanding his success in conciliating the natives, he underwent great hardships. He nevertheless proved the practicability of penetrating into Central Africa by way of the Ogowe, and in 1879 was despatched on another expedition by the African Association of France. In the course of this exploration M. de Brazza and his companions established twenty-seven posts, including the towns of Francheville and Brazzaville, and greatly extended the sphere of French influence by treaties with the native chiefs. He returned in 1882, and in 1883 was despatched by the French Government with a commission to consolidate French authority in the country. Having organized the administration as well as circumstances permitted, he returned to France and was made commissary-general of the new settlements in 1886. In 1887 he departed to assume the government, found the colony suffering from discord, and was obliged by sickness to return for a time. Upon his recovery he went out again, and organized another important expedition in 1891. He finally returned to France in 1897.

Brazzaville. See French Congo.

Brechin, a royal and parliamentary burgh (Montrose group) of Forfarshire, Scotland, 8½ miles W.N.W. of Montrose by road; now the terminus of two branches of the Caledonian railway. Recent erections are Episcopal, United Free, and Established churches, a public library, new municipal buildings, new post office, and new railway station. The ancient cathedral is to be restored. Population (1881), 9031; (1901), 8941.

Breckinridge, John Cabell (1821-1875), American soldier and statesman, was born near Lexington, Kentucky, on 21st January 1821. He graduated at Centre College, and for many years was a successful lawyer in Lexington. He was major of a regiment of Kentucky volunteers in the Mexican war. Subsequently he became a member of the Kentucky House of Representatives, and then for two terms was a representative in Congress. From 1857 to 1861 he was vice-president of the United States. He belonged to the pro-slavery branch of the Democratic party, and was its candidate for the presidency in 1860, in opposition to Stephen A. Douglas. In the electoral college 72 votes were cast for him, 180 for Lincoln, 39 for Bell, and 12 for Douglas. He became United States senator from Kentucky in March 1861, but soon joined the Confederate army, and was expelled from the United States Senate. As major-general in the Confederate service he achieved much distinction. He was secretary of war of the Confederacy from January to April 1865, when that government collapsed. He escaped to Cuba and went to Europe, but in 1868 he returned to his practice as a lawyer. He died at Lexington, 17th May 1875.

Brecon, Brecknock, or **Brecknockshire,** a county of South Wales, bounded on the N.W. by Cardigan, on the N. and N.E. by Radnor, on the E. by Hereford and Monmouth, on the S. by Monmouth and Glamorgan, and on the W. by Carmarthen.

Area and Population.—The area of the ancient county is 475,224 acres, or 743 square miles; population (1881), 57,746; (1891), 57,031 (of whom 28,509 were males, and 28,522 females, the number of persons per square mile being 77, and of acres to a person 8·33); (1901), 59,906. The area of the administrative county is 469,894 acres, with a population in 1891 of 51,393. The area of the registration county is 458,652 acres, with a population in 1891 of 52,872. Within the registration area there was between 1881 and 1891 a decrease in the population of 2·34 per cent. The excess of births over deaths between 1881 and 1891 was 5691, but the resident population decreased by 1268. The following table gives the numbers of births, deaths, and marriages, with the number and percentage of illegitimate births for 1880, 1890, and 1898:—

Year.	Marriages.	Births.	Deaths.	Illegitimate Births.	
				Number.	Per Cent.
1880	370	1627	1126	116	7·1
1890	422	1534	1018	89	5·8
1898	345	1574	919	84	5·3

There were in the county (in 1891) 203 natives of Scotland, 308 natives of Ireland, and 122 foreigners, while 31,086 of the population could speak English, 5228 Welsh, and 13,699 English and Welsh.

Constitution and Government.—The county returns one member to parliament, and also contains part of the parliamentary borough of Merthyr Tydfil. There is one municipal borough, Brecon. The urban districts are Brynmawr, Builth, and Hay. Brecknock is in the South Wales circuit, and assizes are held at Brecon, which has also a separate commission of the peace. The ancient county, which is partly in the diocese of Llandaff and partly in that of St. Davids, contains sixty-six entire parishes and districts, and parts of three others.

Education.—The number of elementary schools on 31st August 1899 was 87, of which 42 were board and 45 voluntary schools, 37 of the latter being National Church of England schools, and 8 "British and other." The average attendance at voluntary schools was 3268, and at board schools 5134. The total school board receipts for the year ending 29th September 1899 were nearly £19,863. The income under the Agricultural Rates Act was £980.

Agriculture.—Only a little more than five-twelfths of the county is under cultivation, and of this about three-fourths is in permanent pasture. There are also nearly 205,000 acres in hill pasture, and about 14,000 acres under woods. Oats occupy more than half the acreage under corn crops, barley more than one-fifth, and wheat about one-sixth. About four-fifths of the green crop area is under turnips, and less than one-seventh under potatoes. The following table gives the larger main divisions of the cultivated area at intervals of five years from 1880:—

Year.	Total Area under Cultivation.	Corn Crops.	Green Crops.	Clover.	Permanent Pasture.	Fallow.
1880	200,205	30,292	6817	22,428	136,442	4226
1885	204,483	27,455	7138	23,498	143,170	3072
1890	206,464	25,709	7517	19,555	151,203	2467
1895	202,345	22,866	7129	19,714	151,456	1149
1900	203,406	21,422	6903	20,893	153,208	969

The following table gives particulars regarding the live stock for the same years:—

Year.	Total Horses.	Total Cattle.	Cows or Heifers in Milk or in Calf.	Sheep.	Pigs.
1880	11,182	35,668	13,576	381,611	7421
1885	12,235	39,736	15,554	386,717	9423
1890	12,418	38,812	15,473	448,877	9723
1895	12,785	40,014	15,117	456,069	9813
1900	12,065	41,920	15,782	489,417	8232

Industries and Trade.—According to the report for 1898 of the chief inspector of factories (1900), the total number of persons employed in textile and non-textile factories and workshops in 1897 was 1073 as compared with 995 in 1896. Non-textile factories claim the large majority, and workshops nearly all the remainder. The number of persons employed in the mining industry in 1899 was 1968. The most valuable mineral is coal (chiefly anthracite). The following table gives particulars of the output in 1890 and 1899:—

	1890.	1899.
Tonnage . .	259,260	383,465
Value . .	£109,563	£142,930

Much valuable limestone is also obtained; 300,151 tons, valued at £41,892, being raised in 1899. In the same year 25,919 tons of gravel and sand were raised, and 75,413 tons of sandstone.

AUTHORITIES.—JONES. *History of the County of Brecknock*, 2 vols. Brecknock, 1805-1809.—POOLE. *Illustrated History of Brecknockshire*, 1886.—KILNER. *Four Welsh Counties*. London, 1891. See also the Guides to South Wales. (T. F. H.)

Breda, a town and railway station (1886) in the province of North Brabant, Netherlands, 30 miles N.N.E. of Antwerp, situated on the Mark, at its junction with the Aa, where the river becomes navigable. There is connexion by steam tram with Antwerp. The mausoleums (ascribed to Michael Angelo) of Engelbert and Henry of Nassau in the Protestant church are highly interesting. The fortress has been dismantled. Population, 26,097.

Bredow, a village of Prussia, in the province of Pomerania, immediately N. of Stettin, of which it virtually forms a suburb. Here are the famous Vulcan iron-works and shipbuilding yards (where the *Deutschland* and the *Kaiser Wilhelm der Grosse*, which broke the Atlantic record, were built), and also sugar, cement, and other factories. Population (1885), 12,715; (1900), 19,992.

Bregentz, or BREGENZ, chief town of the district of the same name in Vorarlberg, Austria, as also of that crown-land. It is a port on Lake Constance and a station on the Austrian state railway. In 1890 the population of the district was 41,824, all German and (with the exception of 420 Protestants) Catholic; in 1900, 46,216. Population of town (1869), 3686; (1890), 6739; (1900), 7595. It has a garrison of 519 men. Numerous Roman antiquities have been placed in the provincial museum. The town has acquired considerable importance through the railway and a steamship service on the lake, which has promoted the trade in corn, cattle, timber, animal products, &c. The principal industries are cotton spinning and weaving, the manufacture of silk, articles of jewellery, woodwork, and hardware.

Bremen, a city of Germany, capital of the free state of Bremen, on both banks of the Weser, 46 miles from the North Sea and 71 miles by rail S.W. of Hamburg. By the completion of engineering works on the Weser in 1887-99, at a total cost of £1,700,000, whereby the river has, amongst other improvements, been straightened and deepened to 18 feet, large ocean-going vessels are now able to steam right up to the city itself. It has excellent railway connexions with the chief industrial districts of Germany. Its trade, however, like that of Hamburg, is predominantly a transit trade; especially is it important as the importer of the raw products of the United States. The growth of the commerce of the port of Bremen-Bremerhaven is illustrated by the following statistics:—The value of the total imports (both sea-borne and by river and rail) increased from £22,721,700 in 1883 to £44,657,100 in 1899; the imports from the United States, from £9,755,000 in 1883 to £15,099,800 in 1899; but from Great Britain they decreased from £3,040,000 in 1883 to £1,357,000 in 1894, though they rose again to £3,053,400 in 1899. The countries, in addition to those already named, from which imports principally come are Germany, Russia, the republics of South America, the Far East, and Australia. The exports amounted in value to a total of £26,096,500 in 1883, a sum which reached £43,043,700 in 1899. The exports to the United States increased from £3,985,000 in 1883 to £6,639,200 in 1897, but in 1899 dropped to £3,849,200. The exports to Great Britain amounted to £1,020,000 in 1883, and to £2,621,000 in 1899. As regards the shipping, the number of vessels which entered the ports of the free state (*i.e.*, Bremen city, Bremerhaven, and Vegesack) increased from 2869 of 1,258,529 aggregate tonnage, in 1883, to 4642 of 2,464,800 tons in 1898; at Bremen-Bremerhaven there arrived 4128 vessels of 2,406,748 tons in 1899. In addition, 1557 vessels of 375,300 tons arrived, belonging to the inland (river) navigation, in 1898. The arrivals under the British flag at the free state ports increased from 389 of 514,310 tons in 1892, to 407 of 661,149 tons in 1899. At the end of 1883 the mercantile fleet of Bremen (state) consisted of 356 sea-going vessels, aggregating 307,559 tons, 99 of these, measuring 89,046 tons, being steamships. By 1899 this fleet had increased to 536 vessels of 566,688 tons. Out of this total 380 vessels of 475,763 tons, or 83·9 per cent. of the total tonnage, belonged to the city of Bremen, which is indeed the seat of some of the more important of the German shipping companies, especially of the North German Lloyd (founded in 1856), which at the end of 1898 possessed a fleet of 73 steamboats of 266,138 tons, besides over 100 lighters and similar craft. Bremen shares with Hamburg the position of being one of the two chief emigration ports of Germany. There are three docks, all to the north-west of the city—namely, the free harbour (which was opened in 1888), the winter harbour, and the timber and industrial harbour; but it has been decided to make a new basin, 7200 feet long, below the present docks, with a separate basin for ships to turn in; also, the area of the timber dock is to be enlarged. Shipbuilding yards, jute-mills, flour-mills, and oil-mills exist on a large scale. A thorough restoration of the cathedral was begun in 1888, and a new tower was added in 1898-99. The church of Our Lady, dating from the 12th and 13th centuries, was restored in 1893, and the 12th-century Romanesque church of St Stephen in 1891. The most important and most imposing amongst the new architectural additions to the city are the post office (1878); the law courts (1891-95), a German Renaissance building; the German National Bank (1896); the Municipal Museum for Natural Science, Ethnology, and Commerce (1896), with several collections; and the city library, of about 115,000 vols., erected in the Dutch Renaissance style in 1895-96. The principal ornamental memorials and useful institutions embrace a gigantic "Roland" statue, symbolical of the city's authority; the Willehad fountain (1883); the monument of the 1870-71 war (1875); the Centaur fountain (1891); an equestrian statue of the Emperor William I. (1893); the Art Exhibition; and an industrial art museum. It is a peculiarity of the domestic accommodation of Bremen that the majority of the houses, unlike the custom in other German towns, are inhabited

each by one family only. Population (1890), 125,684; (1895), 141,894; (1900), 163,418.

The FREE STATE OF BREMEN has an area of 99 square miles, and a population of 156,723 (1880); 180,443 (1890); 224,697 (1900). The constitution was revised in 1875, 1878, and again in 1894. The executive consists of a senate of 16 members, elected for life by the House of Burgesses. The House of Burgesses numbers 150 members, of whom 14 are elected by university graduates, 42 by the merchants, 22 by the mechanics and manufacturers, 44 by the other taxpayers of the city, 12 by the towns of Vegesack and Bremerhaven, and 16 by the country districts. In 1895, 93·8 per cent. of the population, namely 184,360, out of 196,404, professed the creed of the Evangelical Lutheran church, 8686 were Roman Catholics, and less than 1000 were Jews. In 1897 there were in the state 6482 horses, 16,119 head of cattle, 14,875 pigs, and only 522 sheep. The state revenue was estimated for 1899-1900 at £1,266,100, and the expenditure at £1,595,400. The state contribution to the imperial exchequer amounted to £98,910 in 1900. In 1900 the state public debt amounted to £9,043,770. (J. T. BE.)

Bremerhaven, a seaport town of Germany, in the free state of Bremen, at the mouth of the Weser (E. bank), 38 miles by rail N. of the city of Bremen, of which it is the outer port. Commercial and shipping statistics are included in the returns for the city of Bremen (*q.v.*). The Emperor dock (1876) was very considerably enlarged at a cost of £900,000 in 1897-99. This, together with the north portion of the "new" dock (1851), constitutes the free harbour, which is being enlarged by the excavation of a new basin. Here are the workshops and dry docks of the North German Lloyd. The town possesses a technical institute, a natural history collection, a library, theatre, and a monument (1888) to Smidt, the burgomaster of Bremen, to whose enterprise the harbour of Bremerhaven is due. Shipbuilding and kindred industries are carried on. A terrible explosion, caused by an infernal machine, took place on 11th December 1875. Though the miscreant, Thomas, who devised the outrage in order to recover the insurance for goods shipped on the liner *Mosel*, which was thus prematurely wrecked, himself escaped destruction, he committed suicide in his cabin. Population (1885), 14,900; (1895), 18,366; (1900), 20,322.

Brenham, capital of Washington county, Texas, U.S.A., situated in the south-eastern part of the state, at an altitude of 332 feet, on the Houston and Texas Central and the Gulf, Colorado, and Santa Fé railways. The neighbouring region is fertile and produces much cotton, for which Brenham is the compressing- and shipping-point. Population (1880), 4101; (1890), 5209; (1900), 5968.

Brentano, Ludwig Joseph [called LUJO] (1844-——), German economist, a member of the family of the celebrated Clemens and Bettina Brentano, was born at Aschaffenburg, 18th December 1844. He received a portion of his academical education in Dublin, a circumstance almost unexampled in the history of a German author. In 1868 he visited England, and made a thorough study of trade-unionism, which resulted in his principal work, *Die Arbeitergilden der Gegenwart*, Leipzig, 1871-72. The book was assailed by Bamberger and other economists, but has proved epoch-making, not only as an authority on modern associations of workmen, but for having given an impetus to the study of the gilds of the Middle Ages, and the examination of the great stores of neglected information bearing upon the condition of the people in olden days. Brentano's other works are of a more theoretical character, and chiefly relate to political economy, of which he has been professor at Breslau from 1872 to 1882, and at Strasburg since 1882. His work on gilds was translated into English by Miss Lucy Tomlinson Smith.

Brentford, a market town in the Brentford parliamentary division of Middlesex, England, 8 miles W. of St. Paul's, London, on the Brent, and the London and South-Western railway. Brentford has been the county town for elections since 1701. Population of town (an urban district) (1881), 11,810; (1901), 15,171.

Brescia, chief town of the province of the same name, in Northern Italy. Since 1875 considerable improvements have been effected. In the province alone 153 kilometres of new railways and 105 km. of steam tramways have been opened. The chief industries are woollen, cotton, and silk weaving; iron casting and gun making; hat and rope making. The stone quarries of Mazzano now yield between three and four thousand cubic metres per annum. The stone has been used for the monument to Victor Emmanuel II. at Rome, and for various buildings in Austria, England, Egypt, India, and America. The cement industry has also increased. Agriculture has been improved by draining marshy districts; cattle-raising and cheese-making have extended. In the city the communal palace (known as the Loggia), the old cathedral, and the old municipal palace, have been restored. The cathedral was reopened for public worship in 1897. Monuments have been erected since 1880 to Arnold of Brescia (by Tabacchi), to Garibaldi (by Eugenio Maccagnani), and to Bonvicino, called Moretto, by Ghidoni. The Museo Patrio having proved too small, the collections of Christian art have been transferred to the church of Santa Giulia, while the Museo itself has been reserved for Roman remains. By a legacy of Count Leopold Martinengo the municipal gallery has been installed in the Martinengo palace. The collection consists chiefly of 16th and 17th century Italian pictures, including important works by Moretto and Romanino. In 1899-1900 the water-supply was reorganized and a large reservoir is being constructed. The castle hill has been laid out as a public garden. The population of the town in 1900 was 70,618; of the province, 537,690. (L. BI.)

Breslau (Slav. *Vratislavia*), a town of Prussia, capital of Silesia, and an episcopal see, on the Oder, 204 miles S.E. of Berlin on the railway to Vienna. It is the fifth city in point of population in the empire, and the seat of important and growing industries, the chief branches of which are the manufacture of machinery, railway carriages, printing, leather and leather goods, distilleries, breweries, and furniture, cigars, ready-made clothing, and musical instrument factories. It is also the centre of a large trade in the products of the province, partly by rail, partly by river—wool, cereals, minerals, leather, machinery, horses, cattle, sugar, butter, and honey. In 1898 an aggregate of 7552 vessels of 2,305,300 tons entered and cleared by river. The growth and modern spirit of the city are exemplified in the large number of new buildings and monuments erected since 1876. Of these the most important are the provincial house of assembly; the provincial administrative offices (1883-86); the Breslau Bank of Exchange (1890); the savings bank (1891), in which are preserved the municipal library of 130,000 vols. and more than 3000 MSS., as well as the very valuable city archives; the post office (1888), in the Renaissance style; the Silesian Museum of the Industrial Arts and Antiquities, stored in the former assembly hall of the provincial estates, which has been rebuilt (1897-99) for the purpose; the Fine Arts Museum (1875-79), with collections of pictures, &c.; the chemical and anatomical institutes of the university; several new churches (St

Salvator, Luther, St Boniface, &c.), and a gaol. The chief Protestant church of St Elizabeth, which contains portraits of Luther and Melanchthon by Lukas Cranach, was restored in 1891-93; the church of St Mary Magdalene (Protestant), of the same date as the church of St Elizabeth, was restored in 1887-90, after the destruction by fire of one of its twin towers in 1887; the town hall was restored in 1885-88. The city is especially rich in fine monuments, the more recent being the Emperor William I. (1896) by Behrens; a monument of the war of 1870-71; a marble statue of General Tauentzien by Langhans and Schadow; a bronze statue of Svarez, the Prussian jurist (1896); a monument of Schleiermacher (1869), who was born here in 1768; and monuments to the Emperor Frederick III. and Bismarck. Here, too, should be mentioned the handsome outlook tower on the Liebichshöhe (1867). Breslau is also the seat of numerous important educational institutions. First amongst these comes the university (1662 students and 169 professors in 1900). Its library contains 400,000 vols., and 4000 vols. of MSS.; also, an archæological collection. Further, there are a Roman Catholic normal school, a Jewish theological seminary, eight classical and four modern schools, one of the last with technical divisions. This city is the headquarters of the 6th German Army Corps, and of the Silesian Society for Native (*vaterländische*) Civilization, and nearly fifty other learned literary and artistic societies. There are four theatres and three music halls. The course of the Old Oder, which circles round the town to the north-east, was regulated by canal works in 1897. Population (1885), 299,640; (1890), 335,186; (1900), 422,738.

(J. T. Be.)

Brest, chief town of arrondissement, department of Finistère, France, with terminal station on the railway from Paris. Orphan boys are trained as sailors, first in a marine school, and afterwards in one or other of the naval training-ships stationed here. Five lighthouses mark the entrance to the harbour. The industrial activities of the town depend mainly on the government dockyard and arsenal, which employ between 8000 and 9000 workmen. Chemicals and briquettes are manufactured, and there are ironworks. The total imports in 1899 were valued at £283,400, of which coal from England supplied one-fourth, other imports being wine, timber, coffee, and phosphates. The exports (of which strawberries form the bulk) are of small value, but go almost entirely to England. In 1898 a new direct submarine cable was laid between Brest and Cape Cod to the United States, and it has been proposed to organize a fast line of passenger ships between Brest and New York. Population (1881), 57,277; (1901), 84,284.

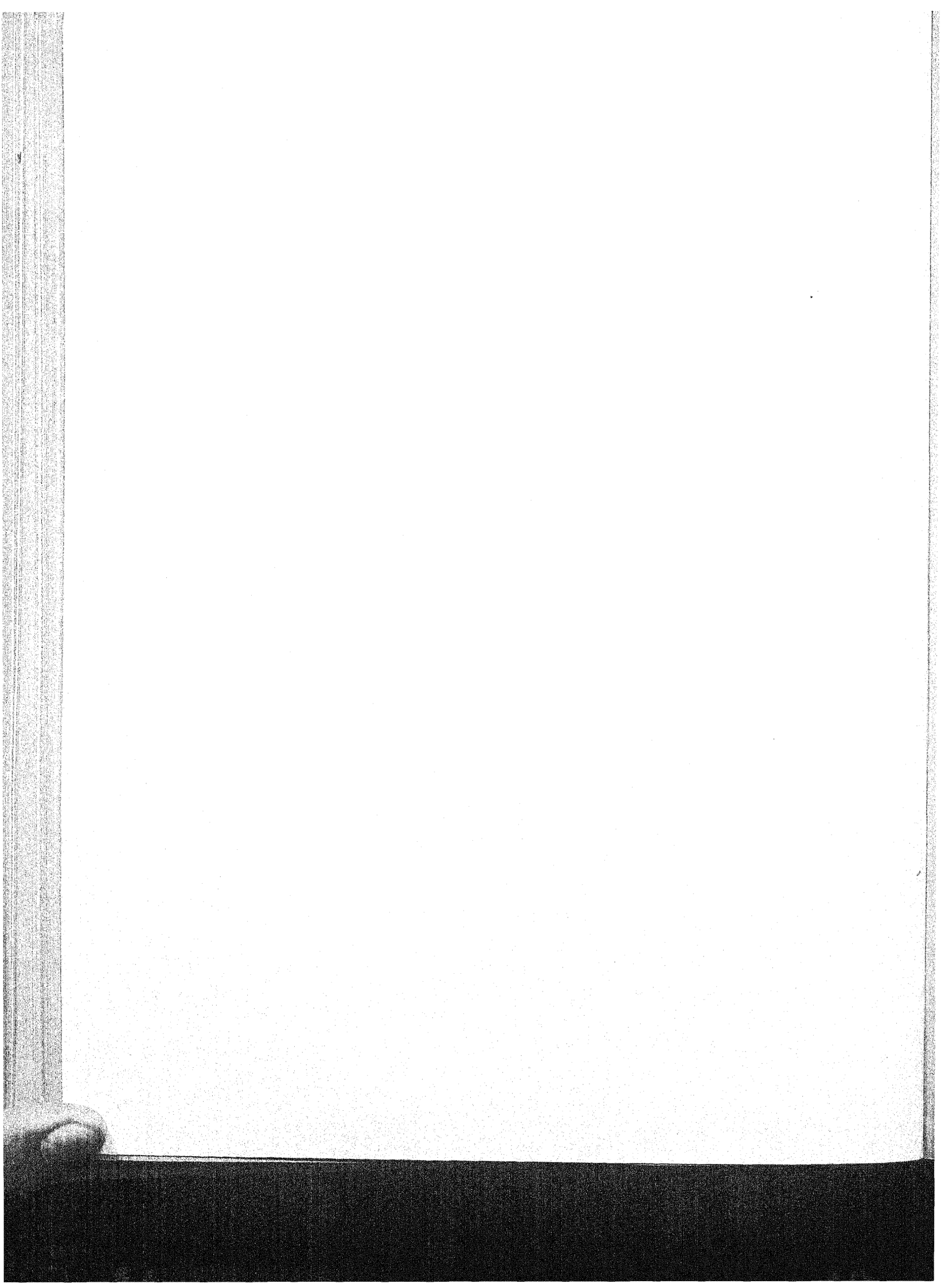
Breton, Cape, an island belonging to the province of Nova Scotia, on the N.E. of the mainland, from which it is separated by the Strait of Canso. The highest land in Nova Scotia is situated in the northern part of the island, where the surface rises to a height of 1500 feet. This area is occupied by pre-Cambrian rocks, which in places are overlaid by Carboniferous strata. In the south-west portion and around Bras d'Or lake there are similar pre-Cambrian areas with others in which Cambrian fossils are abundant. On the west coast between Margaree harbour and Port Hood, and on the south side of the island at Seacoal Bay and Little River, Richmond county, the Coal Measures occur with valuable seams of coal, while the Sydney coalfield occupies the east coast from Mira Bay to St Anns, some of the seams having been mined beneath the sea. The highest temperature at Sydney is 82° F. and the lowest −9°. Population (1881), 84,500; (1891), 86,854. In the latter year there were 4035 adherents of the Church of England, 47,913 of the Church of Rome, 29,413 Presbyterians, 2546 Methodists, and 2435 Baptists. In 1900 there were 463 schools attended by 18,800 pupils. In the same year 2,200,000 tons of coal were produced. There were 102 vessels, 3522 boats, and 7422 men engaged in the fisheries in 1899. The total value of the fish and their products was $1,300,410—the value of fishing vessels, boats, nets, lobster-canneries, &c., being $524,755. In 1891 there were 1,184,426 acres of land occupied, 372,848 improved, 185,552 under crop, and 185,472 in pasture. Of wheat 8283 bushels were raised, 30,093 of barley, 313,556 of oats, 8129 of buckwheat, 1,041,292 of potatoes and other roots, and 112,271 tons of hay. There were 13,885 horses, 1286 oxen, 37,454 milch cows, 33,906 other horned cattle, 96,006 sheep, and 10,035 swine, and 1,888,248 lb of home-made butter were produced, 271,646 lb of cheese, and 285,021 lb of wool.

See Robb and Fletcher. *Reports of Geological Survey*, 1872 to 1882, and 1895 to 1899.—Fletcher. *The Sydney Coal Fields, Cape Breton, N.S.*, 1900.—Charles Dudley Warner. *Baddeck: and that Sort of Thing.*—Sir John Bourinot. *Historical and Descriptive Account of Cape Breton.*

Breton, Jules Adolphe Aimé Louis (1827-——), French painter, was born 1st May 1827, at Courrières, Pas de Calais, France. His artistic gifts being manifest at an early age, he was sent in 1843 to Ghent, to study under the historical painter de Vigne, and in 1846 to Baron Wappers at Antwerp. Finally he worked in Paris under Drolling. His first efforts were in historical subjects: "Saint Piat preaching in Gaul"; then, under the influence of the revolution of 1848, he represented "Misery and Despair." But Breton soon discovered that he was not born to be a historical painter, and he returned to the memories of nature and of the country which were impressed on him in early youth. In 1853 he exhibited the "Return of the Harvesters" at the Paris Salon, and the "Little Gleaner" at Brussels. Thenceforward he was essentially a painter of rustic life, especially in the province of Artois, which he quitted only three times for short excursions: in 1864 to Provence, and in 1865 and 1873 to Brittany, whence he derived some of his happiest studies of religious scenes. His numerous subjects may be divided generally into four classes: labour, rest, rural festivals, and religious festivals. Among his more important works may be named "Women Gleaning," and "The Day after St Sebastian's Day" (1855), which gained him a third-class medal; "Blessing the Fields" (1857), a second-class medal; "Erecting a Calvary" (1859), now in the Lille Gallery; "The Return of the Gleaners" (see Plate) (1859), now in the Luxembourg; "Evening," and "Women Weeding" (1861), a first-class medal; "Grandfather's Birthday" (1862); "The Close of Day" (1865); "Harvest" (1867); "Potato Gatherers" (1868); "A Pardon, Brittany" (1869); "The Fountain" (1872), medal of honour; "The Bonfires of St John" (1875); "Woman mending Nets" (1876), in the Douai Museum; "A Gleaner" (1877), Luxembourg; "Evening, Finistère" (1881); "The Song of the Lark" (1884); "The Last Sunbeam" (1885); "The Shepherd's Star" (1888); "The Call Home" (1889); "The Last Gleanings" (1895); "Gathering Poppies" (1897); "The Alarm Cry" (1899); "Twilight Glory" (1900). Breton was elected to the Institut in 1886 on the death of Baudry. In 1889 he was made Commander of the Legion of Honour, and 1899 Foreign Member of the Royal Academy of London. He has also written several books, among them *Les Champs et la Mer* (1876), *Nos Peintres du Siècle* (1900), and "Jeanne," a poem.

See Jules Breton, *Vie d'un Artiste, Art et Nature* (autobiographical), Paris, 1890.—Marius Vachon, *Jules Breton*, 1899.

"The Return of the Gleaners." By Jules Breton.



BREWING.

THE evolution of the brewing industry since 1875 has been accompanied by many interesting developments, important not only from an economical or trade point of view, but also in their technological and scientific aspects. The period covers the repeal of the malt tax and the introduction of the "free" mash-tun, and, as a consequence of the new law, the greatly increased use of malt substitutes and the rise of the "pure beer" agitation. It is a period which has seen the gradual modification of the character of British beers, the strongly alcoholic, heavily-hopped liquids consumed by the previous generation slowly giving place to the lighter beverage in vogue at the present time. It includes the classical researches of O'Sullivan, Brown, Heron, and Morris, on starch degradation, and those of Hansen, with their brilliant practical application, on the methods of obtaining and cultivating pure yeasts; and many important and innumerable minor improvements in the malting, mashing, refrigerating, and fermenting processes.

Repeal of the Malt Acts, and the Free Mash-tun.—By the Act of 1880 the duty was taken off the malt and placed on the beer, or, more properly speaking, on the wort, and the restrictions as to the use of materials in brewing were removed. The chief feature of Mr Gladstone's Bill was that on and after the 1st October 1880 a beer duty was imposed in lieu of the old malt tax, at the rate of 6s. 3d. per barrel of 36 gallons, at a specific gravity of 1·057; and the regulations for charging the duty were so framed as to leave the brewer practically unrestricted as to the description of malt or corn and sugar, or other description of saccharine substitutes (other than deleterious articles or drugs), which he might use in the manufacture or colouring of beer. This freedom in the choice of materials has continued down to the present time, except that the use of "saccharin" (a product of coal-tar) was prohibited in 1888, the reason being that this substance gives an apparent palate-fulness to beer equal to roughly 4° in excess of its real gravity, the revenue suffering thereby. In 1889 the duty on beer was increased by a reduction in the standard of gravity from 1·057 to 1·055, and in 1894 a further 6d. per barrel was added. The duty thus became 6s. 9d. per barrel, at a gravity of 1·055, which was further increased by 1s. a barrel by the war budget of 1900.

Prior to 1896 rice, flaked maize (see below), and other similar preparations had been classed as malt or corn in reference to their wort-producing powers, but after that date they were deemed sugar [1] in that regard. By the new Act (1880) 42 lb weight of corn, or 28 lb weight of sugar, was to be deemed the equivalent of a bushel of malt, and a brewer was expected by one of the modes of charge to have brewed at least a barrel (36 gallons) of worts (less 4 per cent. allowed for wastage) at the standard gravity for every two bushels of malt (or its equivalents) used by him in brewing; but where, owing to lack of skill or inferior machinery, a brewer cannot obtain the standard quantity of wort from the standard equivalent of material, the charge is made not on the wort, but directly on the material. By the new Act licences at the annual duty of £1 on brewers for sale, and of 6s. (subsequently modified by 44 Vict. c. 12, and 48 & 49 Vict. c. 5, &c., to 4s.) or 9s., as the case might be, on any other brewers, were required. The regulations dealing with the mashing operations are very stringent. Twenty-four hours at least before mashing, the brewer must enter in his brewing-book (provided by the Inland Revenue) the day and hour of commencing to mash malt, corn, &c., or to dissolve sugar; and the date of making such entry; and also, two hours at least before the notice hour for mashing, the quantity of malt, corn, &c., and sugar to be used, and the day and hour when all the worts will be drawn off the grains in the mash-tun. The worts of each brewing must be collected within twelve hours of the commencement of the collection, and the brewer must within a given time enter in his book the quantity and gravity of the worts before fermentation, the number and name of the vessel, and the date of entry. The worts must remain in the same vessel undisturbed for twelve hours after being collected, unless previously taken account of by the officer. There are various other regulations, such as those prohibiting the mixing of worts of different brewings unless account has been taken of each separately, the alteration of the size or shape of any gauged vessel without notice, and so on.

[1] They were classified at 28 lb in 1896, but since 1897 the standard has been at the rate of 32 lb to the bushel.

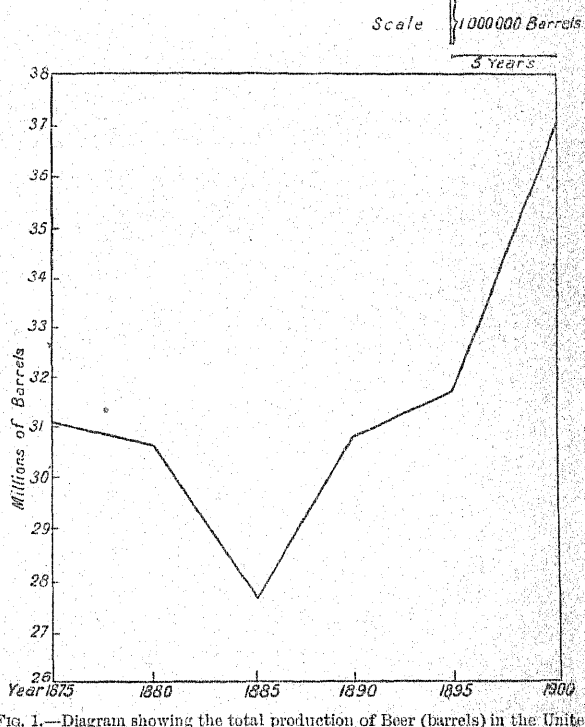


FIG. 1.—Diagram showing the total production of Beer (barrels) in the United Kingdom, 1875-1900.

Commercial Development.—When the article in the ninth edition was written it was believed by competent experts that the brewing trade had attained its maximum extent, and for a series of years it appeared as though this belief was well founded. In the decade 1880-90 both the number of barrels brewed and the quantity of materials annually used were considerably below the figures for 1875; the barrelage remaining almost stationary at 27 to 28 millions, as against 31 millions at the latter date. Since 1891, however, there has been a steady increase, and with the exception of 1895 each year has marked an advance on the preceding one (Fig. 1). The following figures with regard to the barrelage, materials, duty, &c., need no explanation:—

United Kingdom.

Year.	Number of Barrels Produced.	Malt and Corn (Bushels).	Sugar and Equivalents (Cwts.).	Duty Paid (£).	Exports (Barrels).	Imports (Barrels).
1875	31,014,381	58,228,499	890,686	8,218,377	503,381	
1885	27,986,493	51,889,480 [1]	1,274,539 [2]	8,544,749	435,920	28,348
1891	31,927,303	55,098,523 [1]	2,025,658 [2]	9,781,398	569,702	
1899	36,498,204	58,681,112	4,031,200	12,085,822	485,032	40,188
1899 } 1900 }	37,090,986	57,854,904	4,181,889	12,345,150	522,880	50,656

[1] Includes rice, &c. [2] Exclusive of rice, &c.

Germany is now the greatest beer-producing nation, the

United Kingdom coming next, but the consumption per head is considerably greater in the United Kingdom (Fig. 2). The latest comparable figures with regard to the total production and consumption of the three great beer-producing countries, together with those for 1885, are as under :—

Country.	Total Production (Gallons).		Consumption per Head of Population (Gallons).	
	1899.	1885.	1899.	1885.
United Kingdom	1,346,558,000	993,759,000	32·7	27·1
German Empire .	1,529,000,000	932,228,000	27·5	19·8
United States .	1,014,696,000	494,854,000	13·3	8·8

Large as the *per capita* (Fig. 3) consumption in the United Kingdom may seem, it is considerably less than is the case in Bavaria, which stands at the head of the list with 54·6 gallons, and in Belgium, which comes second with 46·9 gallons. In the city of Munich the consumption is actually over 100 gallons, that is to say, more than 2 pints a day for every man, woman, and child. It is curious to note that in Germany, which is usually regarded as the beer-drinking country *par excellence*, the consumption per head of this article is less than in England, and that inversely the average German consumes more alcohol in the shape of spirits than does the inhabitant of the British islands (*consumption of spirits per head:* Germany, 1·85 gallons; United Kingdom, 1·03 gallons). In the British colonies beer is generally, as in the United Kingdom, the staple drink, but whereas in the United Kingdom 31 gallons are consumed annually per head of population, in Australasia the *per capita* consumption amounts to only 10·6, in Canada to 3·6, and in Cape Colony to 1·6 gallons. In the latter colony, however, the staple drink appears to be spirits, which are consumed to the extent of 1·1 gallon per head of population.

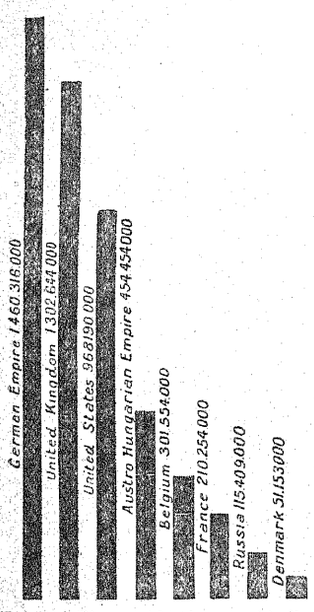


Fig. 2.—Diagram showing graphically the total production of Beer (gallons) in the United Kingdom and chief countries.

As in many other trades, a characteristic feature during recent years has been the absorption or disappearance of small firms and the corresponding growth of the larger breweries. In 1874 there were 34,000 brewers, in 1899 only 6739. At that time the largest brewer (Bass) produced 1,000,000 barrels, now Messrs Guinness (the largest brewers in the world) pay duty on considerably over 2,000,000 barrels. Two other breweries (Bass and Allsopp) produce between 1,000,000 and 2,000,000, and three others between 600,000 and 800,000 barrels. The present capital of Messrs Guinness amounts to £5,200,000, of Messrs Allsopp to £4,900,000, and of Messrs Bass to £3,280,000. In 1874 it was calculated that the capital invested in the liquor trade amounted to £117,000,000; in 1899 (according to Montgomery and Morgan) this had risen to £240,000,000. The number of persons employed is computed at not less than 2,000,000. According to Dr Burns, £162,000,000 were spent by the people of the United Kingdom on alcoholic liquors in 1899, or rather more than £4 per head. The largest Continental breweries are: in Germany, the Schultheiss brewery (Berlin), 478,000 barrels; the Löwenbrau (Munich), 320,000 barrels; in Austria, Anton Dreher, 480,000 barrels.

Barley.—In common with other branches of agriculture, the cultivation of barley in the United Kingdom is apparently declining. The area under cultivation, which was 2,762,263 acres in 1876, had shrunk to 2,068,760 acres in 1898; in 1899 the acreage was 2,151,550. The total estimated quantity also shows a tendency to decrease, but this, apart from the acreage, is naturally dependent on the seasons. It was at a maximum in 1885, when 85,721,672 bushels were collected; the latest figures are 74,730,785 bushels. There are no official returns as to the quantity of home-grown barley used for malting purposes, but there is good reason for believing that, although not actually less than in 1875, it is relatively so. The best English malting barleys are quite on a level with, and perhaps superior to, the foreign grain of a similar class, and the average good foreign malting barley of the Chevalier type possesses no considerable advantage over the English varieties, except that, as a rule, it contains less moisture than the latter. Of late years, however, considerable quantities of six-rowed barley (*Hordeum hexastichum*) have been imported, principally from the Levant, and this type of barley possesses certain properties which commend it to the brewer, especially for the brewing of rapidly clarifying light ales. It possesses roughly 10 per cent. more husk than the ordinary run of English barley, and this permits of closer crushing simultaneously with better drainage of the "goods" in the mash-tun. Moreover, the Levantine and other barleys of this class are usually very well matured and "kindly," as they get plenty of sun, besides which beers brewed with their aid will clarify rapidly. Notwithstanding this, however, the importation of these barleys into the United Kingdom for malting purposes does not make such strides as at one time seemed probable, the chief reason being that the average quality of English malting barleys has tended to improve within the last few years. This is not solely due to the prevalence of favourable climatic conditions, but also to the fact that British farmers are beginning to take advantage of the great mass of practical and scientific research work relating to the cultivation of barley for malting purposes, which has been carried out within the last twenty years.

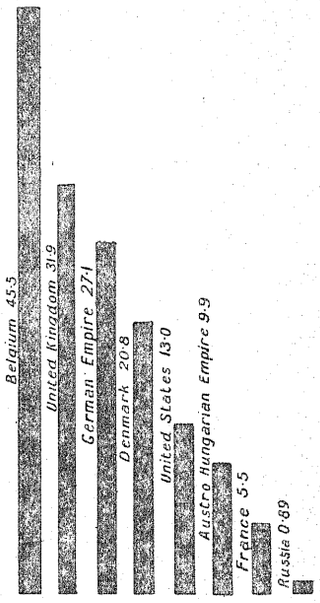


Fig. 3.—Diagram showing graphically Beer consumption (gallons) per head of population in the United Kingdom and chief countries.

It is gratifying to see that the labours of, among others, Lawes and Gilbert, Hellriegel, Maercker, Munro and Beavan, &c., are at last bearing fruit, and that the British farmer is beginning to appreciate them, and to apply their results. Nevertheless, there is still considerable room for improvement, and it is an undoubted fact that an appreciable proportion of the barley grown in the United Kingdom, which, owing to the "unkindly" condition of the starch and the unfavourable character of the nitrogenous matter,

&c., cannot be employed for malting, could be used for that purpose if it were cultivated and malted on the lines indicated by modern experiments in the field, laboratory, and malt-house. Before the malt tax was repealed it was in the brewer's interest to use as heavy a malt as possible, but this is by no means the case nowadays. A heavily manured, highly nitrogenous barley is not suited for brewing light-gravity beers, but many barley-growers have not yet adapted themselves to the new conditions, and continue to produce an article which was suited to the requirements of the past generation of brewers, but is of little use at the present time. The following is a short summary of the views generally held nowadays with regard to the cultivation of malting barley:—

The Soil.—It was formerly held that only a rich, friable loam, or a loose sandy soil with a calcareous subsoil, was suitable for barley, but good crops can be grown on heavier soils provided the ground is well worked to provide a fine tilth, and that the drainage is satisfactory. The clearage of all weeds is a most important matter; it has been found that the crop may be reduced by as much as one-third by neglecting to pay proper attention to this point. With regard to *rotation*, it is considered that the most satisfactory malting barley is obtained by taking barley after wheat or other corn crop. The old Norfolk four-course rotation—roots, *barley*, clover (or beans), and wheat—is probably still adopted by nine farmers out of ten, but it is open to little doubt (Lawes and Gilbert, Munro and Beavan, &c.) that it is better not to grow barley after roots fed off by sheep, as this rotation leaves the land, even if it be of a light description, in too "high" a condition, and a steely, hypernitrogenous barley is likely to be produced. By taking barley as a second corn crop, the latter following roots fed off, or a "high" crop, not only is a better malting barley produced, but this arrangement will be found suitable for the farmer in many other respects. With regard to *manure*, it has been abundantly proved that an excess of nitrogenous manure is particularly undesirable, and that of all nitrogenous manures the ordinary farmyard variety is the least suitable for malting barley. Nitrogenous manure, preferably in the shape of nitrate of soda, should only be used very slightly (part as top dressing), and in conjunction with a sufficiency of phosphates and potash salts. The latter are not indicated to any extent except where the soil is relatively poor in potash, but phosphatic manure appears to be an essential. Excess of nitrogen tends to produce steely, unkindly barleys, which not only cause trouble in the mash-tun, but also retard the clarification of the beer. Excessive potash also tends to increase the nitrogen of the grain unduly. The *seed* should be carefully chosen, kiln-dried if necessary, and sown by mechanical means to ensure evenness, both as regards depth and spacing. Two to three inches is considered the most suitable depth for drilling. The barley should be allowed to become dead ripe before cutting, but directly the latter operation is completed, and the undergrowth dry and withered, the grain should be stacked at once. Before *stacking*, the grain and straw should be quite dry, as damp stacking leads to heating, discolouring, mould, and other evils. As soon as the stack has ceased sweating, the barley will be ready for threshing. Kiln-drying after threshing is strongly recommended, as it not only prevents the defects alluded to above, but also to a great extent supplies the want of sun in an unkindly barley. *Threshing* machines are apt to damage barley if unskilfully used, and damaged barley will give rise to mould on the floors, but if the machine is of the right type, is evenly fed, and provided with properly adjusted screens, the results should be excellent in every respect.

The following figures with regard to the importation of barley will be of interest in view of what has been said above. [*N.B.*—The figures apply to barley generally, and not only to malting barley]:—

I. *Average Annual Quantities of Barley imported into the United Kingdom in Triennial Periods since* 1875.

Period.	Quantity (Cwts.).	Value (£).
1875-77	11,261,000	4,593,000
1881-83	13,936,000	5,113,000
1887-89	17,649,000	4,932,000
1893-95	25,902,000	6,135,000
1897-99	26,201,694	5,474,226

II. *Approximate Percentage of Net Imports to Total Supply.*

Period.	Per Cent.	Period.	Per Cent.
1886-88	32·3	1893-95	44·0
1889-91	33·2	1897-99	44·0
1892-94	40·8		

III. *Percentage of Total Imports contributed by various Countries.*

Country.	1875-77.	1881-83.	1887-89.	1893-95.	1897-99.
Russia, per cent. . .	16·6	25·7	50·7	59·6	42·1
Turkey and Balkan States, per cent. . . .	33·1	34·3	21·9	22·5	32·4
Other countries, per cent. .	50·3	40·0	27·4	17·9	25·5

Malt and Malting.—The repeal of the Malt Acts not only gave a free hand to the brewer with regard to materials, but also removed the many irksome restrictions to which the maltster was subjected prior to 1880. The liberty thus accorded to the maltster, the tendency to apply scientific methods to industrial operations, and the riper knowledge of the true inwardness of the malting processes are the chief factors to which the modern mechanical improvements in malting may be ascribed. The machinery for cleaning and grading the grain, for instance, has been brought to a high state of perfection, and (more especially on the Continent of Europe) the old process of turning the malt on the kiln by hand has been, in many malt-houses, replaced by automatic stationary or travelling turning appliances actuated by clockwork or otherwise. The automatic regulation of heats and of the air-supply on the kiln by thermo-regulators, fans, and other contrivances is also a feature in modern malting.

Up to 1881 malt kilns in England were invariably constructed with a single drying floor, but in that year the first kiln with two floors (Stopes's system) was tried, and this modification of the older methods of working has given satisfactory results. The advantages of the double-kiln system are that it admits of great regularity of temperature on both floors, and effects considerable economy with regard to fuel and labour. Another novelty, which in a sense may be regarded as a corollary to the pneumatic (see below) system of malting, is Free's patent kiln, which is practically an air-tight chamber from which the moisture of the green malt can be rapidly removed by means of an air propeller fitted in the apex of the kiln. This arrangement considerably reduces the kilning time, and permits of materially greater depths of malt on the kiln without a corresponding increase of temperature. It is also possible to work at higher temperatures without affecting the colour of the malt as would be the case on an ordinary kiln.

The *pneumatic* system of malting, which has been developed since the article in the ninth edition was written, is worthy of notice. The principle of this is that the malt is grown, not on an open "floor" to which the air has free access, but in an enclosed space which is continuously provided with a fresh supply of air, the gases exhaled being simultaneously removed. Pneumatic malting may be briefly described as a system which permits of absolute control of temperature and the condition of the air-supply. The system devised by Mr Galland consists of a series of closed drums from which the air and evolved gases are exhausted by a suction pump or fan, which also draws in a continuous fresh supply of air, the latter being cooled and moistened by passing over a bed of coke which is sprayed with cold water. The drums revolve periodically or continuously, thus preventing the grain from growing together in a tangled mess. Apart from the advantages already mentioned, it is held by many authorities that the pneumatic system effects considerable economy as regards primary cost, space, labour, and other working expenses. Pneumatic malting, although extensively employed on the Continent and in America, has not, so far, attained the results that were anticipated of it in England, but the improvements which have been effected (more especially by Hemming) in this system are very marked, and it seems probable that in time it will find a wide application in Great Britain also.

The repeal of the Malt Acts has been responsible for at least one considerable modification in the process of malting, namely, the abandoning of the *couch*. It is true that some maltsters still make use of it, but there can be little doubt that the piling up of the freshly-steeped grain in heaps for any length of time is not only unnecessary but undesirable, as it leads to unevenness of growth on the floors. The conditions necessary for the treatment and modification of unkindly barleys, both as regards the starch and the nitrogenous matters, have formed the subject of many investigations, the results of which have largely added to the maltster's resources. These investigations can only be indicated here, but it may be sufficient to say that our knowledge of the influence of temperature (on the floors as well as on the kiln) of the merits of prolonged slow flooring as opposed to a more rapid (so-called "forced") growth, and of other kindred considerations, has been very considerably increased. It has been shown that the "forcing" process, which consists essentially in the employment of relatively high floor temperatures in order to accelerate rootlet growth, is liable to lead to unsatisfactory clarification—at any rate, when brewing on infusion lines—and that better results are obtained by prolonged flooring at lower temperatures. It also appears fairly certain that the *total quantity* of nitrogen in a barley or a malt is no criterion of its value, but that it is the condition of the nitrogenous matter which is of importance, and more particularly the proportion of coagulable to non-coagulable albuminoids (Morris, Kukla, &c.). The methods for controlling the value of a barley or malt in the laboratory have also been much elaborated, and it is now possible, within certain limits, to determine by a laboratory examination whether a barley or a malt is satisfactory or not, what the methods of treatment should be in the malt-house or the brewery, and so on. If the technical operations have made considerable advances it is to a great extent due to the fact that the objects to be attained and the processes taking place during malting are now much better understood.

The results of some of the more important modern investigations—in this connexion the work of Messrs O'Sullivan, and Brown and Morris must be specially mentioned—may be briefly summed up as follows. During the periods of steeping and germination there is in the first place formed a substance called *cytase*, the principal function of which is to break up or liquefy the envelope of cellulose with which each grain of the starch proper—the granulose—in the barley corn is surrounded, and so to prepare the way for the action of the diastase. The latter is unable to act until this transformation of the cellulose sheath has taken place. Cytase is one of a class of bodies which were formerly called "ferments," but are now termed "enzymes" in order to distinguish them from living micro-organisms such as the yeasts and bacteria. The "enzymes" are unorganized (*i.e.*, without biological structure or life) products formed in the course of the metabolic processes exhibited by the living cell, and they possess a certain specific action or actions which they are able to exercise outside or independently of the organism by which they are produced. It is characteristic of these substances—and in this they are sharply differentiated from the ordinary chemical reagents—that the amount of work they can do (transforming, liquefying, saccharifying, &c.) stands in no definite relation to the quantity of the enzyme.

Messrs Brown and Morris have shown that immediately the germinating process in the barley corn begins, the embryo commences to secrete diastase, which diffuses into the endosperm and there quickly starts its attack on the cellulose (modified by the previous action of the *cytase*) and the starch immediately below the scutellum. This formation of diastase takes place principally, if not indeed entirely, in the epithelium, and is favoured by the presence of small quantities of acid, but restricted almost completely by readily assimilable carbohydrates (sugars). Thus, if barley be germinated in such a way that a sufficient quantity of cane sugar for the nourishment of the embryo is always present, no diastase is formed, and it is therefore probable that the diastatic secretion of the epithelium is an example of the starvation processes well known to botanists.

The action of diastase is twofold, liquefying and saccharifying; that is to say, it both makes the starch soluble in water and also converts it into sugar. It is probable that there are at least three distinct enzymes contained in *malt* diastase; one liquefies starch, a second saccharifies the same, and a third (a peptonizing enzyme) is responsible for the modification of the nitrogenous matters. There is a certain quantity of saccharifying diastase in ungerminated barley, but it possesses no liquefying action. During the process of germination the proportion of this saccharifying diastase is enormously increased, and at the same time the liquefying enzyme is formed and stored for future use. Green malt ordinarily contains a large excess of diastase, especially of the saccharifying variety, and this in itself—apart from other reasons—makes its direct employment in the mash-tub impracticable, but it is necessary that it should contain a very large excess, as the kilning process destroys the diastatic activity of the green malt to a greater or lesser extent.

It is now known that the partial conversion of the insoluble albuminous substances into the soluble forms is one of the most important results of the malting process. An excess of insoluble albuminoids not only causes difficulties in clarification, but tends to promote the growth of undesirable micro-organisms in the finished beer. Hilger and van der Becker give the following figures as an example of the increase of the soluble albuminoids during malting:—

Percentage of Total Nitrogen.

Barley . . .	6·74 per cent.	of soluble nitrogen.
Steeped barley . .	3·75 ,,	,,
Green malt . .	21·96 ,,	,,
Cured ,, . .	24·44 ,,	,,

There is considerable divergence of opinion as to the nature of the soluble bodies formed, but they certainly appear to include coagulable proteids, albumoses, amides, amido-acids, and substances which, if they are not peptones proper, are at any rate very similar to the latter.

Considerable changes also take place during germination in regard to the disappearance of starch and the formation of sugar. The disappearance of starch varies from 4 to 20 per cent. Part of this is lost altogether in the shape of carbonic acid and water, a part is used for the formation of tissue, and the remainder is transformed into cane and other sugars (Brown and Morris, T. C. Day, Kjeldahl, O'Sullivan, &c.). At the same time there is a decrease in the percentage of fat and inorganic salts, but a considerable increase of acid—principally lactic acid.

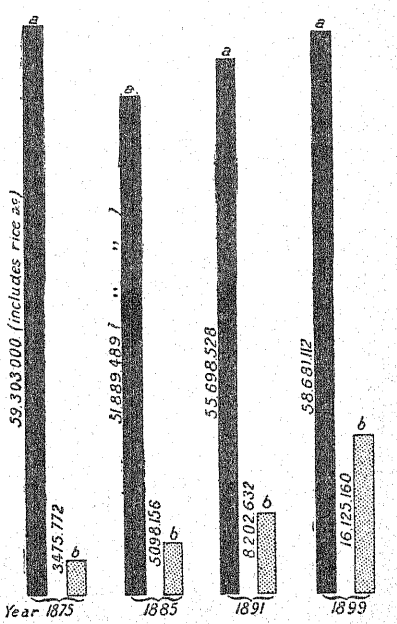


FIG. 4.—Diagram showing graphically the total quantities (bushels) of (*a*) malt and corn and (*b*) malt substitutes used in brewing in the United Kingdom in the years 1875, 1885, 1891, 1899. (Malt substitutes at 28 lb to the bushel.)

Malt Substitutes.—Prior to the repeal of the Malt Acts the only substitute for malt allowed in the United Kingdom was sugar (Fig. 4). The quantity of the latter employed was 295,865 cwt. in 1870, 868,943 cwt. in 1875, and 1,136,434 cwt. in 1880—the last year prior to the passing of the new Act. Since then the figures have shown a steady advance, reaching 2,025,658 cwt. in 1890, and 2,980,039 cwt. in 1900; that is to say, they have practically trebled within twenty years. At the same time other substitutes, such as unmalted corn and preparations of rice and maize, have come into favour, the quantity of these substances used being in 1899, 218.889 bushels of unmalted corn, and 1,087,538 cwt. of rice, maize, &c. These figures appear all the more striking when it is stated that the quantity of malt converted into beer has not increased since 1878. The following statistics with regard to the use of malt substitutes in the United Kingdom are not without interest:—

Year.	Quantities of *Malt* and *Corn* used in Brewing. (Bushels.)	Quantities of *Sugar, Rice, Maize,* &c., used in Brewing. (Bushels.)	Percentage of Substitutes used to Total Material.
1878	59,388,905	3,825,148	6·05
1883	51,331,451 [1]	4,503,680 [2]	8·06
1890	55,359,964 [1]	7,904,708 [2]	12·48
1895	53,731,177	10,754,510	16·66
1900	57,354,904	16,727,536	22·56

[1] Inclusive of rice and maize. [2] Exclusive of rice and maize.

If we take into account the fact that roughly 8,000,000 bushels of malt are used by brewers who do not employ substitutes, the net amount of sugar and its equivalents used in beer brewed with malt adjuncts was in 1900 somewhat over 25 per cent. on the total material. Some brewers have used as much as 60 to 70 per cent. of sugar, but these cases may be regarded as exceptional. With regard to the nature of the substitutes for barley malt more generally employed, *raw grain* (unmalted barley, wheat, rice, maize, &c.) is not used extensively in Great Britain, but in America brewers employ as much as 50 per cent., and even more, of maize, rice, or similar materials. The use of such a high proportion of these materials makes it necessary to work with malts made from coarse-skinned, highly diastatic barleys, in order to ensure efficient drainage and conversion of the goods in the mash-tun. The maize, rice, or other grain is usually gelatinized in a vessel entirely separated from the mash-tun—termed a "converter"—by means of steam at about 200° F., mostly with, but occasionally without, the addition of a little malt meal. After about half an hour the gelatinized mass is mixed with the main mash, and this takes place shortly before taps are set. This is possible inasmuch as the starch, being already in a highly disintegrated condition, is very rapidly converted. By working on the limited decoction system (see below) it is possible to make use of a fair percentage of raw grain in the mash-tun proper, thus doing away with the "converter" entirely. The maize and rice preparations mostly used here are practically starch pure and simple, substantially the whole of the oil, water, and other subsidiary constituents of the grain being removed. The germ of maize contains a considerable proportion of a very objectionable oil, which has to be eliminated before this material is fit for use in the mash-tun. After de-germing, the maize is unhusked, wetted, submitted to a temperature sufficient to rupture the starch cells, dried, and finally rolled out in a flaky condition. Rice is similarly treated.

The *sugars* used are chiefly cane sugar, glucose, and "invert" sugar—the latter commonly known to brewers as "saccharum"—in approximately equal quantities. Cane sugar is mostly used for the preparation of heavy mild ales and stout, as it gives a peculiarly sweet and full flavour to the beer, to which, no doubt, the popularity of this class of beverage is largely due. *Invert sugar* (the ordinary method of preparation) is still substantially the same as that described in the ninth edition. Of late years it has become the practice among many brewers to prepare their own invert sugar, either by the ordinary acid process, or by the method introduced by Tompson, which makes use of the inverting power of one of the enzymes (invertase) contained in ordinary yeast. The cane-sugar solution is pitched with yeast at about 55° C., and at this comparatively high temperature the inversion proceeds very rapidly, and fermentation is practically impossible. When this operation is completed, the whole liquid (including the yeast) is run into the boiling contents of the copper. The chemical equation representing the conversion (or inversion) of cane sugar is :—

$$\underset{\text{Cane sugar.}}{C_{12}H_{22}O_{11}} + H_2O = \underbrace{\underset{\text{Glucose.}}{C_6H_{12}O_6} + \underset{\text{Fructose.}}{C_6H_{12}O_6}}_{\text{Invert sugar.}}$$

Invert sugar is so called because the dextro-rotation (of the plane of a ray of polarized light) of the original cane sugar is changed or inverted by the action of acid or invertase, the resultant mixture being lævo-rotatory. Invert sugar is lævo-rotatory because the rotation due to the lævo-rotatory fructose is greater than that caused by the dextro-rotatory glucose.

Glucose, which is one of the constituents of invert sugar, is largely used by itself in brewing. It is, however, never prepared from invert sugar for this purpose, but directly from starch by means of acid. By the action of dilute boiling acid on starch the latter is rapidly converted first into a mixture of dextrin and maltose and then into glucose. The proportions of glucose, dextrin, and maltose present in a commercial glucose depend very much on the duration of the boiling, the strength of the acid, and the extent of the pressure at which the starch is converted. In England the materials from which glucose is manufactured are generally purified maize, sago, and rice. In Germany potatoes (potato starch) form the most common raw material, and in America purified Indian corn (maize) is ordinarily employed.

The causes which have led to the largely increased use of substitutes in the United Kingdom are of a somewhat complex nature. The brewer has found, to begin with, that the brewing operations are simplified and accelerated by the use of a certain proportion of sugar, and that he is thereby enabled appreciably to increase his turnover—*i.e.*, he can make more beer in a given time from the same plant. Moreover, with the exception, perhaps, of the very finest class of brewing sugar, substitutes are cheaper than malt. In view of the ever-growing competition in the brewing trade, due largely to the development of the "tied house" system and the steady increase of taxation, this is a matter of considerable economical importance. Having regard to the enormous consumption of beer in the United Kingdom, it is obvious that the extensive use of malt substitutes in brewing is a question of interest not only to the brewer and agriculturist, but also to the general public. Beer is not, perhaps, a food in the ordinary sense of the word, but it possesses a certain food value, and the consumption is so great that its albuminous and carbohydrate constituents form an appreciable percentage of the total proteid and carbohydrate food of the nation. Shortly after the repeal of the Malt Acts a serious agitation against the unrestricted and undeclared use of malt substitutes was started by an influential section of the community. This movement attained such dimensions that the Chancellor of the Exchequer appointed a Departmental Committee to consider the whole question. The Beer Materials Committee, as it was called, sat during 1896-98, and the arguments on the main points of controversy are shortly set forth in the following summary :—

The advocates of "pure beer" (the anti-substitute party) pleaded :—

(1) That by the use of substitutes, more especially of sugar, an article is produced which is materially different from the product obtained from barley malt alone ; that the consumer desires to have an "all-malt" beer, and that it is deceiving the latter to sell him an article which is not of the "nature, substance, and quality" desired. The consumer has (owing to the "tied house" system) in many cases no choice but to drink the beer offered him, and is therefore practically not a free agent.

(2) That *cæteris paribus* a beer brewed with a proportion of sugar contains proportionally less nutritive matter—less extract and less of the valuable by-products which are the chief characteristics of beer—as compared with other spirituous liquors.

(3) That foreign substances are introduced into beer by means of substitutes, as these are in many cases not pure. Some of these

foreign matters (for instance the unfermentable residue of potato glucose) have been held by authorities to be deleterious to health; but in any case, by giving an unlimited choice of materials to the brewer, the latter may—no doubt unintentionally—introduce into beer substances which are harmful (see ADULTERATION).

(4) That long experience both in the United Kingdom and abroad has shown that beer brewed from malt alone has important dietetic properties, and that this experience is lacking in the case of substitute beers. That even if it be correct to estimate food value by direct analysis, "substitute" beers contain less food and more alcohol than "all-malt" beers.

(5) That the use of substitutes is not necessary, as many of the most important brewers (including the largest firms in the United Kingdom) use practically none, and that, if it be a fact that, in order to meet the modern demand for light sparkling beers, it is necessary to use a corrective for the excess of nitrogenous matter in much of the English barley, there is no reason why foreign barley should not be used.

(6) That although it is (with certain exceptions) admitted to be an impossibility to detect the use of substitutes by analysis, there is no doubt that science would find the means to overcome this difficulty.

In answer to these arguments it was urged by those defending the use of substitutes:—

(1) That it is possible by modifying the curing, mashing, and fermenting processes to bring about greater changes in the character and composition of a beer than by the moderate and rational use of substitutes. It is denied that the consumer expects to obtain an "all-malt" article when he asks for "beer," nor does he care provided that his palate is suited. That since the repeal of the Malt Acts it has been *legal* for the brewer to use whatever material he desires, but sugar was used, and in considerable quantities, for many years prior to 1880. That the consumer is not forced to drink any particular brew. That if two beers be brewed from the same malt, and on identical lines, but replacing, say, 25 per cent. of the latter by sugar in the one instance, the difference in food value will be infinitesimal—roughly a quarter of an ounce to the pint—and that even if this system of estimating food value be incorrect, there is nothing to prove that the beer brewed with a well-prepared substitute is not, from a dietetic point of view, of equal value to the "all-malt" article.

(2) That the small quantities of so-called foreign substances or impurities contained in properly prepared substitutes are in no way harmful, and, with regard to the questionable nature of potato glucose, there is much experimental evidence tending to prove that it is harmless. That practically none of this glucose is used for brewing in England, and that the use of any harmful ingredient is punishable by the existing laws, and the fact of its being employed could not fail to come to the notice of the Revenue officials.

(3) That the great and increasing demand of modern times for a light and sparkling beer renders the use either of substitutes or of foreign barley a necessity.

(4) That it would be impracticable to enforce a declaration of the use of substitutes, as it is impossible to discover by analysis whether a beer is "all-malt" or not.

(5) That it is not the fact that substitutes are used because they are cheaper than malt; the better class of substitutes are relatively expensive.

The majority of the Committee reported in favour of the existing laws, substantially declaring that there is no reason either for prohibiting the use or for enforcing the declaration of substitutes. A minority report, signed by one of the six members, advocated declaration and closer control of materials, and held that the majority of the points advanced by the "pure beer" party had been proved.

Germany.—In Bavaria the use of all substitutes is absolutely prohibited, the only substances which may be used in brewing being malt, hops, yeast, and water. In the German Brewing Tariff Union (comprising the whole of the German Empire with the exception of Bavaria, Baden, and Würtemberg) brewers are not restricted with regard to materials, except by the general laws relating to the composition of food stuffs injurious to health. It is a curious fact, however, that the North German Brewers' Union has frequently petitioned Government for restrictive legislation directed against the use of all substitutes, on the ground that the general consumer has more faith in Bavarian beer, knowing it to be made from malt and hops alone, and that such legislation would tend to improve the position of the brewers in the Brewing Tariff Union with regard to Bavarian competition. The quantity of substitutes used within the Tariff Union is small, both actually and in relation to the malt employed, when compared with the figures for the United Kingdom (see above, p. 326). The following table gives the statistics concerning the materials used in the Tariff Union for the financial year 1898-99.

Materials.		Quantities (100 Kilos.).	Percentage on Total Material.
Malt and grain	Barley malt	7,444,983	95·4
	Wheat malt	194,719	2·4
	Other grain	4,664	0·1
	Total grain	7,644,366	97·9
Substitutes proper	Rice	102,254	1·3
	Sugar	36,709	0·8
	Syrup	1,584	
	Other substances	17,009	
	Total substitutes	157,556	2·1

The gross percentage of substitutes (including grain other than barley malt) is therefore less than 5 per cent., and of substitutes proper—rice, sugar, &c.—barely 2 per cent.

Taking the whole of Germany the gross quantity of all barley malt substitutes used amounts roughly to 1½ per cent.

United States.—No restriction is placed by law upon the kind, quantity, or quality of the materials employed. The materials commonly used are malt and hops, but a variety of substitutes for malt is in use to a greater or less extent, and usually in combination with malt. The substitutes chiefly employed are rice, corn (maize), cerealine, glucose, and maltose. The American official returns do not lend themselves to an exact calculation of the percentage of malt substitutes employed at an English equivalent, but the figures show that the ratio of barley malt to substitutes is approximately as two to one. Of the substance chiefly used, rice and other grain constitute about one-half, sugar one-seventh, the remainder consisting of materials which are not separately specified.

In *Austria* there is no restriction as to materials, but substitutes are very little employed, probably because they are more expensive in that country than the natural products which they are designed to replace.

In *Belgium* the grain substitutes form roughly 9 per cent. of the total material; sugar may be used, but the nature and weight, &c., must be specified.

In *Holland* there are no restrictions, but substitutes are little used, probably four-fifths of the beer being brewed from grain alone.

Preservatives.—These are very generally, in fact almost universally, employed nowadays for light draught ales; to a lesser extent for stock ales. The light beers in vogue to-day are less alcoholic, more lightly hopped, and more quickly brewed than the beers of the last generation, and in this respect are somewhat less stable and more likely to deteriorate than the latter were. The preservative in part replaces the alcohol and the hop extract, and shortens the brewing time. The preservatives mostly used are the bisulphites of lime and potash, and these, when employed in small quantities, are generally held to be harmless.

Hops.—The acreage under hops in the United Kingdom has varied considerably since 1875, but on the whole is decreasing. At the date mentioned hops were grown on 69,171 acres; in 1885 this area had risen to the maximum figure noted during the last fifty years—71,327 acres—but since then the average has been considerably lower, amounting between 1896 and 1900 roughly to 50,000 acres a year. Very considerable quantities of foreign hops are now used in the United Kingdom, and according to Messrs Briant and Meacham, the explanation of the preference for American and Continental hops by many brewers is that they improve the keeping properties of the beer. This is due to the fact that foreign hops contain rather more of the soft hop resins—to which the main preservative effect of the hop is due—than many of the English samples. The authorities mentioned above (*Journal of the Royal Agricultural Society*, 1897) point out that English methods of growing, drying, and packing are in many cases faulty, and that by improving these methods the quantity and quality of the soft hop resin can be appreciably improved.

Hop substitutes are very little used. They mostly consist of quassia, gentian, and camomile, and these substances

are quite harmless *per se*, but impart an unpleasantly rough and bitter taste to the beer.

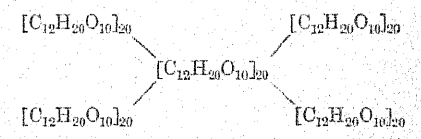
Mashing.—The writer has already alluded to and attempted to give reasons for the fact that in recent times the trend of brewing has been in the direction of light, bright beers, and there is no doubt that in many respects the modern product is preferable to the highly alcoholic, heavily-hopped beers of the bygone generation. When this class of beer is well and cleanly brewed from good material and the fermentation has proceeded on satisfactory lines, it is not only more palatable and sightly, but also less intoxicating and more easily digestible than the beer consumed by our predecessors. Although the imports of foreign beer into the United Kingdom are still infinitesimal compared with the total quantity consumed, it seems that the British taste for beer brewed on the German principle or some modification thereof is steadily growing. Within the most recent times the laying down of a lager beer plant by Messrs Allsopp, capable of turning out 50,000 barrels yearly—*i.e.*, a liquid quantity practically equal to the total imports of foreign beer—has created a very widespread interest. The ordinary German beer—commonly called "Lager" in Great Britain (the German name for it is *Export Bier*, the term *Lager* being reserved for a somewhat different class of brew)—is produced on totally different lines from English beer. The latter is brewed by a process of *infusion*, the former according to the *decoction system*, so called because portions of the mash are treated separately from the whole.

The method pursued in the decoction system is as follows:—After the grist has been mashed with cold water until a homogeneous mixture ensues, sufficient hot water is introduced into the mash-tun to raise the temperature to 85°-100° F. according to circumstances. Thereupon roughly one-third of the mash (including the "goods") is transferred to the *maisch Kessel* (mash copper) in which it is gradually brought to a temperature of (about) 166° F., and this heat is maintained until the mash, which at first presents a milky appearance, becomes transparent—a sign that the starch is completely converted. The *Dickmaische*, as this portion is called, is then raised to the boiling-point and the ebullition sustained between a quarter and three-quarters of an hour. Just sufficient of the *Dickmaische* is returned to the mash-tun proper to raise the temperature of the whole to 110°-125° F., and after a few minutes a third is again withdrawn and treated as before, to form the second *Dickmaische*. When the latter has been returned to the mash-tun the whole is thoroughly worked up, allowed to stand in order that the solids may deposit, and then another third, which is now, however, practically a clear wort (called the *Lautermaische*), is withdrawn, boiled by itself until the coagulable albuminoids are thoroughly precipitated, and finally reconveyed to the mash-tun, where the mashing is continued for some time, the final heat being rather over 160° F. (See under "Fermentation.") As to the relative character and stability of decoction and infusion beers, the latter are, as a rule, more alcoholic; but the former contain more unfermented malt extract, and are therefore, broadly speaking, more nutritive.

Beers of the German type are also less heavily hopped and more peptonized than English beers, and more highly charged with carbonic acid, which, owing to the low fermentation and storing temperatures, is retained for a comparatively long time, and keeps the beer in condition. On the other hand infusion beers are of a more stable and stimulating character. It is impossible to keep "lager" beer on draught in the ordinary sense of the term in England. It will not keep unless placed on ice, and, as a matter of fact, the "condition" of lager is dependent to a far greater extent on the methods of distribution and storing than is the case with infusion beers. If a cask is opened it must be rapidly consumed; indeed, it becomes undrinkable within a very few hours. The gas escapes rapidly when the pressure is released, the temperature rises, and the beer becomes flat and mawkish. In Germany every publican is bound to have an efficient supply of ice, the latter frequently delivered by the brewery together with the beer. The following comparative analysis may give the reader some idea of the difference in composition of various Continental and English beers:—

Beer.		Total Solids (Extract) per Cent.	Alcohol per Cent.	Original Gravity of Wort.
English Beers	Stout	5·27	6·11	1·0648
	Pale Ale	4·32	5·58	1·0579
	Light Bitter	3·96	3·34	1·0394
	Mild Ale	5·81	4·54	1·0554
German &c. Beers	Munich Lager	6·95	3·43	1·0523
	Munich Export	7·48	4·15	1·0595
	Pilsener	4·48	3·39	1·0416

It was formerly believed that by the mashing process the starch of the malt is first converted into dextrin, and that a part of the latter is then transformed into glucose; but modern investigations have shown that the diastatic degradation of starch is by no means so simple a matter. In the first place we now know that the final product obtained from starch under brewing conditions is not glucose, but maltose. It is held by some authorities that the latter is split up into glucose prior to fermentation; but this is certainly not the case in the mash-tun. Although not yet universally accepted, the theory of starch degradation propounded by Messrs Brown and Morris, usually known as the *amyloin* or malto-dextrin theory, and which is based on a great mass of experimental evidence, is of considerable interest, and not only offers a rational and consistent explanation of the phenomena known to accompany the transformation of starch by diastase, but has proved itself to be a practical working hypothesis by which the mashing and fermenting operations may be regulated and controlled. According to Messrs Brown and Morris, the starch molecule consists of five amylin groups, each of which corresponds to the molecular formula $(C_{12}H_{20}O_{10})_{20}$. Four of these amylin radicles are grouped centrally round the fifth thus:—



By the action of diastase this complex molecule is split up, undergoing hydrolysis into four groups of amyloïns, the fifth or central amylin group remaining unchanged (and under brewing conditions unchangeable), forming the substance known as *stable dextrin*. The following equation explains the primary transformation:—

Starch. Water. Stable Dextrin. Amyloïns of various types.

$$5[(C_{12}H_{20}O_{10})_{20}]+n.H_2O=(C_{12}H_{20}O_{10})_{20}+4\begin{cases}(C_{12}H_{22}O_{11})m \leftarrow \text{Maltose radicle.}\\(C_{12}H_{20}O_{10})n \leftarrow \text{Dextrin radicle.}\end{cases}$$

The amyloïns are substances containing varying numbers of amylin (original starch or dextrin) groups in conjunction with a proportional number of maltose radicles. They are not separable into maltose and dextrin by any of the ordinary means, but exhibit the properties of both these substances.

As the process of hydrolysis and degradation proceeds the amyloïns become gradually poorer in amylin and relatively richer in maltose groups, the final product of transformation being maltose. The progress of the transformation of the four convertible amylin groups into malto-dextrins, first of a high and then of a lower type, and finally into maltose, is accompanied by characteristic changes in the physical and chemical properties of the products of hydrolysis. The "opticity"—that is, the power of rotating a ray of polarized light—gradually diminishes, and, inversely, the cupric reduction, by which is denoted the capacity for reducing an alkaline solution of tartrate of copper (Fehling's solution), increases. Messrs Brown and Morris have shown that there is a direct relationship between the opticity and the cupric reduction exercised by the mixed products of starch conversion, and also of any fraction of those mixed products. This relationship is so exact that if either the opticity or the cupric reduction of a solution of starch conversion products of a known density is observed, the other factor can be obtained by calculation. In the

light of our modern knowledge of starch conversion, determinations of the optical properties and the cupric reduction of a wort or of a beer, and of the behaviour of the same towards malt extract and yeast, &c., constitute valuable subsidiary methods for controlling and regulating the brewing operations. Several amyloïns of definite composition have been isolated, one being amylo-dextrin $(C_{12}H_{20}O_{10})_6$ $(C_{12}H_{22}O_{11})$, and another malto-dextrin $(C_{12}H_{20}O_{10})_2$ $(C_{12}H_{22}O_{11})$. The first is an amyloïn of a "high," the second an amyloïn of a "low" type. The amyloïns are not split up in the primary fermentation, but are converted into maltose more or less rapidly, according to their type, during the secondary fermentation. If it is desired to obtain a beer of a stable character—that is to say, one containing a considerable proportion of high-type amyloïns—it is necessary to restrict the action of the diastase in the mash-tub accordingly. On the other hand, for mild running ales, which are to "condition" rapidly, it is necessary to provide for the presence of sufficient malto-dextrin of a low type. Investigation has shown that the type of malto-dextrin can be regulated not only in the mash-tub, but also on the malt-kiln. A higher type is obtained by low kiln and high mashing temperatures than by high kiln and low mashing heats, and it is therefore possible to regulate on scientific lines, not only the quantity, but also the type of amyloïns which are suitable for a particular beer.

Cooling.—The introduction of refrigerators led many brewers to believe that it would be possible to do without the cooler altogether, but experience has shown that this was a fallacious conclusion. It is true that the exposure of hot wort on the cooler is attended with many dangers; but it is now known—thanks chiefly to Pasteur—that the oxygen necessary for the conversion of the hop-resins and other substances into insoluble modifications—that is to say, the *chemically bound* oxygen—can only be absorbed at a relatively high temperature. Beers which have not undergone a thorough hot aeration are liable to be of an unsatisfactory character, owing to the incomplete or tardy precipitation of the hop-resin, &c., in cask. In order, on the other hand, to overcome the dangers attendant on hot aeration, the greatest care must be taken with regard to the purity of the air-supply in the cooling-rooms. With regard to the refrigerator, the wort flows over it in a thin stream, and is, if anything, more exposed to infection during this process than on the cooler. Enclosed refrigerators with a purified air-supply are now being introduced into some breweries, and there is little doubt that this principle will in time be applied to the cooler also.

Fermentation.—The study of the phenomena connected with the process of fermentation, and more particularly of those associated with brewing, has led to discoveries of epoch-making importance, both from a theoretical and practical point of view. Up till 1897 Pasteur's theory of fermentation, according to which this process is indissolubly connected with the living cell, and the products of the fermentation of a saccharine liquid are actual products of yeast metabolism, was almost universally accepted as correct, the evidence in its favour being apparently overwhelming. The discovery in 1897 by Buchner that it is possible to obtain from brewing yeast an unorganized substance, which rapidly converts sugar into alcohol, carbonic acid, &c., outside of and quite apart from the living cell, has necessarily led to some modification of our views. According to Buchner, the substance in question is an enzyme to which he gave the name *zymase*. It may be obtained by grinding up yeast with quartz sand, then subjecting the mass of disintegrated yeast cells so obtained to great pressure, and finally passing the resultant liquid through a filter of the porous porcelain type. By evaporating this liquid at a low temperature the zymase can be obtained in the solid state, and may be kept for a considerable time without losing its property of causing fermentation.

The cause of the activity of the yeast-cell juice has given rise to considerable controversy, and it is contended by some (Ahrens, Macfadyen and Morris, &c.) that it is not due to an enzyme but to particles of living protoplasm. So far, however, the balance of evidence appears to be in favour of Buchner's enzyme theory, and the fact remains that fermentation can be produced without the presence of yeast cells.

The brilliant researches of the Danish chemist and botanist Hansen, which we will next consider, not only mark a new era in our knowledge of the yeasts, but have probably had a greater influence on the fermentation—and especially the brewing—industries than the work of any other man, excepting, no doubt, that of Pasteur. Hansen recognized the fact that it was impossible to study the life action and functions of micro-organisms, more particularly of the yeasts, without first obtaining these in a pure—that is, an unmixed or uncontaminated—state. The "pure culture" yeast of Pasteur (*see* under "Fermentation," vol. ix. ninth edition) was not a pure culture in the true sense, as no certainty existed that the yeast obtained by Pasteur's method did not contain more than one type of organism. Hansen perceived that in order to obtain a really pure culture—that is to say, a culture containing only one particular variety—it was necessary to start from a single cell. He successfully attained this object by two methods—first, by the *dilution method*, so called because a drop of liquid, the approximate number of organisms in which is known, is diluted to such an extent that the average drop of the dilute liquid contains less than one cell; and secondly, by a modification of Koch's plate method, by which each cell, after the distribution of a small number amongst a suitable medium, is kept under microscopic observation during the whole of its development into a colony. By examining ordinary brewing yeast by these methods Hansen discovered that it consists of a number of different species and varieties, some of which are not favourable to the formation of a good beer, and it was found that not only bacteria and the so-called "disease-ferments" (Pasteur, &c.), but also certain types of yeast proper possess various undesirable properties from the brewer's point of view. Hansen showed that although different species and varieties of the same species may appear identical under the microscope, they may possess properties of a widely divergent nature, and that by virtue of those properties they may be differentiated. The chief types occurring in ordinary brewing yeast are—(1) The various varieties of *Saccharomyces cerevisiæ*; (2) *Saccb. Pastor* I., II., and III.; and (3) *Saccb. ellipsoideus* I., II., and III. Of these the *S. cerevisiæ* varieties are the true brewing yeasts. *S. Pastor* I. gives a bitter taste to the beer; *S. Pastor* III. and *S. ellips.* I. produce no particular ill effects, but are not characteristic beer yeasts; the latter being in fact the most common species among the grape yeasts.

Application of Hansen's Discoveries to Brewing.—In 1883 Hansen described a method by which he overcame a persistent tendency of the beers brewed at the Tuborg brewery near Copenhagen to become turbid. This he effected by introducing a pure yeast grown from a single cell. At the same time the Old Carlsberg brewery was afflicted in that its beer displayed a disagreeably bitter taste. Hansen examined the yeast in use there and discovered that it consisted of four varieties, and by experiment he found that only one of these gave a satisfactory beer; a pure culture of this was then tried in the brewery with excellent results, and has been in use there ever since. This is the yeast which is now known as Carlsberg bottom-yeast I. The advantages attendant on the use of pure yeast consist in the fact that it is possible to select the yeast which is best suited to the character of the beer which it is desired to brew, and that by always working with the same yeast it is possible to be absolutely certain of the results—that is to say, flavour, attenuation, stability, and so on, will remain constant.

In Denmark, Norway, and Sweden the practice of brewing with pure yeast is wellnigh universal; it has also been adopted in most of the chief breweries in Germany and Holland, and in many cases in America. Hansen's method has not yet made much headway in England, but it seems probable that in the course of time it will find favour there, but no doubt in a somewhat modified form. The chief difficulty so far is that the conditions under which English beer is fermented are quite unlike those obtaining for beer brewed on decoction lines, and also the radically different characters of the two classes of beer. In the English *top-fermentation* system the wort is pitched and fermented at a relatively high temperature —55°-65° F., sometimes higher. The fermenting vessels are of enormous size, and therefore present a large surface

to the air. The system is called *top-fermentation*, because the type of yeast employed develops on the surface of the liquid, forming the "head." The primary fermentation proceeds rapidly, and is usually complete in two to three days, and in the case of running ales the secondary fermentation is over within a fortnight, or even less. In the Continental *bottom-fermentation* system, the pitching and fermentation take place at a very low temperature (and in relatively small vessels), the cellars being maintained at a temperature of approximately 37°-38° F. The yeast formed in the fermenting wort, the temperature of which rarely rises above 50° F., reposes at the bottom of the fermenting tun, and hence is derived the name of bottom-fermentation. After eleven or twelve days the primary fermentation is complete, and the beer is then run into store (lager) casks where it remains at a temperature approaching the freezing-point of water for six weeks to six months, or even more, according to the time of the year and the class of beer that is being brewed. To put the matter briefly, these are conditions eminently suitable for the employment of pure yeast and the maintenance of it in an uncontaminated state, whereas the high temperatures, the surface exposure of the yeast and so on, which are essential factors of the English system, tend to cause a rapid deterioration of the pure yeast originally used. It is also more or less generally held that there is no single type of yeast which will produce English beer with all its characteristics, but that the latter are due to the joint action of at least two or three varieties or species. It has been stated that satisfactory results have been obtained in English breweries by the use of mixed pure cultures, which fact is not without interest, inasmuch as it is a general rule that one type of yeast (and this applies to micro-organisms generally) tends to predominate in a given liquid at a certain temperature. Cases are known, it is true, where several micro-organisms are essential to the production of a certain substance. This form of multifold existence is termed "symbiosis." Thus for the process of fermentation which results in ginger beer, two organisms are necessary—the one a yeast, the other a mould.

The process of lager beer brewing introduced by Messrs Allsopp into the United Kingdom exhibits many features of interest, as it combines infusion mashing with fermentation on decoction lines, and also embodies a new principle, that of vacuum fermentation, and many of the latest improvements in brewing technology. This process, which is used fairly widely in America, and has even taken a footing in Germany, is the Pfaudler vacuum fermentation process, of which the following is a brief description :— The wort is prepared on the ordinary infusion lines, and is then rapidly cooled by means of refrigerated brine before passing to a temporary store tank, which serves as a gauging vessel. From the latter the wort passes directly to the fermenting tuns, huge closed cylindrical vessels made of sheet-steel and coated with glass-enamel. Here the wort ferments under reduced pressure, the carbonic acid generated being removed by means of a vacuum pump, and the gas thus withdrawn is replaced by the introduction of cool sterilized air. The fermenting cellars are kept at a temperature of 40° F. all the year round, but the fermenting liquid, which shows 45° Fahr. at the commencement, gradually rises to a final temperature of about 53° F. The yeast employed is a pure culture bottom-yeast, but the withdrawal of the products of yeast metabolism and the constant supply of pure fresh air cause the fermentation to proceed far more rapidly than is the case with lager beer brewed on ordinary lines; it is, in fact, finished in about six days. Thereupon the air supply is cut off, the green beer cooled by means of refrigerated brine to 40° F. and then conveyed by means of filtered air pressure to the store tanks. Here the secondary fermentation which takes three weeks proceeds at a low temperature (about 33° F.), but the gases of fermentation are now not removed, but, on the contrary, allowed to collect under pressure, so that the beer may be thoroughly charged with the carbonic acid necessary to give it condition, and in order to replace the gas withdrawn during the primary fermentation. When the secondary fermentation is completed (the attenuation being 68-70 per cent.) the beer is quite bright, but in order to make sure of its being perfectly free of yeast cells, &c., it is passed through a refrigerator and then through a filter, before going to the racking or bottling rooms, as the case may be. The beer is racked and bottled under counter pressure, so that none of the gas of the secondary fermentation can escape; indeed, from the time the wort leaves the copper to the moment when it is bottled in the shape of beer it does not come into contact with the outer air. (P. S.)

Brialmont, Henri Alexis (1821-——), Belgian general and military engineer, son of General Laurent Mathieu Brialmont (d. 1885), was born at Venloo in Limburg on 25th May 1821. Educated at the Brussels military school, he entered the army as sub-lieutenant of engineers in 1843, and was employed on the defences of Diest. From 1847 to 1850 he was private secretary to the war minister, General Chazal. In 1855 he entered the staff corps and rose to the rank of lieutenant-general in 1877, having been appointed, in 1875, inspector-general of fortifications and of the corps of engineers. The preparation and execution of the defence works of the country, and particularly of Antwerp, and of the new works of the Meuse were carried out under his direction. In 1883 he went to Rumania to advise as to the fortification works required for the defence of the country, and presided over the elaboration of the scheme by which Bucarest was proposed to be made a first-class fortress. On his return to Belgium in 1884 he resumed his command of the Antwerp military district. He retired in 1886, but continued to supervise the Rumanian defences. He is a member of the Belgian Royal Academy of Science, and is widely known as an expert in fortification and as a writer of many military works. He originated in 1850 *Le journal de l'Armée Belge*. Some of his principal publications are: *Considérations politiques et militaires sur la Belgique*, 1851-52; *Histoire du duc de Wellington*, 1856-57; *Agrandissement général d'Anvers*, 1858; *Études sur la défense des états et sur la fortification*, 1863; *Traité de fortification-polygonale*, 1869; *La fortification à fossés secs*, 1872; *La défense des états et les camps retranchés*, 1876; *La fortification du champ de bataille*, 1878; *Tactique de combat des trois armes*, 1881; *Situation militaire de la Belgique: Travaux de défense de la Meuse*, 1882; *Le Général Comte Todleben, sa vie et ses travaux*, 1884; *La fortification du temps présent*, 1885.

Brianza, a district of Italy, called the "Garden of Lombardy." It lies between the two southern arms of Lake Como, and stretches south as far as Mariano. It is a hilly and beautiful country, which, although possessing no large town, is densely populated, and, owing to the mildness of its climate and the softness of its air, is a favourite summer resort of the Milanese. Area, about 170 sq. miles.

Briare, a town in the arrondissement of Gien, department of Loiret, France, on the right bank of the Loire, 43 miles in direct line S.E. of Orleans. A bust of Bapterosses (introducer of the button manufacture) was erected in 1897, and there is a handsome modern church. It has

manufactures of fine pottery, and the so-called porcelain buttons, made of specially prepared feldspar; with commerce in wine, wood, and coal. The *Canal of Briare* (about 37 miles long) unites the Loire with the Loing. A new port has been established on a branch of the lateral canal, opened in 1896, on which the traffic in 1898 was 36,217 tons; the traffic on the Canal de Briare being 57,512 tons. Population (1881), 4577; (1901), 5619.

Bribery and Corrupt Practices.—Administrative corruption was dealt with by the British Parliament in the Public Bodies' Corrupt Practices Act, 1889. The public bodies concerned are county councils, town or borough councils, boards, commissioners, select vestries, and other bodies having local government, public health, or poor law powers, and having for those purposes to administer rates raised under public general Acts. The giving or receiving, promising, offering, soliciting or agreeing to receive any gift, fee, loan, or advantage by any person as an inducement for any act or forbearance by a member, officer, or servant of a public body in regard to the affairs of that body is made a misdemeanour in England and Ireland and a crime and offence in Scotland. Prosecution under the Act requires the consent of the Attorney- or Solicitor-General in England or Ireland and of the Lord Advocate in Scotland. Conviction renders liable to imprisonment with or without hard labour for a term not exceeding two years, and to a fine not exceeding £500, in addition to or in lieu of imprisonment. The offender may also be ordered to pay to the public body concerned any bribe received by him; he may be adjudged incapable for seven years of holding public office, *i.e.*, the position of member, officer, or servant of a public body; and if already an officer or servant, besides forfeiting his place, he is liable at the discretion of the court to forfeit his right to compensation or pension. On a second conviction he may be adjudged forever incapable of holding public office, and for seven years incapable of being registered or of voting as a parliamentary elector, or as an elector of members of a public body. An offence under the Act may be prosecuted and punished under any other Act applicable thereto, or at common law; but no person is to be punished twice for the same offence.

Public officers.

For a list of the principal statutes dealing with corrupt and illegal practices at elections, and for the effect of such practices in avoiding returns, see ELECTIONS. Corrupt practices include bribery as defined by the Corrupt Practices Prevention Act, 1883, treating, undue influence, personation, and aiding, abetting, counselling, and procuring personation. The definition of treating has been extended to include the case where the treater is not a candidate, and the voter treated is guilty of the offence as well as the treater; the definition of undue influence now expressly includes the inflicting or threatening to inflict spiritual injury, damage, harm, or loss. Illegal practices are certain acts and omissions in regard to an election which are now prohibited, whether done or omitted, honestly or dishonestly. They may be classified under the following heads:—(1) Acts which are illegal practices by whomsoever committed. These are as follows: Payment or receipt or contracts to pay or receive money for conveyance of voters to or from the poll, on account of any committee room beyond the number allowed by the Act, or to an elector for use of house or land to exhibit addresses, &c., or for exhibition by him (otherwise than in the ordinary course of his business of advertising agent) of such addresses, &c.; payment of election expenses otherwise than by or through the election agent, and payment otherwise than to a candidate or election agent of money provided by any other person for election expenses; voting or procuring to vote of any person prohibited from voting, if the person offending knows of the prohibition; knowingly publishing a false statement that a candidate has withdrawn, or publishing with a view to affect the return of a candidate a false statement as to his character or conduct. (2) Acts and omissions which are illegal practices in the case of candidates and agents only, being breaches of duties specially imposed on them. These are the payment or incurring expenses in excess of the maximum authorized by the Legislature, the omitting without lawful excuse to make a return and declaration of expenses in due time, and the payment by an election agent of any election expense amounting to 40s. not vouched by bill of particulars and receipt, of any claim for expenses not sent in in due time, or of any such claim after the time allowed for payment thereof. (3) Acts which are illegal practices when done by a candidate or agent, and are a minor offence when done by any one else. These are illegal payments, employment, and hiring, and printing, publishing, or posting a bill, placard, or poster not bearing on its face the name of the printer or publisher. Illegal payments are knowingly providing money for prohibited payments or expenses in excess of the maximum, corruptly inducing a candidate to withdraw by payment or promise of payment (the candidate so induced being guilty of the like offence), paying or agreeing to pay for torches, flags, banners, cockades, ribbons, and other marks of distinction (the receiver being guilty of the like offence if he is aware of the illegality). Illegal employment is the employment for payment or promise of payment of persons beyond the number allowed by the Legislature or for purposes not authorized. The employé is guilty of the like offence if he knows of the illegality. Illegal hiring is the letting or lending, or the employing, hiring, borrowing, or using to carry voters to the poll of stage, or hackney carriages, or horses, or of carriages or horses ordinarily let for hire, and the hiring of committee rooms in premises licensed for the sale of intoxicants, in a club (not being a permanent political club) where intoxicants are sold, in premises where refreshments are ordinarily sold, or in a public elementary school in receipt of a parliamentary grant. Personation and aiding, abetting, &c., of personation are felonies punishable with two years' imprisonment with hard labour. All other corrupt practices are indictable misdemeanours (in Scotland, crimes and offences) punishable with one year's imprisonment, with or without hard labour, or a fine not exceeding £200. Conviction of any corrupt practice also renders the offender incapable for seven years of being registered as an elector, or voting at any election, parliamentary or other, in the United Kingdom, or of holding any public or judicial office, or of being elected to or sitting in the House of Commons; and any such office or seat held by him at the time is vacated. In the case of a parliamentary candidate, if an election court finds that there has been treating or undue influence by him, or any other corrupt practice with his knowledge or consent, he becomes incapable of ever being elected for the same constituency, and incurs the like incapacities as if he had been convicted on indictment; if it is found by the election court that he has been guilty by his agents of a corrupt practice, he becomes incapable for seven years of being elected for the same constituency. Illegal practices are offences punishable on summary conviction with a fine not exceeding £100, and with five years' incapacity for being registered or voting as a parliamentary elector, or an elector to public office within the county or borough where the offence was committed. Illegal payments, employment, and hiring, and printing and publishing of

Elections.

bills, &c., not bearing the printer's or publisher's name, are, when committed by any one who is not a candidate or agent, offences punishable on summary conviction with a fine not exceeding £100, but carry with them no incapacities. Where an election court finds that any illegal practice has been committed with the knowledge or consent of a parliamentary candidate, he becomes incapable for seven years of being elected to or sitting in the House of Commons for the same constituency. He incurs the like incapacity, limited to the duration of the parliament for which the election was held, if the election court finds that he was guilty by his agents of an illegal practice. A prosecution for any of the above offences cannot be instituted more than a year after the offence was committed, unless an inquiry by Election Commissioners takes place, in which case it may be instituted at any time within two years from the commission of the offence, not being more than three months after the date of the Commissioners' report.

The law as to corrupt and illegal practices, as above stated, applies to parliamentary, municipal, county, parochial, and school board elections. Incapacities corresponding to those incurred by parliamentary candidates found guilty by an election court are incurred by municipal and other candidates in the like case, *e.g.*, a municipal candidate found personally guilty of a corrupt practice is incapacitated forever, and a candidate found guilty by his agents is incapacitated for three years from holding corporate office in the borough. No maximum of expenses is prescribed for school board candidates, nor is any return and declaration of expenses required from them.

Bribery at elections of fellows, scholars, officers, and other persons in colleges, cathedral and collegiate churches, hospitals, and other societies is prohibited by the Act 31 Eliz. c. 6. If a member receives any money, fee, reward, or other profit for giving his vote in favour of any candidate, he forfeits his own place; if for any such consideration he resigns to make room for a candidate, he forfeits double the amount of the bribe, and the candidate by or on whose behalf a bribe is given or promised is incapable of being elected on that occasion. The Act is to be read at every election of fellows, &c., under a penalty of £40 in case of default. By the same Act any person for corrupt consideration presenting, instituting, or inducting to an ecclesiastical benefice or dignity forfeits two years' value of the benefice or dignity; the corrupt presentation is void, and the right to present lapses for that turn to the Crown, and the corrupt presentee is disabled from thereafter holding the same benefice or dignity; a corrupt institution or induction is void, and the patron may present. For a corrupt resignation or exchange of a benefice the giver and taker of a bribe forfeit each double the amount of the bribe. Any person corruptly procuring the ordaining of ministers or granting of licenses to preach forfeits £40, and the person so ordained forfeits £10, and for seven years is incapacitated from holding any ecclesiastical benefice or promotion. (L. L. S.)

Bridge.—Bridge is a game of cards for four players developed out of the game of whist. It is probably of Russian origin. It appeared to have been first played in England about 1880 under the name of Biritch or Russian whist. It found its way to the London clubs about 1894, from which date its popularity rapidly increased. Bridge differs from whist in the following respects:—Although there are four players, yet in each hand the partner of the dealer takes no part in the play of that particular hand. After the first lead his cards are placed on the table exposed, and are played by the dealer as at dummy whist; nevertheless the dealer's partner is interested in the result of the hand equally with the dealer. The trump suit is not determined by the last card dealt, but is selected by the dealer or his partner without consultation, the former having the first option. It is further open to them to play without a trump suit. The value of tricks and honours varies with the suit declared as trumps. Honours are reckoned differently from whist, and on a scale which is somewhat involved and illogical. There are five honours, the ten being accepted as one of them. The score for honours does not count towards winning or losing the rubber, but is added afterwards to the trick score in order to determine the value of the rubber. There is also a score for holding no trumps in one of the hands, and for winning a "slam."

The *score* has to be kept on paper. It is usual for the scoring block to have two vertical columns divided halfway by a horizontal line. The left column is for the scorers' side and the right for the opponents'. Honours are scored above the horizontal line and tricks below. The drawback to this arrangement is that, since the scores for each hand are not kept separately, it is generally impossible to trace an error in the score without going through the whole series of hands. A better plan, it seems, is to have four columns ruled, the inner two being assigned to tricks, the outer ones to honours. By this method a line can be reserved for each hand, and any discrepancy in the scores at once rectified.

The Portland Club drew up a code of laws in 1895, and this code, with a few amendments, was in July 1895 adopted by a joint committee of the Turf and Portland Clubs. The provisions of the code are here summarized. Each trick above 6 counts 2 points in a spade declaration, 4 in a club, 6 in a diamond, 8 in a heart, 12 in a no-trump declaration. The game consists of 30 points made by tricks alone. When one side has won two games the rubber is ended. The winners are entitled to add 100 points to their score. Honours consist of ace, king, queen, knave, ten, in a suit declaration. If a player and his partner conjointly hold 3 honours they score twice the value of a trick; if 4 honours, 4 times; if 5 honours, 5 times. If a player in his own hand hold 4 honours he is entitled to score 4 honours in addition to the score for conjoint honours; thus, if one player hold 4 honours and his partner the other their total score is 9 by honours. Similarly if a player hold 5 honours in his own hand he is entitled to score 10 by honours. If in a no-trump hand the partners conjointly hold 3 aces, they score 30 for honours; if 4 aces, 40 for honours. 4 aces in 1 hand count 100. On the same footing as the score for honours are the following: *chicane*, if a player hold no trump, in amount equal to 2 by honours; *grand slam*, if one side win all the tricks, 40 points; *little slam*, if they win 12 tricks, 20 points. At the end of the rubber the total scores, whether made by tricks, honours, chicane, slam, or rubber points, are added together, and the difference between the two totals is the number of points won.

The Play.—The cards are shuffled, cut, and dealt (the last card not being turned) as at whist; but the dealer cannot lose the deal by misdealing. After the deal is completed, the dealer makes the trump declaration, or passes the choice to his partner without remark. If the dealer's partner make the declaration out of his turn, either adversary may, without consultation, claim a fresh deal. If an adversary make a declaration, the dealer may claim a fresh deal or disregard the declaration. Then, after the declaration, either adversary may double, the leader having first option. The effect of doubling is that each trick is worth twice as many points as before; but the scores for honours, chicane, and slam are unaltered. If a declaration is doubled, the dealer and his partner

have the right of redoubling, thus making each trick worth four times as much as at first. The declarer has the first option. The other side can again redouble, and so on. It is well to limit the value to which a trick can reach to 100 points. In the play of the hand the laws are nearly the same as the laws of whist, except that the dealer may expose his cards and lead out of turn without penalty. Dummy cannot revoke. The dealer's partner may take no part in the play of the hand beyond reminding the dealer when it is his lead or dummy's, and guarding him against revoking.

Advice to Players.

In the choice of a suit two objects are to be aimed at: first, to select the suit in which the combined forces have the best chance of making tricks; secondly, to select the trump so that the value of the suit agrees with the character of the hand, *i.e.*, a suit of high value when the hands are strong and of low value when very weak. As the deal is a great advantage it generally happens that a high value is to be aimed at, but occasionally a low value is desirable. The task of selection should fall to the hand which has the most distinctive features, that is, either the longest suit or unusual strength or weakness. No consultation being allowed, the dealer must assume only an average amount of variation from the normal in his partner's hand. If his own hand has distinctive features beyond the average, he should name the trump suit himself, otherwise pass it to his partner. It may here be stated what is the average in these respects. As regards the length of suit, a player's long suit is rather more likely to be fewer than five than over five. If the dealer has in his hand a suit of five cards including two honours, it is probable that he has a better suit to make trumps than dummy; if the suit is in hearts or diamonds, and the dealer has a good hand, he ought to name the trump. As regards strength, the average hand would contain ace, king, queen, and knave or equivalent strength. Hands stronger or weaker than this by the value of a king or less may be described as featureless. If the dealer's hand is a king over the average, it is more likely than not that his partner will either hold a stronger hand, or will hold such a weak hand as will counteract the player's strength. The dealer would not, therefore, with such a hand declare no trump, especially as by making a no-trump declaration the dealer forfeits the advantage of holding the long trumps.

The following is a rough method of calculating the value of the player's chances:—Count each ace (above or below the player's share, 1 ace) as worth $1\frac{1}{4}$ tricks; each king, $\frac{3}{4}$ trick; each queen, $\frac{1}{2}$ trick; each knave, $\frac{1}{4}$ trick; each trump beyond $3\frac{1}{2}$, 1 trick. The result, multiplied by the suit value, gives the player's net expectation after deducting the value of the adversaries' chance. As regards the score for honours, compared with an average declaration with 2 honours, 3 honours are equivalent to half an extra trick, 4 honours to 2 extra tricks, and each honour short means a loss of half a trick. In no-trump declarations the value of high cards is nearly double that given above for suit declarations. When the decision has been left to dummy, he knows that he can expect less than average assistance from the dealer's hand. On this account he should deduct 1 trick for a no-trump, heart, or diamond declaration. When considering the strength of a hand, account must be taken whether the high cards are guarded or not; a king single is of less value than a queen guarded.

Declarations by Dealer.—A hand, to be strong enough for a no-trump declaration, should be a king and knave, or two queens above the average, or a king above the average, if all the honours are well guarded; and perhaps even a queen above the average if all the suits are protected. But in doubtful cases a suit of 6 red cards with 2 honours, or even 4, all honours, is to be preferred. With an average hand declare 5 hearts with 2 honours, or 4 with 3 honours; 5 diamonds with 3 honours, or 4 all honours; 6 clubs with 3 honours, or 5 with 4 honours; 8 spades. With a weak hand, containing a king only, or a queen and knave, declare any suit containing 5 cards with 2 honours. With a very weak hand, containing no card higher than a 10, declare 6 hearts or 5 diamonds, or 4 clubs or 1 spade. Hands containing a suit headed by a strong sequence of high cards lend themselves especially to no-trump declarations. With an established black suit of 5 or 6 cards the dealer should declare no-trump if he has another suit protected. When very weak in red suits the dealer should propose rather more often, especially when blank in a suit. Thus with no hearts he should be content with 1 trump fewer in clubs and 2 trumps fewer in spades than when he has a fair suit of hearts.

Declarations by dummy.—When the dealer has passed the declaration to his partner, the latter knows that the dealer's hand is not strong, either as regards high cards or in the two red suits, whilst there is a slightly increased possibility of the dealer being strong in the black suits. This is about accurately represented by subtracting 1 trick in the case of a no-trump or red suit declaration. With the advantage of the long trumps, the dealer's side generally have still the better chance of winning the odd trick, and the cautious policy often adopted is a mistake. The value of dummy's chance, with different declarations, can be calculated by the method given above, and the best chosen. With a hand an ace above the average, or with 3 aces, no trumps should be declared, unless dummy has a suit of 6 hearts or diamonds. With a hand two queens above the average no trump should also be declared, unless there is a good red suit; and there are hands in which all suit declarations are so weak that a no-trump declaration can be made with a king above the average. With an average hand the best suit should be declared, if it consists of 5 cards. If there be no suit of 5 cards, it is sometimes better to declare 3 clubs or spades than 4 of a red suit. With a hand an ace below the average, a red suit should not often be selected unless it contains 6 cards; 4 clubs or 3 spades should be chosen in preference to a suit of 5 hearts or diamonds.

Doubling.—When either the dealer or his partner has declared no trumps, hearts, or diamonds, he is nearly certain to have a hand apparently worth two tricks above the normal; the average value of hands will probably be three tricks. It would appear to be to the adversaries' advantage to double whenever one of them holds a hand with a better face-value than the average strength that the declarer may be presumed to hold. But it has to be considered, first, that doubling gives the declarer a chance of redoubling should he hold an exceptionally strong hand; secondly, that doubling gives information to the dealer—not of much value when the doubler is on the declarer's left, but of great value when he is on the declarer's right. The player on the declarer's left is justified in doubling if the face-value of his hand is 4 tricks above the normal, by the method explained above. In order that the player on the declarer's right may be justified in doubling, his hand must be considerably stronger, or else his hand must be so free from tenaces that it is immaterial on which side the strength lies. A spade declaration can be much more freely doubled by either player. The presumption is that when the dealer declares spades his weakness fully counterbalances the advantage of the deal. When the dealer has declared spades, either adversary possessing a hand worth

two tricks above the normal can double. When dummy has declared spades, either adversary may double if his hand is worth three tricks above the normal. With a club declaration the strength that would justify doubling is intermediate between that in the case of spades and of a high declaration.

Sometimes the player who has the lead may be justified in doubling in a no-trump declaration on account of a suit established, having weakness in other suits. With such a hand he should not rely on any assistance from his partner. There is, however, one case in which the player on the right of the dealer should double a no-trump declaration. When he has an established suit of six or seven cards, it is of great importance that he should inform his partner of his strength in the suit. This he does by doubling; his partner then knows that there is great strength in one suit, and abandons his own game to lead the suit in which he is most likely to find his partner strong. This has become a recognized signal, but with a double interpretation. In England the player will lead the suit in which he himself is weakest. In America he will lead hearts, the suit in which the dealer is least likely to be strong. Regarded purely as a signal, reserving the device for the heart suit makes it of greater value, since the command given is of a definite character; often, even with moderate strength, it will save enough tricks to compensate for the doubled value. It must be admitted, however, that it approaches an arbitrary convention.

Redoubling.—When a declaration has been doubled, the declarer knows the minimum that he will find against him; he must be prepared to find occasionally strength against him considerably exceeding this minimum. Except in the case of a spade declaration, cases in which redoubling is justifiable are very rare.

The play of the hand.—In a no-trump declaration the main object is to bring in a long suit. In selecting the suit to establish, the dealer should be guided by the following considerations:—One hand should hold at least five cards of the suit. The two hands, unless with a sequence of high cards, should hold between them eight cards of the suit, so as to render it probable that the suit will be established in three rounds. The hand which contains the strong suit should be sufficiently strong in cards of re-entry. The suit should not be so full of possible tenaces as to make it disadvantageous to open it. The tricks lost should, if possible, be inevitable ones; for instance, of two suits of equal length, one headed by a king, queen, knave, the other by ace, king (there being no chance of catching the queen), the former should be chosen, since the ace of that suit will win a trick anyhow, but the queen of the latter suit will not unless the suit is opened early. As regards the play of the cards in a suit, it is not the object to make tricks early, but to make all possible tricks. Deep finesses should be made when there is no other way of stealing a trick. Tricks may be given away, if by so doing a favourable opening can be made for a finesse. When, however, it is doubtful with which hand the finesse should be made, it is better to leave it as late as possible, since the card to be finessed against may fall, or an adversary may fail, thus disclosing the suit. It is in general unsound to finesse against a card that must be unguarded. From a hand short in cards of re-entry, winning cards should not be led out so as to exhaust the suit from the partner's hand. Even a trick should sometimes be given away. For instance, if one hand holds seven cards headed by ace, king, and the other hand holds only two of the suit, although there is a fair chance of making seven tricks in the suit, it would often be right to give the first trick to the adversaries. When one of the adversaries has shown a long suit, it is frequently possible to prevent its being brought in by a device, such as holding up a winning card, until the suit is exhausted from his partner's hand, or playing in other suits so as to give the player the lead whilst his partner has a card of his suit to return, and to give the latter the lead when he has no card to return. The dealer should give as little information as possible as to what he holds in his own hand, playing frequent false cards. Usually he should play the higher or highest of a sequence; still there are positions in which playing the higher gives more information than the lower; a strict adherence to a rule in itself assists the adversaries. In a suit declaration the positions are so numerous that no general remarks can be offered on the dealer's conduct of the hand.

In a no-trump declaration the opponents of the dealer should endeavour to find the longest suit in the two hands, or the one most easily established. With this object the leader should open his best suit. If his partner next obtains the lead he ought to return the suit, unless he himself has a suit which he considers better, having due regard to the fact that the first suit is already partially established. The opponents should employ the same tactics as the dealer to prevent the latter from bringing in a long suit; they can use them with special effect when the long suit is in the exposed hand.

To lead up to dummy's weak suits is a valuable rule. The converse, to lead through strength, must be used with caution, and does not apply to no-trump declarations. It is not advisable to adopt any of the recent whist methods of giving information. It is clear that, if the dealer's is the only hand kept secret, he, in addition to his natural advantage, has the further advantage of better information than either of the adversaries. In no-trump declarations, however, it is of great importance that a player should be able to show his strong suit. The original leader does this by his lead; his partner can often only show his by his discard. This he does by discarding from his weak suit. It is open to objection that he must sometimes unguard the dealer's or dummy's suit. When he considers it advisable to discard from his long suit, it is a recognized signal that he should discard a higher card before a low one. A similar method is used to show strength in the suit opened by his partner. In a suit declaration this signal sometimes has a different signification, and is taken to mean that the player has no more of the suit.

The highest of a sequence led through dummy will frequently tell the third player that he has a good finesse. The lowest of a sequence led through the dealer will sometimes explain the position to the third player, at the same time keeping the dealer in the dark.

When on dummy's left it is futile to finesse against a card not in dummy's hand. But with ace and knave, if dummy has either king or queen, the knave should usually be played, partly because the other high card may be in the leader's hand, partly because, if the finesse fails, the player may still hold a tenace over dummy. In a suit declaration it is frequently the best play for the original leader not to lead from his longest suit, as at whist, (1) because with so many cards exposed his partner is not likely to be deceived by the lead, and will probably lead the suit to him to greater advantage; (2) because there is not much chance of his bringing in a suit. He may often, with success, lead a singleton in hearts or diamonds, knowing from the declarations that he is not leading up to great strength, and that the suit is probably his partner's.

Playing to the score.—At the beginning of the hand

the chances are so great against any particular result, that at the score of love-all the advantage of getting to any particular score has no appreciable effect in determining the choice of suit. In the play of the hand, the advantage of getting to certain points should be borne in mind. The principal points to be aimed at are 6, 18, and, in a less degree, 22. The 2 points that take the score from 4 to 6 are worth 4, or perhaps 5, average points; and the 2 points that take the score from 6 to 8 are worth 1 point. When approaching game it is an advantage to make a declaration that may just take the player out, and, in a smaller degree, one that will not exactly take the adversaries out. When the score is 24 to 22 against the dealer, hearts and clubs are half a trick better relatively to diamonds than at the score of love-all. In the first and second games of the rubber the value of each point scored for honours is probably about a third of a point scored for tricks—in a close game rather less, in a one-sided game rather more. In the deciding game of the rubber, on account of the importance of winning the game, the value of each point scored for honours sinks to one-fifth of a point scored for tricks. (W. H. W.*)

Bridge of Allan, a police burgh (1870) and health resort of Stirlingshire, Scotland, on the Allan water, 3 miles N. of Stirling by rail and tramway. There are two public halls and two reading-rooms, a hydropathic establishment, a mineral spring and well-room, and a fine art and natural history museum. The industries are bleaching, dyeing, and paper-making. The private schools are noted. Population (1881), 3004; (1901), 3240.

Bridgend, a market town of South Wales on the Ogmore, 20 miles W. by N. of Cardiff by rail, in the southern parliamentary division of the county of Glamorgan. There are a town hall, and two lunatic asylums, for the county of Glamorgan and the county borough of Swansea, erected at a cost of nearly £200,000. Bridgend has a foundry, joinery works, a tannery, and brickworks. Area of urban district (created in 1894), 2448 acres; population (1881), 4153; (1901), 6399.

Bridgenorth, a municipal borough and market town in the Ludlow parliamentary division (since 1885) of Salop, England, on the Severn, 20 miles S.E. of Shrewsbury by rail. A steep line of rail between the Low and the High Town has been opened, and the town hall (1652) restored. Area, 1168 acres; population (1881), 5317; (1901), 6049.

Bridgeport, a town and city of Connecticut, U.S.A., and capital of Fairfield county, the town and city occupying the same area, situated on Long Island Sound, at the mouth of Pequanoc river. The New York, New Haven, and Hartford railway furnishes communication. There are extensive manufactures, which in 1890 employed over $13,000,000 of capital, and produced more than $22,000,000 of manufactured goods. The principal among these were corsets, steam-fitting and heating apparatus, and foundry and machine-shop products. In 1900 the assessed valuation of real and personal property was $62,905,862, the tax rate $13 per $1000, and the net debt $1,270,098. Population (1880), 27,643; (1890), 48,866; (1900), 70,996, of whom 22,281 were foreign-born, and 1149 were negroes. The death-rate in 1900 was 17·3.

Bridges.—The article in the ninth edition of this Encyclopædia ends with a description of the Tay Bridge, then in course of construction (1876).[1] That bridge was overturned in a storm on 28th December 1879, when an aggregate length of 3000 feet of girders fell, this being one of the greatest disasters which ever occurred to an engineering structure. Since that time greater attention has been given to the loading forces acting on bridges, to the determination of the severest straining actions, and to the best and most economical arrangement of material. The general use of mild steel in place of wrought iron in bridge-work involves much greater care in the selection and testing of the material. The analysis of the secondary straining actions, bending and twisting due to the local conditions in which loads are applied to individual members, has been worked out. With more complete knowledge of the straining actions engineers have greater confidence in design, and bridges have been built with spans approaching the theoretical limit possible for the material used. Lastly, with increase of size, more study of methods of erection has been necessary, and it is recognized that in large bridges facility of erection becomes a governing consideration in design. In materials other than iron or steel the greatest change has been the extension of the use of cement concrete for foundations and substructures, and in some cases for the arches of large arched bridges. Concrete strengthened by iron bars or a network of steel has also been used, and seems likely to be of considerable value. In metal bridges wrought iron has been replaced by mild steel—a stronger, tougher, and better material. Ingot metal or mild steel was sometimes treacherous when first introduced, and accidents occurred, the causes of which were obscure. In fact, small differences of composition or variations in thermal treatment during manufacture involve relatively large differences of quality. Now it is understood that care must be taken in specifying the exact quality and in testing the material supplied. Structural wrought iron has a tenacity of 20 to 22½ tons per sq. in. in the direction of rolling, and an ultimate elongation of 8 or 10 per cent. in 8 inches. Across the direction of rolling the tenacity is about 18 tons per square inch, and the elongation 3 per cent. in 8 inches. Steel has only a small difference of quality in different directions. There is still controversy as to what degree of hardness, or (which is nearly the same thing) what percentage of carbon, can be permitted with safety in steel for structures.

The qualities of steel used may be classified as follows:—(*a*) Soft steel, having a tenacity of 22½ to 26 tons per sq. in., and an elongation of 32 to 24 per cent. in 8 in. (*b*) Medium steel, having a tenacity of 26 to 30 tons per sq. in., and 28 to 25 per cent. elongation. (*c*) Moderately hard steel, having a tenacity of 30 to 34 tons per sq. in., and 20 per cent. elongation. (*d*) Hard steel, having a tenacity of 34 to 40 tons per sq. in., and 10 per cent. elongation. Soft steel is used for rivets always, and sometimes for the whole superstructure of a bridge, but medium steel more generally for the plates, angle bars, &c., the weight of the bridge being then reduced by about 7 per cent. for a given factor of safety. Moderately hard steel has been used for the larger members of long span bridges. Hard steel, if used at all, is used only for compression members, in which there is less risk of flaws extending than in tension members. With medium or moderately hard steel all rivet holes should be drilled, or punched ⅛ inch less in diameter than the rivet and reamed out, so as to remove the ring of material strained by the punch.

The external forces acting on a bridge may be classified as follows:—I. The *live or temporary load*, for road bridges, is taken to be the weight of a dense crowd (about 120 lb per sq. ft.), or the weight of a heavily loaded waggon (say 10 to 25 tons on four wheels), while for railway bridges it is the weight of the heaviest train likely to come on the bridge. II. An allowance is sometimes made for *impact*, that is, the dynamical action of the live load due to irregularities of the permanent way or yielding of the structure. III. The *dead load* comprises the weight of the main girders, flooring and wind bracing, or total weight of the superstructure exclusive of any part

[1] Later information will be found, however, in the ninth edition under other headings, *e.g.*, the Forth Bridge under RAILWAYS, xx. 234.

directly carried by the piers. IV. The *horizontal pressure* is due to a wind blowing transversely to the span. V. The *longitudinal drag* is due to the friction of a train when braked (about $\frac{1}{7}$th of the weight of the train). VI. On a curved bridge the *centrifugal load* is due to the radial acceleration of the train. VII. In some cases changes of temperature set up stresses equivalent to those produced by an external load.

Live load. In the earlier girder railway bridges the live load was taken to be equivalent to a uniform load of one ton per foot run for each line of way. At that time locomotives on railways of 4 ft. $8\frac{1}{2}$ in. gauge weighed at most 35 to 45 tons, and their length between buffers was such that the average load did not exceed one ton per foot run. Trains of waggons did not weigh more than three-quarters of a ton per foot run when most heavily loaded. The weights of engines and waggons are now greater, and in addition it is recognized that the concentration of the loading under the axles gives rise to straining actions greater than those due to the same load uniformly distributed. A modern heavy English tank locomotive may weigh 47 tons with a length over buffers of $30\frac{1}{2}$ feet, and a wheel base of 16 feet. This corresponds to 1·53 tons per foot run of engine length. American locomotives are heavier. Thus, a consolidation engine and tender may weigh 126 tons, with a length over buffers of 57 feet, corresponding to an average load of 2·55 tons per foot run. In America long ore waggons are sometimes used which weigh loaded two tons per foot run. It is clear, with such variation in weight and in its distribution, that some typical arrangement of loads must be assumed representing in given cases the worst to be expected. Mr Waddell (*De Pontibus*, New York, 1898) proposes to arrange railways in seven classes, according to the live loads which may be expected from the character of their traffic, and to construct the bridges in accordance with this classification:—For the lightest class, he takes a locomotive and tender of 93·5 tons, 52 feet between buffers (average load = 1·8 tons per foot run), and for the heaviest, a locomotive and tender weighing 144·5 tons, 52 feet between buffers (average load = 2·77 tons per foot run). Waggons he assumes to weigh for the lightest class 1·3 tons per foot run, and for the heaviest 1·9 tons. Then he takes the live load for a bridge to consist of two such engines, followed by a train of waggons covering the span.

Impact. If a vertical load is imposed suddenly, but without velocity, work is done during deflection, and the deformation and stress are momentarily double those due to the same load at rest on the structure. No load of exactly this kind is ever applied to a bridge. But if a load is so applied that the deflection increases with speed, the stress is greater than that due to a very gradually applied load, and vibrations about a mean position are set up. The rails not being absolutely straight and smooth, centrifugal and lurching actions occur which alter the distribution of the loading. Again, rapidly-changing forces, due to the moving parts of the engine which are unbalanced vertically, act on the bridge; and, lastly, inequalities of level at the rail ends give rise to shocks. For all these reasons the stresses due to the live load are greater than those due to the same load resting quietly on the bridge. This increment is larger on the flooring girders than on the main ones, and on short main girders than on long ones. The impact stresses depend so much on local conditions that it is difficult to fix what allowance should be made. Mr E. H. Stone (*Trans. Am. Soc. of Civil Engineers*, xli. p. 467) collated some measurements of deflection taken during official trials of Indian bridges, and found the increment of deflection due to impact to depend on the ratio of dead to live load. By plotting and averaging he obtained the following results:—

Excess of Deflection and straining Action of a moving Load over that due to a resting Load.

Dead load in per cent. of total load	10	20	30	40	50	70	90
Live load in per cent. of total load	90	80	70	60	50	30	10
Ratio of live to dead load	9	4	2·3	1·5	1·0	0·43	0·10
Excess of deflection and stress due to moving load per cent.	23	13	8	5·5	4·0	1·6	0·3

These results are for the centre deflections of main girders, but Mr Stone infers that the augmentation of stress for any member, due to causes included in impact allowance, will be the same percentage for the same ratios of live to dead load stresses. Valuable measurements of the deformations of girders and tension members due to moving trains have been made by Mr Robinson (*Proc. Am. Soc. C. E.*, xvi.) and by Mr Turneaure (*Proc. Am. Soc. C. E.* xli.). The latter used a recording deflectometer and two recording extensometers. The observations are difficult, and the inertia of the instrument is liable to cause error, but much care was taken. The most striking conclusions from the results are that the locomotive balance weights have a large effect in causing vibration, and next, that in certain cases the vibrations are cumulative, reaching a value greater than that due to any single impact action. Generally: (1) At speeds less than 25 miles an hour there is not much vibration. (2) The increase of deflection due to impact at 40 or 50 miles an hour is likely to reach 40 to 50 per cent. for girder spans of less than 50 ft. (3) This percentage decreases rapidly for longer spans, becoming about 25 per cent. for 75-feet spans. (4) The increase per cent. of boom stresses due to impact is about the same as that of deflection; that in web bracing bars is rather greater. (5) Speed of train produces no effect on the mean deflection, but only on the magnitude of the vibrations.

A purely empirical allowance for impact stresses has been proposed, amounting to 20 per cent. of the live load stresses for floor stringers; 15 per cent. for floor cross girders; and for main girders, 10 per cent. for 40-feet spans, and 5 per cent. for 100-feet spans. These percentages are added to the live load stresses.

Dead load. The dead load consists of the weight of main girders, flooring, and wind-bracing. It is almost always reckoned as uniform per foot run, though sometimes allowance should be made for the increase of weight towards the centre of the span. The weight of the bridge flooring depends on the type adopted. Roughly, the weight of sleepers, rails, &c., is 0·25 ton per foot run for each line of way, while the rail girders, cross girders, or troughing weigh 0·15 to 0·25 ton. The weight of main girders increases rapidly with the span, and there is for any type of bridge a limiting span beyond which the dead load stresses exceed the assigned limit of working stress.

Let W_l be the total live load, W_f the total flooring load on a bridge of span l, both being considered for the present purpose to be uniform per foot run. Let $k(W_l+W_f)$ be the weight of main girders designed to carry W_l+W_f, but not their own weight in addition. Then

$$W_g=(W_l+W_f)(k+k^2+k^3\ldots)$$

will be the weight of main girders to carry W_l+W_f and their own weight (Buck, *Proc. Inst. C. E.* lxvii. p. 331). Hence,

$$W_g=(W_l+W_f)k/(1-k).$$

Since in designing a bridge W_l+W_f is known, $k(W_l+W_f)$ can be found from a provisional design in which the weight W_g is neglected. The actual bridge must have the section of all members greater than those in the provisional design in the ratio $k/(1-k)$.

Mr Waddell (*De Pontibus*) gives the following convenient empirical relations. Let w_1, w_2, be the weights of main girders per foot run for a live load p per foot run and spans l_1, l_2. Then

$$\frac{w_2}{w_1}=\frac{1}{2}\left[\frac{l_2}{l_1}+\left(\frac{l_2}{l_1}\right)^2\right].$$

Now let w_1', w_2' be the girder weights per foot run for spans l_1, l_2, and live loads p' per foot run. Then

$$\frac{w_2'}{w_2}=\frac{1}{5}\left(1+4\frac{p'}{p}\right)$$

$$\frac{w_2'}{w_1}=\frac{1}{10}\left[\frac{l_2}{l_1}+\left(\frac{l_2}{l_1}\right)^2\right]\left(1+4\frac{p'}{p}\right).$$

A partially rational approximate formula for the weight of main girders is the following (Unwin, *Wrought-Iron Bridges and Roofs*, 1869, p. 40):—Let W be the total distributed load on a girder exclusive of its own weight, in tons; W_1, the weight of the girder; l, the span, in ft.; s, average stress, in tons, per sq. in. on gross section of members; d = depth of girder at centre, in ft.; r = ratio of depth of girder to span. Then

$$W_1=\frac{Wl^2}{Cds-l^2}=\frac{Wlr}{Cs-lr}$$

where C is a constant for any type of bridge. It is not easy to fix the average stress s per sq. in. of gross section. Hence the formula is more useful in the form

$$W_1=\frac{Wl^2}{kd-l^2}=\frac{Wlr}{k-lr},$$

where $k=(W_1+W)lr/W_1$ is to be deduced from the data of some bridge previously designed for the same live load per foot run and the same working stresses. From some known examples, C varies from 1500 to 1800 for iron, and from 1200 to 1500 for steel bridges, k = 6000 to 7200 for iron, and = 4800 to 6000 for steel bridges.

Wind pressure. Much attention has been given to wind action since the disaster to the Tay Bridge in 1879. As to the maximum wind pressure on small plates normal to the wind, there is not much doubt. Anemometer observations show that pressures of 30 lb per sq. ft. occur in storms annually in many localities, and that occasionally higher pressures are recorded in

exposed positions. Thus at Bidstone, Liverpool, where the gauge has an exceptional exposure, a pressure of 80 lb per sq. ft. has been observed. In tornadoes, such as that at St Louis in 1896, it has been calculated, from the stability of structures overturned, that pressures of 45 to 90 lb per sq. ft. must have been reached. As to anemometer pressures, it should be observed that the recorded pressure is made up of a positive front and negative (vacuum) back pressure, but in structures the latter must be absent or only partially developed. Great difference of opinion exists as to whether on large surfaces the average pressure per sq. ft. is as great as on small surfaces, such as anemometer plates. The experiments of Sir B. Baker at the Forth Bridge showed that on a surface 30 ft. ×15 ft. the intensity of pressure was less than on a similarly exposed anemometer plate. In the case of bridges there is the further difficulty that some surfaces partially shield other surfaces; one girder, for instance, shields the girder behind it (see *Brit. Assoc. Report*, 1884). In 1881 a committee of the Board of Trade decided that the maximum wind pressure on a vertical surface in Great Britain should be assumed in designing structures to be 56 lb per sq. ft. For a plate girder bridge of less height than the train, the wind is to be taken to act on a surface equal to the projected area of one girder and the exposed part of a train covering the bridge. In the case of braced girder bridges, the wind pressure is taken as acting on a continuous surface extending from the rails to the top of the carriages, plus the vertical projected area of so much of one girder as is exposed above the train or below the rails. In addition, an allowance is made for pressure on the leeward girder according to a scale. The committee recommended that a factor of safety of 4 should be taken for wind stresses. For safety against overturning they considered a factor of 2 sufficient. In the case of bridges not subject to Board of Trade inspection, the allowance for wind pressure varies in different cases. Mr Shaler Smith allows 300 lb per foot run for the pressure on the side of a train, and in addition 30 lb per sq. ft. on twice the vertical projected area of one girder, treating the pressure on the train as a travelling load. In the case of bridges of less than 50 feet span he also provides strength to resist a pressure of 50 lb per sq. ft. on twice the vertical projection of one truss, no train being supposed to be on the bridge.

Stresses permitted.

For a long time engineers held the convenient opinion that, if the total dead and live load stress on any section of a structure (of iron) did not exceed 5 tons per sq. in., ample safety was secured. It is no longer possible to design by so simple a rule. In an interesting address to the British Association in 1885, Sir B. Baker described the condition of opinion as to the safe limits of stress as chaotic. "The old foundations," he said, "are shaken, and engineers have not come to an agreement respecting the rebuilding of the structure. The variance in the strength of existing bridges is such as to be apparent to the educated eye without any calculation. In the present day engineers are in accord as to the principles of estimating the magnitude of the stresses on the members of a structure, but not so in proportioning the members to resist those stresses. The practical result is that a bridge which would be passed by the English Board of Trade would require to be strengthened 5 per cent. in some parts and 60 per cent. in others, before it would be accepted by the German Government, or by any of the leading railway companies in America." Sir B. Baker then described the results of experiments on repetition of stress, and added that "hundreds of existing bridges which carry twenty trains a day with perfect safety would break down quickly under twenty trains an hour. This fact was forced on my attention nearly twenty-five years ago by the fracture of a number of girders of ordinary strength under a five-minutes' train service."

Practical experience taught engineers that though 5 tons per sq. in. for iron, or 6½ tons per sq. in. for steel, was safe or more than safe for long bridges with large ratio of dead to live load, it was not safe for short ones in which the stresses are mainly due to live load, the weight of the bridge being small. The experiments of Wöhler, repeated by Bauschinger, Sir B. Baker, and others, show that the breaking stress of a bar is not a fixed quantity, but depends on the range of variation of stress to which it is subjected, if that variation is repeated a very large number of times. Let K be the breaking strength of a bar per unit of section, when it is loaded once gradually to breaking. This may be termed the statical breaking strength. Let $k_{max.}$ be the breaking strength of the same bar when subjected to stresses varying from $k_{max.}$ to $k_{min.}$ alternately and repeated an indefinitely great number of times; $k_{min.}$ is to be reckoned + if of the same kind as $k_{max.}$, and − if of the opposite kind (tension or thrust). The range of stress is therefore $k_{max.} - k_{min.}$, if the stresses are both of the same kind, and $k_{max.} + k_{min.}$, if they are of opposite kinds. Let $\Delta = k_{max.} \mp k_{min.}$ = the range of stress, where Δ is always positive. Then Wöhler's results agree closely with the rule,

$$k_{max.} = \frac{\Delta}{2} + \sqrt{(K^2 - n\ \Delta K)},$$

where n is a constant which varies from 1·3 to 2 in various qualities of iron and steel. For ductile iron or mild steel it may be taken as 1·5. For a statical load, range of stress nil, $\Delta = 0$, $k_{max.} = K$, the statical breaking stress. For a bar so placed that it is alternately loaded and the load removed, $\Delta = k_{max.}$ and $k_{max.} = 0{\cdot}6$ K. For a bar subjected to alternate tension and compression of equal amount, $\Delta = 2 f_{max.}$ and $k_{max.} = 0{\cdot}33$ K. The safe working stress in these different cases is $k_{max.}$ divided by the factor of safety. It is sometimes said that a bar is "fatigued" by repeated straining. The real nature of the action is not well understood, but the word fatigue may be used, if it is not considered to imply more than that the breaking stress under repetition of loading diminishes as the range of variation increases.

It was pointed out as early as 1869 (Unwin, *Wrought-Iron Bridges and Roofs*) that a rational method of fixing the working stress, so far as knowledge went at that time, would be to make it depend on the ratio of live to dead load, and in such a way that the factor of safety for the live load stresses was double that for the dead load stresses. Let A be the dead load and B the live load, producing stress in a bar; $\rho = B/A$ the ratio of live to dead load; f_1 the safe working limit of stress for a bar subjected to a dead load only and f the safe working stress in any other case. Then

$$f = f_1 \frac{A + B}{A + 2B} = f_1 \frac{1 + \rho}{1 + 2\rho}.$$

The following table gives values of f so computed on the assumption that $f_1 = 7\frac{1}{2}$ tons per sq. in. for iron and 9 tons per sq. in. for steel.

Working Stress for combined Dead and Live Load. Factor of Safety twice as great for Live Load as for Dead Load.

	Ratio. ρ	$\frac{1+\rho}{1+2\rho}$	Values of f, tons per sq. in.	
			Iron.	Mild Steel.
All dead load . .	0	1·00	7·5	9·0
	·25	0·83	6·2	7·5
	·33	0·78	5·8	7·0
	·50	0·75	5·6	6·8
	·66	0·71	5·3	6·4
Live load = Dead load	1·00	0·66	4·9	5·9
	2·00	0·60	4·5	5·4
	4·00	0·56	4·2	5·0
All live load . .	∞	0·50	3·7	4·5

Bridge sections designed by this rule differ little from those designed by formulæ based directly on Wöhler's experiments. This rule has been revived in America, and appears to be increasingly relied on in bridge-designing. (See *Trans. Am. Soc. C. E.* xli. p. 156.)

Weyrauch and Launhardt's method, based on an empirical expression for Wöhler's law, has been much used in bridge designing (see *Proc. Inst. C. E.* lxiii. p. 275). Let t be the *statical breaking strength* of a bar, loaded once gradually up to fracture (t = breaking load divided by original area of section); u the breaking strength of a bar loaded and unloaded an indefinitely great number of times, the stress varying from u to 0 alternately (this is termed the *primitive strength*); and, lastly, let s be the breaking strength of a bar subjected to an indefinitely great number of repetitions of stresses equal and opposite in sign (tension and thrust), so that the stress ranges alternately from s to $-s$. This is termed the *vibration strength*. Wöhler's and Bauschinger's experiments give values of t, u, and s, for some materials. If a bar is subjected to alternations of stress having the range $\Delta = f_{max.} - f_{min.}$, then, by Wöhler's law, the bar will ultimately break, if

$$f_{max.} = F\Delta, \quad . \quad . \quad . \quad . \quad (1)$$

where F is some unknown function. Launhardt found that, for stresses always of the same kind, $F = (t-u)/(t-f_{max.})$ approximately agreed with experiment. For stresses of different kinds Weyrauch found $F = (u-s)/(2u-s-f_{max.})$ to be similarly approximate. Now let $f_{max.}/f_{min.} = \phi$, where ϕ is + or − according as the stresses are of the same or opposite signs. Putting the values of F in (1) and solving for $f_{max.}$, we get for the breaking stress of a bar subjected to repetition of varying stress,

$$f_{max.} = u\left(1 + \frac{t-u}{u}\phi\right) \quad \text{[Stresses of same sign.]}$$

$$f_{max.} = u\left(1 + \frac{u-s}{u}\phi\right) \quad \text{[Stresses of opposite sign.]}$$

The working stress in any case is $f_{max.}$ divided by a factor of safety. Let that factor be 3. Then Wöhler's results for iron and Bauschinger's for steel give the following equations for tension or thrust :—

$$\text{Iron, working stress, } f = 4{\cdot}4\left(1 + \frac{1}{2}\phi\right)$$

$$\text{Steel, } \quad ,, \quad ,, \quad = 5{\cdot}87\left(1 + \frac{1}{2}\phi\right).$$

In these equations ϕ is to have its + or − value according to the case considered. For shearing stresses the working stress may have 0·8 of its value for tension. The following table gives values of the working stress calculated by these equations :—

Working Stress for Tension or Thrust by Launhardt and Weyrauch Formula.

	ϕ	$1+\frac{\phi}{2}$	Working Stress f, tons per sq. in.	
			Iron.	Steel.
All dead load . . .	1·0	1·5	6·60	8·80
	0·75	1·375	6·05	8·07
	0·50	1·25	5·50	7·34
	0·25	1·125	4·95	6·60
All live load . . .	0·00	1·00	4·40	5·87
	−0·25	0·875	3·85	5·14
	−0·50	0·75	3·30	4·40
	−0·75	0·625	2·75	3·67
Equal stresses + and −	−1·00	0·500	2·20	2·93

To compare this with the previous table, $\phi = (A+B)/A = 1+\rho$. Except when the limiting stresses are of opposite sign, the two tables agree very well. In bridge work this occurs only in some of the bracing bars.

It is a matter of discussion whether, if fatigue is allowed for by the Weyrauch method, an additional allowance should be made for impact. There was no impact in Wöhler's experiments, and therefore it would seem rational to add the impact allowance to that for fatigue; but in that case the bridge sections become larger than experience shows to be necessary. Some engineers escape this difficulty by asserting that Wöhler's results are not applicable to bridge work. They reject the allowance for fatigue (that is, the effect of repetition) and design bridge members for the total dead and live load, plus a large allowance for impact varied according to some purely empirical rule. (See Waddell, *De Pontibus*, p. 7.) Now in applying Wöhler's law, $f_{max.}$ for any bridge member is found for the maximum possible live load, a live load which though it may sometimes come on the bridge and must therefore be provided for, is not the usual live load to which the bridge is subjected. Hence the range of stress, $f_{max.} - f_{min.}$, from which the working stress is deduced, is not the ordinary range of stress which is repeated a practically infinite number of times, but is a range of stress to which the bridge is subjected only at comparatively long intervals. Hence practically it appears probable that the allowance for fatigue made in either of the tables above is sufficient to cover the ordinary effects of impact also.

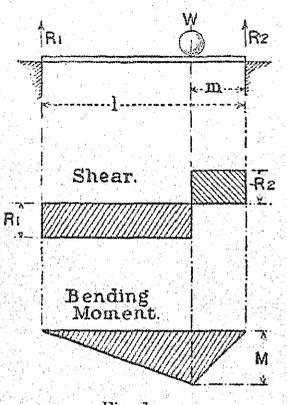


Fig. 1.

English bridge-builders are somewhat hampered in adopting rational limits of working stress by the rules of the Board of Trade. Nor do they all accept the guidance of Wöhler's law. The following are some examples of limits adopted. For the Dufferin Bridge (steel), the working stress was taken at 6·5 tons per sq. in. in bottom booms and diagonals, 6·0 tons in top booms, 5·0 tons in verticals and long compression members. For the Stanley Bridge at Brisbane, the limits were 6·5 tons per sq. in. in compression boom, 7·0 tons in tension boom, 5·0 tons in vertical struts, 6·5 tons in diagonal ties, 8·0 tons in wind bracing, and 6·5 tons in cross and rail girders. In the new Tay Bridge the limit of stress is generally 5 tons per sq. in., but in members in which the stress changes sign 4 tons per sq. in.

Let a girder, supported at the ends, carry a fixed load W at m from the right abutment. The reactions at the abutments are $R_1 = Wm/l$ and $R_2 = W(l-m)/l$. The shears on vertical sections to the left and right of the load are R_1 and $-R_2$, and the distribution of shearing force is given by two rectangles (Fig. 1). Bending moment increases uniformly from either abutment to the load, at which the bending moment is $M = R_2 m = R_1(l-m)$. The distribution of bending moment is given by the ordinates of a triangle. Next let the girder carry a uniform load w per foot run (Fig. 2). The total load is wl; the reactions at abutments, $R_1 = R_2 = \frac{1}{2}wl$. The distribution of shear on vertical sections is given by the ordinates of a sloping line. The greatest bending moment is at the centre and $= M_c = \frac{1}{8}wl^2$. At any point x from the abutment, the bending moment is $M = \frac{1}{2}wx(l-x)$, an equation to a parabola.

Straining action.

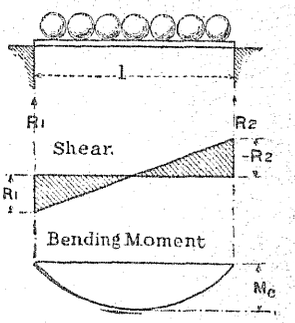


Fig. 2.

Let a uniform train weighing w per foot run advance over a girder of span $2c$, from the left abutment. When it covers the girder to a distance x from the centre (Fig. 3) the total load is $w(c+x)$; the reaction at B is

$$R_2 = w(c+x) \times \frac{c+x}{4c} = \frac{w}{4c}(c+x)^2,$$

which is also the shearing force at C for that position of the load. As the load travels, the shear at the head of the train will be given by the ordinates of a parabola having its vertex at A, and a maximum $F_{max.} = -\frac{1}{2}wl$ at B. If the load travels the reverse way, the shearing force at the head of the train is given by the ordinates of the dotted parabola. The greatest shear at C for any position of the load occurs when the head of the train is at C. For any load p between C and B will increase the reaction at B and therefore the shear at C by part of p, but at the same time will diminish the shear at C by the whole of p. The web of a girder must resist the maximum shear, and, with a travelling load like a railway train, this is greater for partial than for complete loading. Generally a girder supports both a dead and a live load. The distribution of total shear, due to a dead load w_d per foot run and a travelling load w_l per foot run, is shown in Fig. 4, arranged so that the dead load shear is added to the maximum travelling load shear of the same sign.

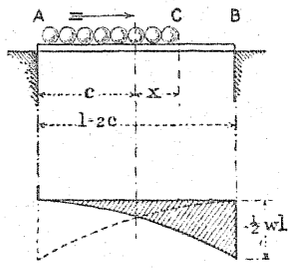


Fig. 3.

In the case of girders with braced webs, the tension bars of which are not adapted to resist a thrust, another circumstance due to the position of the live load must be considered. For a train advancing from the left, the travelling load shear in the left half of the span is of a different sign from that due to the dead load. Fig. 5 shows the maximum shear at vertical sections due to a dead and travelling load, the latter advancing (Fig. 5, *a*) from the left and (Fig. 5, *b*) from the right abutment. Comparing the figures it will be seen that over a distance x near the middle of the girder the shear changes sign, according as the load advances from the left or the right. The bracing bars therefore for this part of the girder must be adapted to resist either tension or thrust. Further, the range of stress to which they are subjected is the sum of the stresses due to the load advancing from the left or the right. To find the greatest shear with a set of concentrated loads at fixed distances, let the loads advance from the left abutment, and let C be the section at which the shear is required (Fig. 6). The greatest shear at C may occur with W_1 at C. If W_1 passes beyond C, the shear at C will probably be greatest when W_2 is at C. Let R be the resultant of the loads on the bridge when

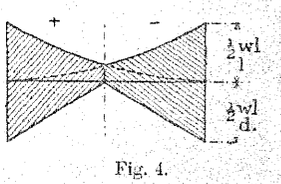


Fig. 4.

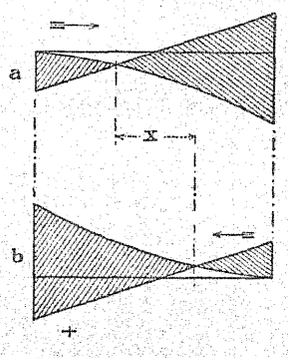


Fig. 5.

W_1 is at C. Then the reaction at B and shear at C is Rn/l. Next let the loads advance a distance a so that W_2 comes to C. Then the shear at C is $R(n+a)/l - W_1$, plus any reaction d at B, due to any additional load which has come on the girder during the movement. The shear will therefore be increased by bringing W_2 to C, if

$$Ra/l + d > W_1$$

and d is generally small and negligible.

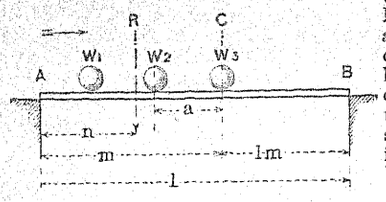


Fig. 6.

This result is modified if the action of the load near the section is distributed to the bracing intersections by rail and cross girders. In Fig. 7 the action of W is distributed to A and B by the flooring. Then the loads at A and B are $W(p-x)/p$ and Wx/p. Now let C (Fig. 8) be the section at which the greatest shear is required, and let the loads advance from the left till W_1 is at C. If R is the resultant of the loads then on the girder, the reaction at B and shear at C is Rn/l. But the shear may be greater when W_2 is at C. In that case the shear at C becomes $R(n+a)/l + d - W_1$, if $a > p$, and $R(n+a)/l + d - W_1 a/p$, if $a < p$. If we neglect d, then the shear increases by moving W_2 to C, if $Ra/l > W_1$ in the first case, and if $Ra/l > W_1 a/p$ in the second case.

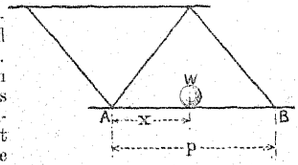


Fig. 7.

For the greatest bending moment due to a travelling live load, let a load of w per foot run advance from the left abutment (Fig. 9), and let its centre be at x from the left abutment. The reaction at B is $2wx^2/l$ and the bending moment at any section C, at m from the left abutment, is $2wx^2(l-m)/l$, which increases as x increases till the span is covered. Hence, for uniform travelling

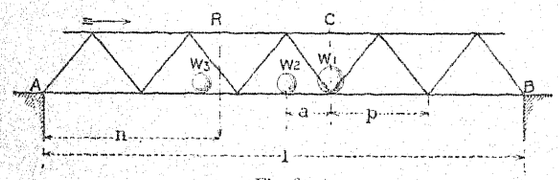


Fig. 8.

loads, the bending moments are greatest when the loading is complete. In that case the loads on either side of C are proportional to m and $l-m$. In the case of a series of travelling loads at fixed distances apart passing over the girder from the left, let W_1, W_2 (Fig. 10), at distances x and $x+a$ from the left abutment, be their resultants on either side of C. Then the reaction at B is $W_1 x/l + W_2(x+a)/l$. The bending moment at C is

$$M = W_1 \frac{x}{l}(l-m) + W_2 m\left(1 - \frac{x+a}{l}\right).$$

If the loads are moved a distance Δx to the right, the bending moment becomes

$$M + \Delta M = W_1 \frac{x+\Delta x}{l}(l-m) + W_2 m\left(1 - \frac{x+a+\Delta x}{l}\right)$$

$$\Delta m = W_1 \frac{\Delta x}{l}(l-m) - W_2 \frac{\Delta x}{l} m,$$

and this is positive or the bending moment increases, if $W_1(l-m) > W_2 m$, or if $W_1/m > W_2/(l-m)$. But these are the average loads per foot run to the left and right of C. Hence, if the average load to the left of a section is greater than that to the right, the bending moment at the section will be increased by moving the loads to the right, and *vice versâ*. Hence the maximum bending moment at C for a series of travelling loads will occur when the average load is the same on either side of C. If one of the loads is at C, spread over a very small distance in the neighbourhood of C, then a very small displacement of the loads will permit the fulfilment of the condition. Hence the criterion for the position of the loads which makes the moment at C greatest is this: one load must be at C, and the other loads must be distributed, so that the average loads per foot on either side of C (the load at C being neglected) are nearly equal. If the loads are very unequal in magnitude or distance this condition may be satisfied for more than one position of the loads, but it is not difficult to ascertain which position gives the maximum moment. Generally one of the largest of the loads must be at C with as many others to right and left as is consistent with that condition.

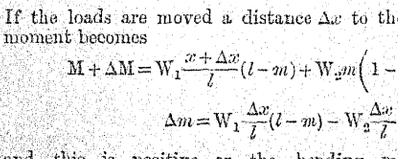


Fig. 9.

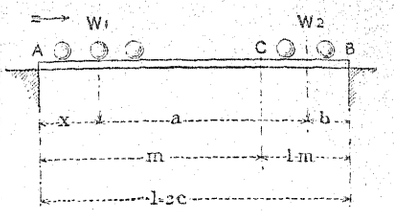


Fig. 10.

Fig. 11 shows the curve of bending moment under one of a series of travelling loads at fixed distances. Let W_1, W_2, W_3 traverse the girder from the left at fixed distances a, b. For the position shown the distribution of bending moment due to W_1 is given by ordinates of the triangle A′CB′; that due to W_2 by ordinates of A′DB′; and that due to W_3 by ordinates of A′EB′. The total moment at W_1, due to three loads, is the sum $mC + mn + mo$ of the intercepts which the triangle sides cut off from the vertical under

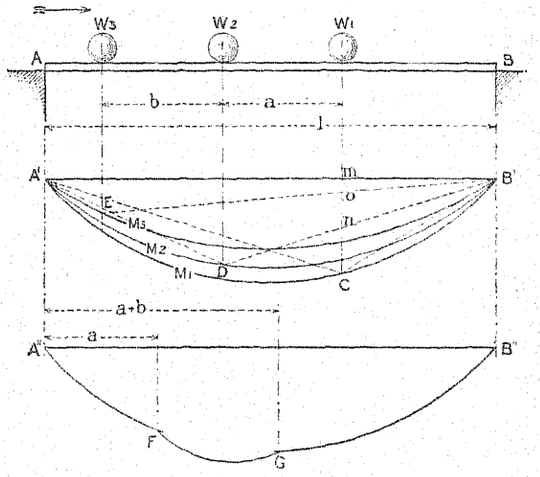


Fig. 11.

W_1. As the loads move over the girder, the points C, D, E describe the parabolas M_1, M_2, M_3, the middle ordinates of which are $\frac{1}{4}W_1 l$, $\frac{1}{4}W_2 l$, and $\frac{1}{4}W_3 l$. If these are first drawn it is easy, for any position of the loads, to draw the lines B′C, B′D, B′E, and to find the sum of the intercepts which is the total bending moment under a load. The lower portion of the figure is the curve of bending moments under the leading load. Till W_1 has advanced a distance a only one load is on the girder, and the curve A″F gives bending moments due to W_1 only; as W_1 advances to a distance $a+b$, two loads are on the girder, and the curve FG gives moments due to W_1 and W_2. GB″ is the curve of moments for all three loads $W_1 + W_2 + W_3$.

Fig. 12 shows maximum bending moment curves for an extreme case of a short bridge with very unequal loads. The three lightly dotted parabolas are the curves of maximum moment for each of the loads taken separately. The three heavily dotted curves are curves of maximum moment under each of the loads, for the three loads passing over the bridge, at the given distances, from left to right. As might be expected, the moments are greatest in this case at the sections under the 15-ton load. The heavy continuous line gives the last-mentioned curve for the reverse direction of passage of the loads.

With short bridges it is best to draw the curve of maximum bending moments for some assumed typical set of loads in the way just described, and to design the girder accordingly. For longer bridges the funicular polygon affords a method of determining maximum bending moments which is perhaps more convenient. But very great accuracy in drawing this curve is unnecessary, because the rolling stock of railways varies so much that the precise magnitude and distribution of the loads which will pass over a bridge cannot be known. All that can be done is to assume a set of loads likely to produce somewhat severer straining than any probable actual rolling loads. Now, except for very short bridges

and very unequal loads, a parabola can be found which includes the curve of maximum moments. This parabola is the curve of maximum moments for a travelling load uniform per foot run. Let w_e be the load per foot run which would produce the maximum moments represented by this parabola. Then w_e may be termed the uniform load per foot equivalent to any assumed set of concentrated loads. Mr Waddell has calculated tables of such equivalent uniform loads. But it is not difficult to find w_e, approximately enough for practical purposes, very simply. Experience

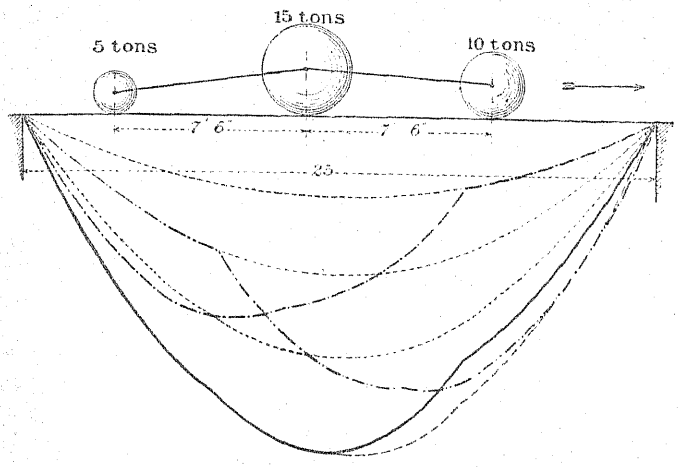


Fig. 12.

shows that (*a*) a parabola having the same ordinate at the centre of the span, or (*b*) a parabola having the same ordinate at one-quarter span as the curve of maximum moments, agrees with it closely enough for practical designing. A criterion already given shows the position of any set of loads which will produce the greatest bending moment at the centre of the bridge, or at one-quarter span. Let M_c and M_a be those moments. At a section distant x from the centre of a girder of span $2c$, the bending moment due to a uniform load w_e per foot run is

$$M=\frac{w_e}{2}(c-x)(c+x).$$

Putting $x=0$, for the centre section

$$M_c=\frac{w_e c^2}{2};$$

and putting $x=\frac{1}{2}c$, for section at quarter span

$$M_a=\frac{3w_e c^2}{8}.$$

From these equations a value of w_e can be obtained. Then the bridge is designed, so far as the direct stresses are concerned, for bending moments due to a uniform dead load and the uniform equivalent load w_e.

In dealing with the action of travelling loads much assistance may be obtained by using a line termed an *influence line*. Such a line has for abscissa the distance of a load from one end of a girder, and for ordinate the bending moment or shear at any given section, or on any member, due to that load. Generally the influence line is drawn for unit load. In Fig. 13 let A′B′ be a

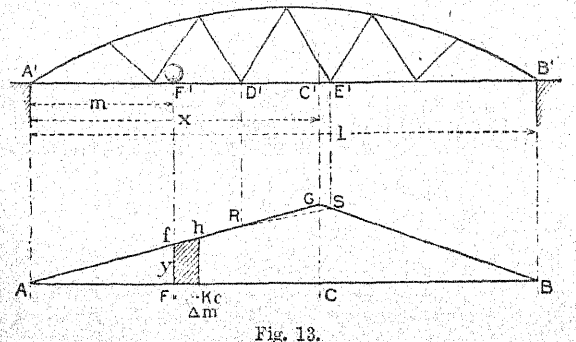


Fig. 13.

girder supported at the ends and let it be required to investigate the bending moment at C′ due to unit load in any position on the girder. When the load is at F′, the reaction at B′ is m/l and the moment at C′ is $m(l-x)/l$, which will be reckoned positive, when it resists a tendency of the right-hand part of the girder to turn counter-clockwise. Projecting A′F′C′B′ on to the horizontal AB, take $Ff=m(l-x)/l$, the moment at C of unit load at F. If this process is repeated for all positions of the load, we get the influence line AGB for the bending moment at C. The area AGB is termed the influence area. The greatest moment CG at C is $x(l-x)/l$. To use this line to investigate the maximum moment at C due to a series of travelling loads at fixed distances, let $P_1, P_2, P_3, \ldots$ be the loads which at the moment considered are at distances $m_1, m_2, \ldots$ from the left abutment. Set off these distances along AB and let $y_1, y_2, \ldots$ be the corresponding ordinates of the influence curve ($y=Ff$) on the verticals under the loads. Then the moment at C due to all the loads is

$$M=P_1y_1+P_2y_2+\ldots$$

The position of the loads which gives the greatest moment at C may be settled by the criterion given above. For a uniform travelling load w per foot of span, consider a small interval $Fk=\Delta m$ on which the load is $w\Delta m$. The moment due to this, at C, is $wm(l-x)\Delta m/l$. But $m(l-x)\Delta m/l$ is the area of the strip $Ffhk$, that is $y\Delta m$. Hence the moment of the load on Δm at C is $wy\Delta m$, and the moment of a uniform load over any portion of the girder is $w\times$ the area of the influence curve under that portion. If the scales are so chosen that a inch represents one inch ton of moment, and b inch represents one foot of span, and w is in tons per foot run, then ab is the unit of area in measuring the influence curve.

If the load is carried by a rail girder (stringer) with cross girders at the intersections of bracing and boom, its effect is distributed to the bracing intersections D′E′ (Fig. 14), and the part of the influence line for that bay (panel) is altered. With unit load in the position shown, the load at D′ is $(p-n)/p$, and that at E′ is n/p. The moment of the load at C is $m(l-x)/l-n(p-n)/p$. This is the equation to the dotted line RS (Fig. 13).

If the unit load is at F′, the reaction at B′ and the shear at C′ is m/l, positive if the shearing stress resists a tendency of the part of the girder on the right to move upwards; set up $Ff=m/l$ (Fig. 15) on the vertical under the load. Repeating the process for other positions, we get the influence line AGHB, for the shear at C due to unit load anywhere on the girder. GC $=x/l$ and CH $=-(l-x)/l$. The lines AG, HB are parallel. If the load is in the bay D′E′ and is carried by a rail girder which distributes it to cross girders at D′ E′, the part of the influence line under this bay is altered. Let n (Fig. 16) be the distance of the load from D′, x_1 the

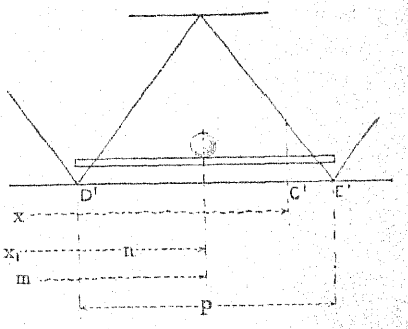


Fig. 14.

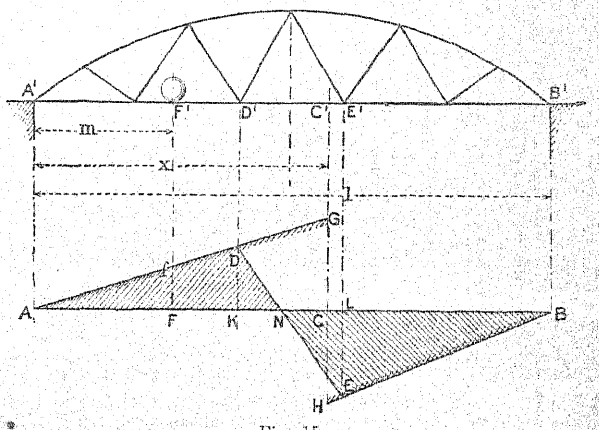


Fig. 15.

distance of D′ from the left abutment, and p the length of a bay. The loads at D′, E, due to unit weight on the rail girder are $(p-n)/p$ and n/p. The reaction at B′ is $\{(p-n)x_1+n(x_1+p)\}/pl$. The shear at C′ is the reaction at B′ less the load at E′, that is $\{p(x_1+n)-nl\}/pl$, which is the equation to the line DH (Fig. 15).

Clearly, the distribution of the load by the rail girder considerably alters the distribution of shear due to a load in the bay in which the section considered lies. The total shear due to a series of loads $P_1, P_2, \ldots$ at distances $m_1, m_2, \ldots$ from the left abutment, $y_1, y_2, \ldots$ being the ordinates of the influence curve under the loads, is

$$S = P_1y_1 + P_2y_2 + \ldots$$

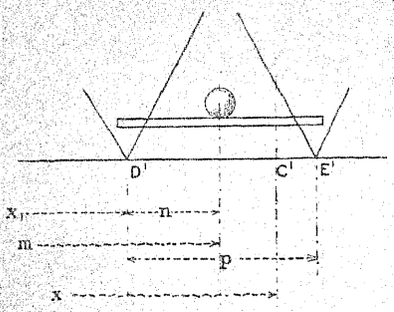


Fig. 16.

Generally, the greatest shear S at C will occur when the longer of the segments into which C divides the girder is fully loaded and the other is unloaded, the leading load being at C. If the loads are very unequal or unequally spaced, a trial or two will determine which position gives the greatest value of S. The greatest shear at C′ of the opposite sign to that due to the loading of the longer segment occurs with the shorter segment loaded. For a uniformly-distributed load w per foot run the shear at C is $w \times$ the area of the influence curve under the segment covered by the load, attention being paid to the sign of the area of the curve. If the load rests directly on the main girder, the greatest + and − shears at C will be $w \times$ AGC and $-w \times$ CHB. But if the load is distributed to the bracing intersections by rail and cross girders, then the shear at C′ will be greatest when the load extends to N, and will have the values $w \times$ ADN and $-w \times$ NEB.

Influence lines were described by Fränkel, *Der Civilingenieur*, 1876. See also *Handbuch der Ingenieur-wissenschaften*, vol. ii. ch. x., 1882, and Levy, *La statique graphique*, 1886. There is a useful paper by Prof. G. F. Swain (*Trans. Am. Soc. C. E.* xvii., 1887), and another by L. M. Hoskins (*Proc. Am. Soc. C. E.* xxv., 1899).

Another method of investigating the maximum shear at a section due to any distribution of a travelling load has been given by Prof. H. T. Eddy (*Trans. Am. Soc. C. E.* xxii., 1890). Let *hk* (Fig. 17) represent in magnitude and position a load W, at x from the left abutment, on a girder AB of span l. Lay off *kf*, *hg*, horizontal and equal to l. Join f and g to h and k. Draw verticals at A, B, and join *no*. Obviously *no* is horizontal and equal to l. Also $mn/mf = hk/kf$ or $mn = W(l-x)/l$, which is the reaction at A due to the load at C, and is the shear at any point of AC. Similarly, *po* is the reaction at B and shear at any point of CB. The shaded rectangles represent the distribution of shear due to the load at C, while *no* may be termed the datum line of

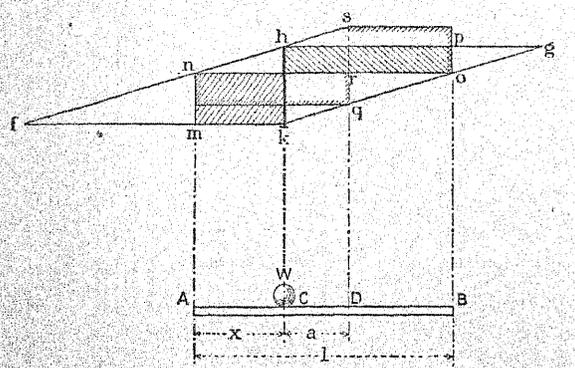


Fig. 17.

shear. Let the load move to D, so that its distance from the left abutment is $x+a$. Draw a vertical at D, intersecting fh, kg, in s and q. Then $qr/ro = hk/hg$ or $ro = W(l-x-a)/l$, which is the reaction at A and shear at any point of AD, for the new position of the load. Similarly, $rs = W(x+a)/l$ is the shear on DB. The distribution of shear is given by the partially-shaded rectangles. For the application of this method to a series of loads Prof. Eddy's paper must be referred to.

In the case of a bridge of many spans, there is a length of span which makes the cost of the bridge least. The cost of abutments and bridge flooring is practically independent of the length of span adopted. Let P be the cost of one pier; G the cost of the main girders for one span, erected; n the number of spans; l the length of one span, and L the length of the bridge between abutments. Then, $n = L/l$ nearly. Cost of piers $(n-1)P$. Cost of main girders nG. The cost of a pier will not vary materially with the span adopted. It depends mainly on the character of the foundations and height at which the bridge is carried. The cost of the main girders for one span will vary nearly as the square of the span for any given type of girder and intensity of live load. That is, $G = al^2$, where a is a constant. Hence the total cost of that part of the bridge which varies with the span adopted is—

$$C = (n-1)P + nal^2$$
$$= LP/l - P + Lal.$$

Differentiating and equating to zero, the cost is least when

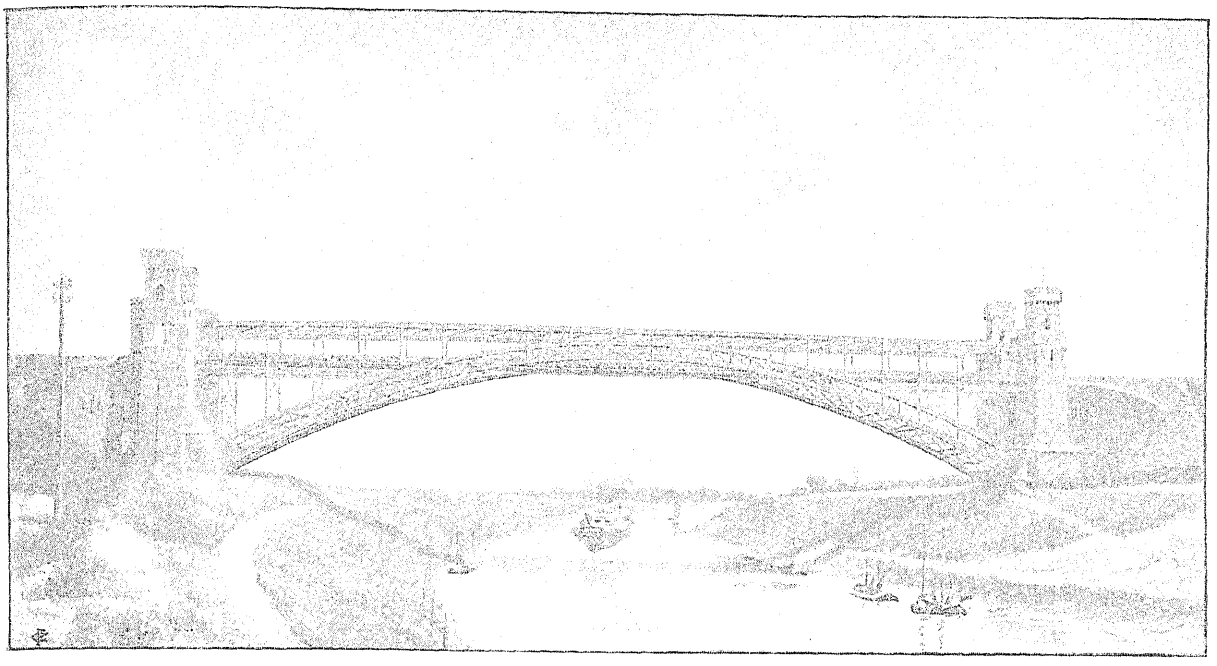
$$\frac{dC}{dl} = -\frac{LP}{l^2} + La = 0,$$
$$P = al^2 = G;$$

that is, when the cost of one pier is equal to the cost erected of the main girders of one span. Sir Guildford Molesworth puts this in a convenient but less exact form. Let G be the cost of superstructure of a 100-feet span erected, and P the cost of one pier with its protection. Then the economic span is $l = 100\sqrt{P}/\sqrt{G}$.

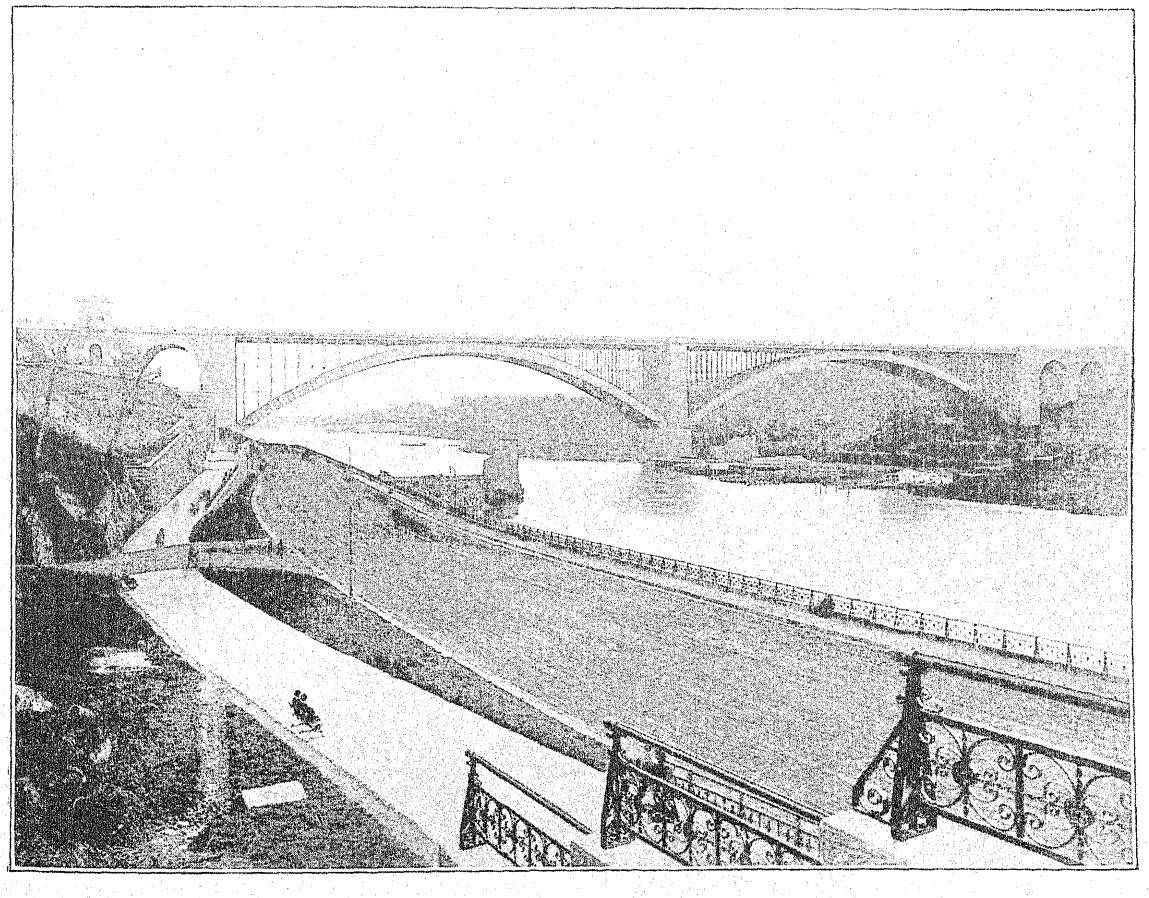
Arched bridges.

All the earlier arched bridges were of masonry or brickwork, so built that they could be treated as blockwork structures composed of rigid voussoirs. The stability of such structures depends on the position of the line of pressure in relation to the extrados and intrados of the arch ring. Generally the line of pressure lies within the middle half of the depth of the arch ring. In finding the line of pressures some principle such as the principle of least action must be used in determining the reactions at the crown and springings. For an elastic arch of metal there is a complete theory, but it is difficult, and there is always some doubt as to the validity of some of the assumptions which must be made. If hinges are introduced at crown and springings, the calculation of the stresses in the arch ring becomes simple, as the line of pressures must pass through the hinges. Such hinges have been used not only for metal arches, but in a modified form for masonry and concrete arches. Three cases therefore arise: (*a*) The arch is rigid at crown and springings; (*b*) the arch is two-hinged (hinges at springings); (*c*) the arch is three-hinged (hinges at crown and springings). For an elementary account of the theory of arches, hinged or not, reference may be made to a paper by Mr H. M. Martin (*Proc. Inst. C. E.* vol. xciii. p. 462); and for that of the elastic arch, to a paper by Mr A. E. Young (*Proc. Inst. C. E.* vol. cxxxi. p. 323).

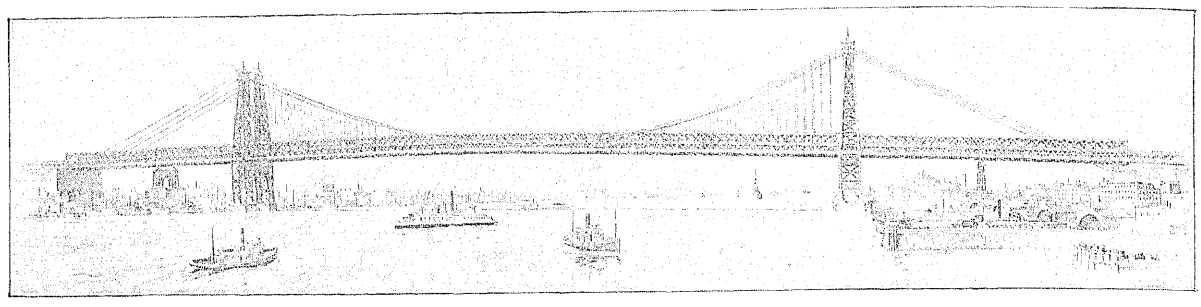
In Germany three hinged arches of masonry and concrete have been built, up to 150 feet span, with much economy, and the calculations being simple, an engineer can venture to work closely to the dimensions required by theory. For hinges, Mr Liebbrand, of Stuttgart, uses sheets of lead about one inch thick extending over the middle third of the depth of the voussoir joints, the rest of the joints being left open. As the lead is plastic this construction is virtually an articulation. If the pressure on the lead is uniformly varying, the centre of pressure must be within the middle third of the width of the lead; that is, it cannot deviate from the centre of the voussoir joint by more than one-eighteenth of its depth. In any case the position of the line of pressures is confined at the lead articulations within very narrow limits, and ambiguity as to the stresses is greatly diminished. The restricted area on which the pressure acts at the lead joints involves greater intensity of stress than has been usual in arched bridges. In the Würtemberg hinged arches a limit of stress of 110 tons per square foot was allowed, while in the unhinged arches at Cologne and Coblentz the limit was 50 to 60 tons per square foot (*Annales des Ponts et Chaussées*, 1891). At Rechtenstein a bridge of two concrete arches has been constructed, span 75½ feet, with lead articulations: width of arch 11 feet; depth of arch at crown and springing 2·1 and 2·96 feet respectively. The stresses were calculated to be 15, 17, and 12 tons per square foot at crown, joint of rupture, and springing respectively. At Cincinnati, a concrete arch of 70 feet span has been built, with a rise of 10 feet. The concrete is reinforced by eleven 9-inch steel-rolled joists, spaced 3 feet apart and supported by a cross channel joist at each springing. The arch is 15 inches thick at the crown and 4 feet at the abutments. The concrete consisted of 1 cement, 2 sand, and 3 to 4 broken stone. An important series of experiments on the strength of masonry,



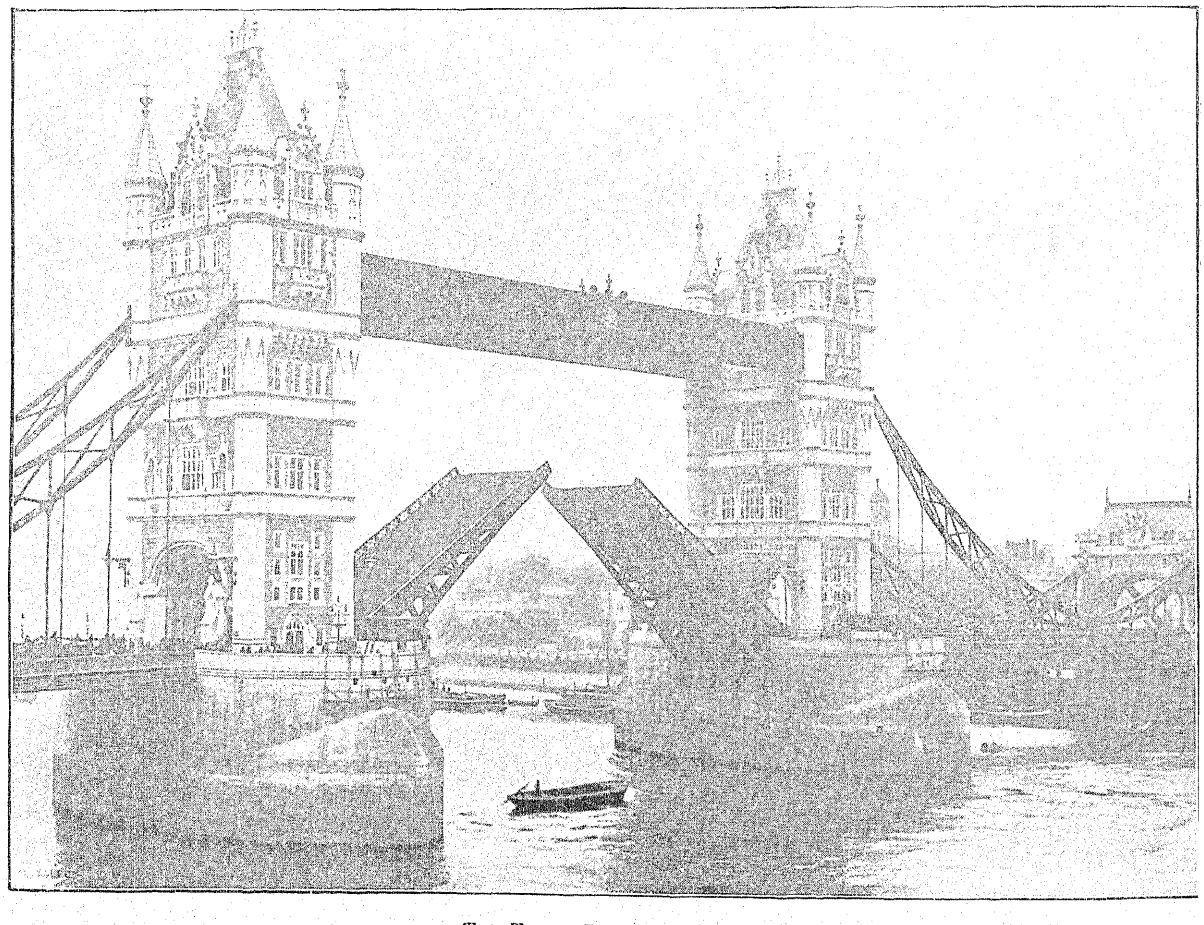
Steel Span Bridge over the North Sea and Baltic Canal.



Washington Bridge, New York.



The New East River Bridge, New York.



The Tower Bridge, London.

(From a Photograph by C. Talbot, London.)

brick, and concrete structures will be found in the *Zeitschr. des Österreichen Ing. und Arch. Vereines*, 1895.

Recently steel arches of great span have been constructed, partly because they have a better appearance than girder bridges, but mainly because they can be erected without false works. The first very important bridges of this kind were the St. Louis Bridge (for description, see article BRIDGES in *Ency. Brit.* vol. iv. p. 339), and the Douro Bridge (Fig. 18). Amongst other examples the Washington Bridge over the Harlem river, New York, may be mentioned (see Plate). It has a length of 2375 feet, with a roadway 80 feet in width, 133 feet above the river. Two principal arches are 510 feet span, springing from granite piers. Each steel arch has six ribs resting on steel pins 34 inches long and 18 inches in diameter, carried on steel bearings. The ribs, of a nearly uniform depth of 13 feet, are formed of a web plate and flanges of steel plate. The Niagara arched Railway Bridge, replacing a suspension bridge, was erected without stopping the traffic. The span is 550 feet and the rise 114 feet. The hinges are formed of two steel castings. Between

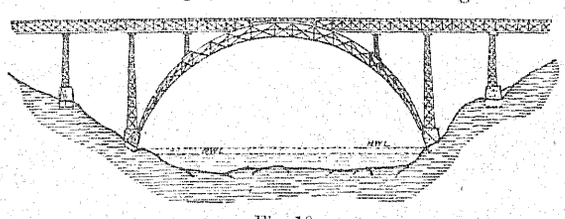


Fig. 18.

the convex face of the upper and concave face of the lower casting are 45 segmental rollers set radially to the centre of movement. The pressure on the rollers is one ton per lineal inch. The Garabit Viaduct carries the railway near St Flour, in the Cantal Department, France, at 420 feet above low water. The deepest part of the valley is crossed by an arch of 541 feet span, and 213 feet rise. The bridge is similar to that at Oporto, also designed by Mr Seyrig. It is formed by a crescent-shaped arch, continued on one side by four, on the other side by two lattice girder spans, on iron piers. The arch is formed by two lattice ribs hinged at the abutments. Its depth at the crown is 33 feet, and its centre line follows nearly the parabolic line of pressures. The two arch ribs are 65½ feet apart at the springings and 20½ feet at the crown. The roadway girders are lattice, 17 feet deep, supported from the arch ribs at four points. The total length of the viaduct is 1715 feet. The lattice girders of the side spans were first rolled into place, so as to project some distance beyond the piers, and then the arch ribs were built out, being partly supported by wire-rope cables from the lattice girders above. The total weight of ironwork was 3200 tons and the cost £124,000 (*Annales des travaux publiques*, 1884).

In suspension bridges the principal member is in tension, and can be made of material of great tenacity, such as wire. The compression member required in girder bridges is absent. Hence, suspension bridges should be economical in cost. But, on the other hand, expensive piers and anchorages are necessary, together with stiffening members to counteract the flexibility of the chain. The Ordish Bridge, built at Prague in 1868, had oblique chains supporting the stiffening girders at intermediate points of the span. A curved chain supports the oblique chains and keeps them straight. Cables are now made of wire either in twisted strands or laid parallel. In the East River Bridge, New York (see Plate), the individual wires forming the cable were led over the piers one by one, thus avoiding the severe straining to which heavy cables are subjected from flexure over the saddles and elsewhere during erection.

Suspension bridges.

The Brooklyn Bridge, New York, including approaches, is 5989 feet long. The centre span is 1595½ feet, and the clear height over the water 135 feet. The tower piers are built on caissons. The roadway is suspended from four steel-wire cables. Number of wires in strands of cable, 278; strands in each cable, 19; wires (7 B.W.G.) in each cable, 5296; strength of cable per square inch, 71 tons; total weight of bridge, 14,680 tons; approximate cost, £3,067,000.

The Tower Bridge, London, is a suspension bridge with a secondary bascule bridge in the centre span to permit the passage of ships (see Plate). Two main towers in the river and two towers on the shore abutments carry the suspension chains. The opening bridge between the river towers consists of two leaves or bascules, pivoted near the faces of the piers and rotating in a vertical plane. When raised, the width of 200 feet between the main river piers is unobstructed up to the high-level foot-bridge, which is 141 feet above Trinity H.W. The clear width of the two shore spans is 270 feet. The total length of the bridge is 940 feet, and that of the approaches 1260 feet on the north and 780 feet on the south. The width of the bridge between parapets is 60 feet, except across the centre span, where it is 49 feet. The main towers consist of a skeleton of steel, enclosed in a facing of granite and Portland stone, backed with brickwork. There are two high-level footways for use when the bascules are raised, the main girders of which are of the cantilever and suspended girder type. The cantilevers are fixed to the shore side of the towers. The middle girders are 120 feet in length and attached to the cantilevers by links. The main suspension chains are carried across the centre span in the form of horizontal ties resting on the high-level footway girders. These ties are jointed to the hanging chains by pins 20 inches in diameter with a ring in halves surrounding it 5 inches thick. One half ring is rigidly attached to the tie and one to the hanging chain, so that the wear due to any movement is distributed over the length of the pin. A rocker bearing under these pins transmits the load at the joint to the steel columns of the towers. The abutment towers are similar to the river towers. On the abutment towers the chains are connected by horizontal links, carried on rockers, to anchor ties. The suspension chains are constructed in the form of braced girders, so that they are stiff against unsymmetrical loading. Each chain over a shore span consists of two segments, the longer attached to the tie at the top of the river tower, the shorter to the link at the top of the abutment tower, and the two jointed together at the lowest point. Transverse girders are hung from the chains at distances of 18 feet. There are fifteen main transverse girders to each shore span, with nine longitudinal girders between each pair. The trough flooring, ⅜ inches thick and 6 inches deep, is riveted to the longitudinals. The anchor ties are connected to girders embedded in large concrete blocks in the foundations of the approach viaducts.

The two bascules are each constructed with four main girders. Over the river these are lattice girders, with transverse girders 12 feet apart, and longitudinal and subsidiary transverse girders dividing the floor into rectangles 3 feet by 3½ feet covered with buckled plates. The roadway is of pine blocks dowelled. The bascules rotate through an angle of 82°, and their rear ends in the bascule chambers of the piers carry 365 tons of counterweight, the total weight of each being 1070 tons. They rotate on steel shafts 21 inches in diameter and 48 feet long, and the bascules can be lifted or lowered in one minute, but usually the time taken is one and a half minutes. They are worked by hydraulic machinery.

The main girders of girder bridges consist of three principal members, a tension and compression boom or chord, and a web. When the booms are parallel the web resists the shear. If one or both booms are curved the straining action on the web is diminished. At first the girders had plate webs even for large spans, but now plate webs are not used for spans over 50 to 75 feet. The web in modern girders is an arrangement of struts and ties termed bracing. In some girder bridges the members are jointed or connected by pins, in others they are more rigidly connected by riveting. The pin connexion system first used in England in the Crumlin and Newark Dyke Bridges is now much more commonly adopted in America, so that it has come to be regarded as a distinctively American feature. With pin connexions some weight is saved in the girders, and erection is easier, but the girders are less rigid than riveted girders and suffer more from oxidation. Commonly now the pin connexion is restricted to tension members. A fundamental difference in girder bridges arises from the method of support. In the simplest case the main girders are supported at the ends, and if there are several spans, are discontinuous. Next, the main girder may be supported at more than two points so as to be continuous over two or more spans. This economizes weight, but the objection is that very small alterations of level of the supports involve comparatively large differences in the straining action. Settlement of one of the piers might perhaps render the girder unsafe. A girder may be supported at the centre and then forms a pair of cantilevers. Lastly, some bridges are composed of cantilevers and suspended girders. The main girder is then virtually a continuous girder hinged at the points of contrary flexure so that no ambiguity can arise as to the stresses.

Girder bridges.

Figs. 19, 20, and 21 show an independent girder, a cantilever, and a cantilever and suspended girder bridge.

In a three-span bridge continuous girders are lighter than discontinuous ones by about 45 per cent. for the dead load and 15 per cent. for the live load, if no allowance is made for ambiguity due to uncertainty as to the level of the supports. The cantilever and suspended girder types are as economical and free from uncertainty as to the stresses. In long-span bridges the cantilever system permits erection by building out, which is economical and sometimes necessary. It is, however, unstable unless rigidly fixed at the piers. In the Forth Bridge stability is obtained partly by the great excess of dead over live load, partly by the great width of the river piers. The majority of bridges not of great span have girders with parallel booms. This

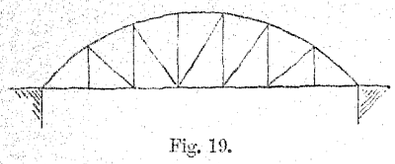


Fig. 19.

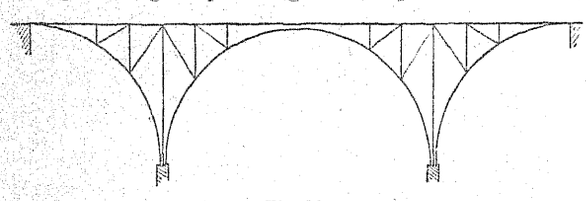


Fig. 20.

involves the fewest difficulties of workmanship and perhaps permits the closest approximation of actual to theoretical dimensions of the parts. In spans over 200 feet it is economical to have one horizontal boom and one polygonal (approximately parabolic) boom. The hog-backed girder is a compromise between the two types, avoiding some difficulties of construction near the ends of the girder.

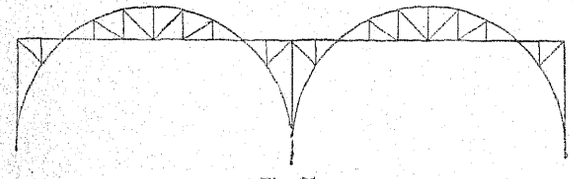


Fig. 21.

Most braced girders may be considered as built up of two simple forms of truss, the king-post truss (Fig. 22, *a*), or the queen-post truss (Fig. 22, *b*). These may be used either in the upright or the inverted position. A *multiple truss* consists of a number of simple

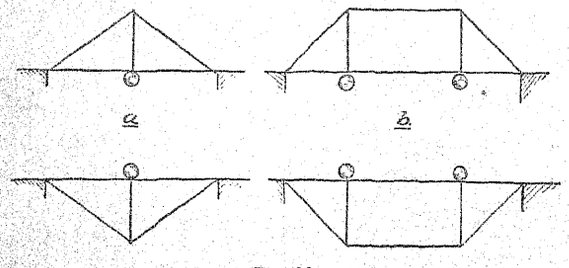


Fig. 22.

trusses, *e.g.*, Bollman truss (see BRIDGES, ninth edition). Some timber bridges consist of queen-post trusses in the upright position, as shown diagrammatically in Fig. 23, where the circles indicate points at which the flooring girders transmit load to the main

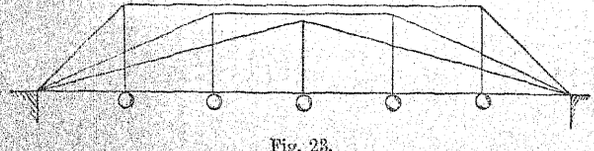


Fig. 23.

girders. *Compound* trusses consist of simple trusses used as primary, secondary, and tertiary trusses, the secondary supported on the primary, and the tertiary on the secondary. Thus, the Fink truss consists of king-post trusses; the Pratt truss (Fig. 24) and Whipple truss (Fig. 25) of queen-post trusses; the Warren truss of queen-post trusses alternately upright and inverted.

A combination bridge is built partly of timber, partly of steel, the compression members being generally of timber and the tension

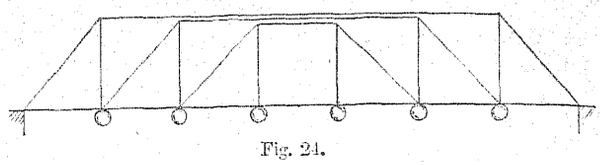


Fig. 24.

members of steel. On the Pacific coast, where excellent timber is obtainable and steel works are distant, combination bridges are still largely used (Ottewell, *Trans. Am. Soc. Civil Eng.* xxvii. p. 467). The combination bridge at Roseburgh, Oregon, is a cantilever bridge. The shore arms are 147 ft. span, the river arms 105 ft., and the suspended girder 80 ft., the total distance between anchor piers being 584 ft. The floor beams, floor, and railing are of timber. The compression members are of timber

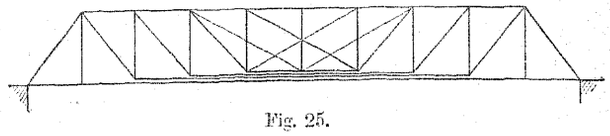


Fig. 25.

except the struts and bottom chord panels next the river piers, which are of steel. The tension members are of iron and the pins of steel. The chord blocks and post shoes are of cast iron.

The exceptional local conditions at the site of the Forth Bridge led to the adoption there of the cantilever system, till then little considered. Now it is well understood that in many positions that system is the simplest, most convenient, and most economical method of bridging. The spans are virtually reduced to smaller spans so far as the girders are concerned; and what is much more important, the cantilevers can be built out from the piers, member by member, and no river staging is required. Mr. Waddell has shown that, in some cases, it is convenient to erect simple independent spans, by building them out as cantilevers and converting them into independent girders after erection. Fig. 26 shows girders erected in this way, the dotted lines being temporary members during erection, which are removed

Cantilever bridges.

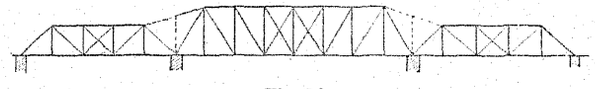


Fig. 26.

afterwards. The side spans are erected first on staging and anchored to the piers. From these, by the aid of the temporary members, the centre span is built out from both sides. The principal cantilever bridges are (1) the Forth Bridge, with two central spans of 1710 ft., and two anchor spans of 680 ft.; (2) the railway bridge at Memphis over the Mississippi, span 790 ft.; (3) the Red Rock Bridge over the Colorado river, with a span of 660 ft. and anchor spans of 165 ft., suspended girder 330 ft. in length; (4) the Poughkeepsie Bridge over the Hudson; (5) the Lansdowne Bridge over the Indus at Sukkur, which, though designed later, was erected earlier than the Forth Bridge; (6) the Niagara Bridge for a railway—towers 495 ft. high, cantilever arms each 175 ft., suspended girder 120 ft., total length of bridge 910 ft.

The Forth Bridge was described in *Ency. Brit.* vol. xx. p. 234. Further details may be found in *The Forth Bridge*, by W. Westhofen, reprinted from *Engineering*; "The Forth Bridge," by Sir B. Baker, *Reports of British Association*, 1884 and 1885; *Die Forth Brücke*, von G. Barkhausen, Berlin, 1889; *The Forth Bridge*, by Philip Philips, Edinburgh. In the Sukkur Bridge (Fig. 27), the

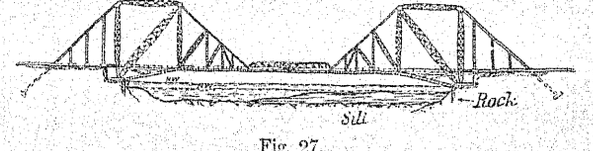


Fig. 27.

clear span is 790 ft., and the suspended girder 200 ft. in length. The span to the centres of the end uprights is 820 ft.; width between centres of main uprights at bed-plate 100 ft., and between centres of main members at end of cantilevers 20 ft. The bridge is for a single line of railway of 5 ft. 6 in. gauge. The back guys are the most heavily strained part of the structure, the stress provided for being 1200 tons. This is due to the half weight of

centre girder, the weight of the cantilever itself, the rolling load on half the bridge, and the wind pressure. The anchors are built up of steel plates and angle bars, and are buried in a large mass of concrete. The area of each anchor plate, normal to the line of stress, is 32 ft. by 12 ft. The bridge was designed by Sir A. Rendel, the consulting engineer to the Indian Government.

In the United States, few railway companies design or build their own bridges. General specifications as to span, loading, &c., are furnished to bridge-building companies, which make the design under the direction of engineers who are experts in this kind of work. The design, with strain sheets and detail drawings, is submitted to the railway engineer with estimates. The result is that American bridges are generally of well-settled types and their members of uniform design, carefully considered with reference to convenient and accurate manufacture. Standard patterns of details are largely adopted, and more system is introduced in the workshop than is possible where designs are more varied. Riveted plate girders are used up to 50 ft. span, riveted braced girders for spans of 50 ft. to 75 ft., and pin-connected girders for longer spans. Since the erection of the Forth Bridge, cantilever bridges have been extensively used, and some remarkable steel arch and suspension bridges have also been constructed. Overhead railways are virtually continuous bridge constructions, and much attention has been given to a study of the special conditions appertaining to that case.

Erection.

Consideration of the local conditions affecting the erection of bridges is always important, and sometimes becomes a controlling factor in the determination of the design. The methods of erection may be classed as—(1) erection on staging or falsework; (2) floating to the site and raising; (3) rolling out from one abutment; (4) building out member by member, the completed part forming the stage from which additions are handled.

(1) In erection on staging, the materials available determine the character of the staging; stacks of timber, earth banks, or built-up staging of piles and trestles have all been employed, also iron staging, which can be rapidly erected and moved from site to site. The most ordinary type of staging consists of timber piles at nearly equal distances of 20 ft. to 30 ft., carrying a timber platform, on which the bridge is erected. Sometimes a wide space is left for navigation, and the platform at this part is carried by a timber and iron truss. When the headway is great or the river deep, timber-braced piers or clusters of piles at distances of 50 ft. to 100 ft. may be used. These carry temporary trusses of timber or steel. The Kuilenburg Bridge in Holland, which has a span of 492 ft., was erected on a timber staging of this kind, containing 81,000 cubic feet of timber and 5 tons of bolts. The bridge superstructure weighed 2150 tons, so that 38 cubic feet of timber were used per ton of superstructure.

(2) The Britannia and Conway Bridges were built on staging on shore, lifted by pontoons, floated out to their position between the piers, and lastly lifted into place by hydraulic presses. The Moerdyk Bridge in Holland, with 14 spans of 328 ft., was erected in a similar way. The convenience of erecting girders on shore is very great, but there is some risk in the floating operations and a good deal of hauling plant is required.

(3) If a bridge consists of girders continuous over two or more spans, it may be put together on the embankment at one end and rolled over the piers. In some cases hauling tackle is used, in others power is applied by levers and ratchets to the rollers on which the girders travel. In such rolling operations the girder is subjected to straining actions different from those which it is intended to resist, and parts intended for tension may be in compression; hence it may need to be stiffened by timber during rolling. The bending action on the bottom boom in passing over the rollers is also severe. Modifications of the system have been adopted for bridges with discontinuous spans. In narrow ravines a bridge of one span may be rolled out, if the projecting end is supported on a temporary suspension cable anchored on each side. The free end is slung to a block running on the cable. If the bridge is erected when the river is nearly dry a travelling stage may be constructed to carry the projecting end of the girder while it is hauled across, the other end resting on one abutment. Sometimes a girder is rolled out about one-third of its length, and then supported on a floating pontoon.

(4) Some types of bridge can be built out from the abutments, the completed part forming an erecting stage on which lifting appliances are fixed. Generally, in addition, wire cables are stretched across the span, from which lifting tackle is suspended. In bridges so erected the straining action during erection must be studied, and material must be added to resist erecting stresses. In the case of the St Louis Bridge, half arches were built out on either side of each pier, so that the load balanced. Skeleton towers on the piers supported chains attached to the arched ribs at suitable points. In spite of careful provision, much difficulty was experienced in making the connexion at the crown, from the expansion due to temperature changes. The Douro Bridge was similarly erected. The girders of the side spans were rolled out so as to overhang the great span by 105 ft., and formed a platform from which parts of the arch could be suspended. Dwarf towers, built on the arch ring at the fifth panel from either side, helped to support the girder above, in erecting the centre part of the arch (Seyrig, *Proc. Inst. C. E.* lxiii. p. 177). The great cantilever bridges have been erected in the same way, and they are specially adapted for erection by building out. (W. C. U.)

Bridgeton, capital of Cumberland county, New Jersey, U.S.A., situated in 39° 26′ N. lat. and 74° 14′ W. long., in the southern part of the state, on Cohansey Creek, which is tidal and navigable at this point. It is entered by two railways, the Central of New Jersey and the West Jersey and Southern. Population (1880), 8722; (1890), 11,424; (1900), 13,913.

Bridgwater, a municipal borough (extended in 1896), seaport, and market town in the Bridgwater parliamentary division of Somersetshire, England, 12 miles N.E. of Taunton by rail, on the Parret. Recent erections are a corn exchange and waterworks; the infirmary has been enlarged. The value of foreign and colonial imports in 1900 was £104,827; of exports of produce and manufactures of the United Kingdom, £5682. The tonnage entered in 1900 was 162,626 (of which 148,870 tons was coasting); the tonnage cleared was 159,889 (of which 157,640 tons was coasting). The registered shipping in 1901 was 90 sailing vessels of 5724 tons, and 10 steamers of 499 tons. Population on the enlarged area (1891), 13,264; (1901), 15,209.

Bridport, a municipal borough, seaport, and market town in the Western parliamentary division (since 1885) of Dorsetshire, England, 18 miles W. of Dorchester, on the Brit, and a branch of the Great Western railway. Area, 571 acres. Population (1881), 6795; (1891), 6611; (1901), 5710.

Brieg, a town of Prussia, province of Silesia, on the Oder, 26 miles S.E. from Breslau, by the railway to Beuthen. It is an industrial place, manufacturing cigars, millstones, ribbons, leather, machinery, paper, and sugar. The castle (begun 1544) is now used as a military store. Population (1885), 18,899; (1895), 21,164.

Brighouse, a municipal borough (1893) in the Elland parliamentary division of the West Riding of Yorkshire, England, 4 miles N.E. of Huddersfield by rail, on the river Calder. It is governed by a mayor, 8 aldermen, and 24 councillors. There are a technical school, a theatre and opera-house, and a public library, opened in 1898 in commemoration of Queen Victoria's Diamond Jubilee. The corporation owns gas, water, and electric-lighting works, but a new scheme of electric lighting has been adopted. Extensive sewage works were commenced in 1896. Population of municipal borough area (1891), 20,666; (1901), 21,735.

Bright, Sir Charles Tilston (1832-1888), telegraph engineer, the youngest son of Mr Brailsford Bright, was born on 8th June 1832, at Wanstead. He was employed from very early youth in telegraph work. At the age of twenty he became engineer to the Magnetic Telegraph Company, and in that capacity—the telegraphs had not at that time been taken over by the State—superintended the laying of lines in various parts of Great Britain. He was also working out in conjunction with his brother many valuable telegraphic inventions. In 1853 he laid the first submarine cable between England and Ireland. His experiments soon convinced him of the practicability of signalling electrically between the British Isles and

America, and though the very idea was regarded as absurd by some of the leading authorities of the day, with the aid of friends he raised the money with which to make the attempt. The result was the first Atlantic cable—that of 1858. As is well known, this, regarded as a means of practical communication, had only a very limited success, and largely on account of the ill-treatment to which it was subjected by the ignorance of the operators its useful life was a very brief one. It was, however, quite sufficient to prove the general principle that electrical signals can be sent for thousands of miles under the sea. Subsequently, Sir Charles Bright himself supervised the laying of submarine cables in almost every region of the world. He died on 3rd May 1888, at Abbey Wood, near London.

Bright, John (1811-1889), British manufacturer, political economist, and statesman, was born at Rochdale on 16th November 1811. His father, Jacob Bright, was a much respected member of the Society of Friends, who had started a cotton-mill at Rochdale in 1809. The family had reached Lancashire by two migrations. Abraham Bright was a Wiltshire yeoman, who, early in the 18th century, removed to Coventry, where his descendants remained, and where, in 1775, Jacob Bright was born. Jacob Bright was educated at the Ackworth School of the Society of Friends, and was apprenticed to a fustian manufacturer at New Mills. He married his employer's daughter, and settled with his two brothers-in-law at Rochdale in 1802, going into business for himself seven years later. His first wife died without children, and in 1809 he married Martha Wood, daughter of a tradesman of Bolton-le-Moors. She had been educated at Ackworth school, and was a woman of great strength of character and refined taste. There were eleven children of this marriage, of whom John Bright was the second, but the death of his elder brother in childhood made him the eldest son. He was a delicate child, and was sent as a day-scholar to a boarding-school near his home, kept by Mr William Littlewood. A year at the Ackworth school, two years at a school at York, and a year and a half at Newton, near Clitheroe, completed his education. He learned, he himself said, but little Latin and Greek, but acquired a great love of English literature, which his mother fostered, and a love of outdoor pursuits—especially fishing, which became his chief relaxation in later years. In his sixteenth year he entered his father's mill, and in due time became a partner in the business. Two agitations were then going on in Rochdale—the first (in which Jacob Bright was a leader) in opposition to a local church-rate, and the second for parliamentary reform, by which Rochdale successfully claimed to have a member allotted to it under the Reform Bill. In both these movements John Bright took part. He was an ardent Nonconformist, proud to number among his ancestors John Gratton, a friend of George Fox, and one of the persecuted and imprisoned preachers of the Society of Friends. His political interest was probably first kindled by the Preston election in 1830, in which Lord Stanley, after a long struggle, was defeated by "Orator" Hunt. But it was as a member of the Rochdale Juvenile Temperance Band that he first learned public speaking. These young men went out into the villages, borrowed a chair of a cottager, and spoke from it at open-air meetings. In Mrs John Mills's life of her husband is an account of John Bright's first extempore speech. It was at a temperance meeting. Bright got his notes muddled, and broke down. The chairman gave out a temperance song, and during the singing told Bright to put his notes aside and say what came into his mind. Bright obeyed, began with much hesitancy, but found his tongue and made an excellent address. On some early occasions, however, he committed his speech to memory. In 1832 he called on the Rev. John Aldis, an eminent Baptist minister, to accompany him to a local Bible meeting. Mr Aldis described him as a slender, modest young gentleman, who surprised him by his intelligence and thoughtfulness, but who seemed nervous as they walked to the meeting together. At the meeting he made a stimulating speech, and on the way home asked for advice. Mr Aldis counselled him not to learn his speeches, but to write out and commit to memory certain passages and the peroration. Bright took the advice, and acted on it all his life.

This "first lesson in public speaking," as Bright called it, was given in his twenty-first year, but he had not then contemplated entering on a public career. He was a fairly prosperous man of business, very happy in his home, and always ready to take part in the social, educational, and political life of his native town. He was one of the founders of the Rochdale Literary and Philosophical Society, took a leading part in its debates, and on returning from a holiday journey in the East, gave the society

JOHN BRIGHT.
(From a photograph by Elliott and Fry.)

a lecture on his travels. He first met Richard Cobden in 1836 or 1837. Cobden was an alderman of the newly-formed Manchester corporation, and Bright went to ask him to speak at an education meeting in Rochdale. "I found him," said Bright, "in his office in Mosley Street, introduced myself to him, and told him what I wanted." Cobden consented, and at the meeting was much struck by Bright's short speech, and urged him to speak against the Corn Laws. His first speech on the Corn Laws was made at Rochdale in 1838, and in the same year he joined the Manchester Provisional Committee which in 1839 founded the Anti-Corn Law League. He was still only the local public man, taking part in all public movements, especially in opposition to Mr Feilden's proposed factory legislation, and to the Rochdale church-rate. In 1839 he built the house which he called "One Ash," and married Elizabeth, daughter of Jonathan Priestman of Newcastle-on-Tyne. In November of the same year there was a dinner at Bolton to Mr Paulton, who had just returned from a successful Anti-Corn Law tour in Scotland. Among the speakers were Cobden and Bright, and the dinner is memorable as the first occasion on which the two future leaders appeared together on a Free Trade platform. Bright is described by the historian of the League as "a young man then appearing for the first time in any meeting out of his own town, and giving evidence, by his energy and by his grasp of the subject, of his capacity

soon to take a leading part in the great agitation." But his call had not yet come. In 1840 he led a movement against the Rochdale church-rate, speaking from a tombstone in the churchyard, where it looks down on the town in the valley below. A very happy married life at home contented him, and at the opening of the Free Trade Hall in January 1840 he sat with the Rochdale deputation, undistinguished in the body of the meeting. A daughter, Helen, was born to him; but his young wife, after a long illness, died of consumption in September 1841. Three days after her death at Leamington, Cobden called to see him. "I was in the depths of grief," said Bright, when unveiling the statue of his friend at Bradford in 1877, "I might almost say of despair, for the life and sunshine of my house had been extinguished." Cobden spoke some words of condolence, but "after a time he looked up and said, 'There are thousands of homes in England at this moment where wives, mothers, and children are dying of hunger. Now, when the first paroxysm of your grief is past, I would advise you to come with me, and we will never rest till the Corn Laws are repealed.' I accepted his invitation," added Bright, "and from that time we never ceased to labour hard on behalf of the resolution which we had made." At the general election in 1841 Cobden was returned for Stockport, and in 1843 Bright was the Free Trade candidate at a by-election at Durham. He was defeated, but his successful competitor was unseated on petition, and at the second contest Bright was returned. He was already known in the country as Cobden's chief ally, and was received in the House of Commons with a suspicion and hostility even greater than had met Cobden himself. In the Anti-Corn Law movement the two speakers were the complements and correlatives of each other. Cobden had the calmness and confidence of the political philosopher, Bright had the passion and the fervour of the popular orator. Cobden did the reasoning, Bright supplied the declamation, but like Demosthenes he mingled argument with appeal. No orator of modern times rose more rapidly to a foremost place. He was not known beyond his own borough when Cobden called him to his side in 1841, and he entered Parliament towards the end of the session of 1843 with a formidable reputation as an agitator. He had been all over England and Scotland addressing vast meetings and, as a rule, carrying them with him; he had taken a leading part in a conference held by the Anti-Corn Law League in London, had led deputations to the duke of Sussex, to Sir James Graham, then Home Secretary, and to Lord Ripon and Mr Gladstone, the Secretary and Under Secretary of the Board of Trade; and he was universally recognized as the chief orator of the Free Trade movement. Wherever "John Bright of Rochdale" was announced to speak, vast crowds assembled. He had been so announced, for the last time, at the first great meeting in Drury Lane Theatre on 15th March 1843; henceforth his name was enough. He took his seat in the House of Commons as one of the members for Durham on 28th July 1843, and on 7th August delivered his maiden speech in support of a motion by Mr Ewart for reduction of import duties. He was there, he said, "not only as one of the representatives of the city of Durham, but also as one of the representatives of that benevolent organization, the Anti-Corn Law League." A member who heard the speech described Bright as "about the middle size, rather firmly and squarely built, with a fair, clear complexion, and an intelligent and pleasing expression of countenance. His voice is good, his enunciation distinct, and his delivery free from any unpleasant peculiarity or mannerism." He wore the usual Friend's coat, and was regarded with much interest and hostile curiosity on both sides of the House.

Mr Ewart's motion was defeated, but the movement of which Cobden and Bright were the leaders continued to spread. In the autumn the League resolved to raise £100,000; an appeal was made to the agricultural interest by great meetings in the farming counties, and in November the *Times* startled the world by declaring, in a leading article, "The League is a great fact. It would be foolish, nay, rash, to deny its importance." In London great meetings were held in Covent Garden Theatre, at which William Johnson Fox was the chief orator, but Bright and Cobden were the leaders of the movement. Bright publicly deprecated the popular tendency to regard Cobden and himself as the chief movers in the agitation, and Cobden told a Rochdale audience that he always stipulated that he should speak first, and Bright should follow. His "more stately genius," as Mr John Morley calls it, was already making him the undisputed master of the feelings of his audiences. In the House of Commons his progress was slower. Cobden's argumentative speeches were regarded more sympathetically than Bright's more rhetorical appeals, and in a debate on Villiers's annual motion against the Corn Laws Bright was heard with so much impatience that he was obliged to sit down. In the next session (1845) he moved for an inquiry into the operation of the Game Laws. At a meeting of county members earlier in the day Peel had advised them not to be led into discussion by a violent speech from the member for Durham, but to let the committee be granted without debate. Bright was not violent, and Cobden said that he did his work admirably, and won golden opinions from all men. The speech established his position in the House of Commons. In this session Bright and Cobden came into opposition, Cobden voting for the Maynooth Grant and Bright against it. On only one other occasion—a vote for South Kensington—did they go into opposite lobbies, during twenty-five years of parliamentary life. In the autumn of 1845 Bright retained Cobden in the public career to which Cobden had invited him four years before. Bright was in Scotland when a letter came from Cobden announcing his determination, forced on him by business difficulties, to retire from public work. Bright replied that if Cobden retired the mainspring of the League was gone. "I can in no degree take your place," he wrote. "As a second I can fight, but there are incapacities about me, of which I am fully conscious, which prevent my being more than second in such a work as we have laboured in." A few days later he set off for Manchester, posting in that wettest of autumns through "the rain that rained away the Corn Laws," and on his arrival got his friends together, and raised the money which tided Cobden over the emergency. The crisis of the struggle had come. Peel's budget in 1845 was a first step towards Free Trade. The bad harvest and the potato disease drove him to the repeal of the Corn Laws, and, at a meeting in Manchester on 2nd July 1846, Cobden moved and Bright seconded a motion dissolving the League. A library of twelve hundred volumes was presented to Bright as a memorial of the struggle.

Bright married, in June 1847, Miss Margaret Elizabeth Leatham, of Wakefield, by whom he had seven children, Mr John Albert Bright being the eldest. In the succeeding July he was elected for Manchester, with Mr Milner Gibson, without a contest. In the new Parliament, as in the previous session, he opposed legislation restricting the hours of labour, and, as a Nonconformist, spoke against clerical control of national education. In 1848 he voted for Hume's household suffrage motion, and introduced a Bill for the repeal of the Game Laws. When Lord John Russell brought forward his Ecclesiastical Titles Bill, Bright opposed it as "a little, paltry, miserable measure,"

and foretold its failure. In this Parliament he spoke much on Irish questions. In a speech in favour of the Government Bill for a rate in aid in 1849, he won loud cheers from both sides, and was complimented by Disraeli for having sustained the reputation of that assembly. From this time forward he had the ear of the House, and took effective part in the debates. He spoke against capital punishment, against church rates, against flogging in the army, and against the Irish Established Church. He supported Cobden's motion for the reduction of public expenditure, and in and out of Parliament pleaded for peace. In the election of 1852 he was again returned for Manchester on the principles of free trade, electoral reform, and religious freedom. But war was in the air, and the most impassioned speeches he ever delivered were addressed to this Parliament in fruitless opposition to the Crimean War. Neither the House nor the country would listen. "I went to the House on Monday," wrote Macaulay in March 1854, "and heard Bright say everything I thought." His most memorable speech, the greatest he ever made, was delivered on 23rd February 1855. "The angel of death has been abroad throughout the land. You may almost hear the beating of his wings," he said, and concluded with an appeal to the Prime Minister that moved the House as it had never been moved within living memory. There was a tremor in Bright's voice in the touching parts of his great speeches which stirred the feelings even of hostile listeners. It was noted for the first time in this February speech, but the most striking instance was in a speech on Mr Osborne Morgan's Burials Bill in April 1875, in which he described a Quaker funeral, and protested against the "miserable superstition of the phrase, 'buried like a dog.'" "In that sense," he said, "I shall be buried like a dog, and all those with whom I am best acquainted, whom I best love and esteem, will be 'buried like a dog.' Nay more, my own ancestors, who in past time suffered persecution for what is now held to be a righteous cause, have all been buried like dogs, if that phrase is true." The tender, half-broken tones in which these words were said, the inexpressible pathos of his voice and manner, were never forgotten by those who heard that Wednesday morning speech.

Bright was disqualified by illness during the whole of 1856 and 1857. In Palmerston's penal dissolution in the latter year, Bright was rejected by Manchester, but in August, while ill and absent, Birmingham elected him without a contest. He returned to Parliament in 1858, and in February seconded the motion which threw out Lord Palmerston's government. Lord Derby thereupon came into office for the second time, and Bright had the satisfaction of assisting in the passing of two measures which he had long advocated, the admission of Jews to Parliament and the transfer of the government of India from the East India Company to the Crown. He was now restored to full political activity, and in October addressed his new constituents, and started a movement for parliamentary reform. He spoke at great gatherings at Edinburgh, Glasgow, Bradford, and Manchester, and his speeches filled the papers. For the next nine years he was the protagonist of Reform. Towards the close of the struggle he told the House of Commons that a thousand meetings had been held, that at every one the doors were open for any man to enter, yet that an almost unanimous vote for reform had been taken. In the debates on the Reform Bills submitted to the House of Commons from 1859 to 1867, Bright's was the most influential voice. He rebuked Lowe's "Botany Bay view," and described Horsman as retiring to his "cave of Adullam," and hooking in Lowe. "The party of two," he said, "reminds me of the Scotch terrier, which was so covered with hair that you could not tell which was the head and which was the tail." These and similar phrases, such as the excuse for withdrawing the Reform Bill in the year of the great budget of 1860—"you cannot get twenty waggons at once through Temple Bar"—were in all men's mouths. It was one of the triumphs of Bright's oratory that it constantly produced these popular cries. The phrase "a free breakfast table" was his; and on the rejection of Forster's Compensation for Disturbance Bill he used the phrase as to Irish discontent, "Force is not a remedy."

During his great reform agitation Bright had vigorously supported Cobden in the negotiations for the treaty of commerce with France, and had taken, with his usual vehemence, the side of the North in the discussions in England on the American civil war. In March 1865 Cobden died, and Bright told the House of Commons he dared not even attempt to express the feelings which oppressed him, and sat down overwhelmed with grief. Their friendship was one of the most characteristic features of the public life of their time. "After twenty years of intimate and almost brotherly friendship with him," said Bright, "I little knew how much I loved him till I had lost him." In June 1865 Parliament was dissolved, and Bright was returned for Birmingham without opposition. Palmerston's death in the early autumn brought Lord John Russell into power, and for the first time Bright gave his support to the Government. Russell's fourth Reform Bill was introduced, was defeated by the Adullamites, and the Derby-Disraeli ministry was installed. Bright declared Lord Derby's accession to be a declaration of war against the working classes, and roused the great towns in the demand for reform. Bright was the popular hero of the time. As a political leader the winter of 1866-67 was the culminating point in his career. The Reform Bill was carried with a clause for minority representation, and in the autumn of 1868 Bright, with two Liberal colleagues, was again returned for Birmingham. Mr Gladstone came into power with a programme of Irish reform in church and land such as Bright had long urged, and he accepted the post of President of the Board of Trade. He thus became a member of the Privy Council, with the title of Right Honourable, and from this time forth was a recognized leader of the Liberal party in Parliament and in the country. He made a great speech on the second reading of the Irish Church Bill, and wrote a letter on the House of Lords, in which he said, "In harmony with the nation they may go on for a long time, but throwing themselves athwart its course they may meet with accidents not pleasant for them to think of." He also spoke strongly in the same session in favour of the bill permitting marriage with a deceased wife's sister. The next session found him disqualified by a severe illness, which caused his retirement from office at the end of the year, and kept him out of public life for four years. In August 1873 Mr Gladstone reconstructed his Cabinet, and Bright returned to it as Chancellor of the Duchy of Lancaster. But his hair had become white, and though he spoke again with much of his former vigour, he was now an old man. In the election in January 1874 Bright and his colleagues were returned for Birmingham without opposition. When Mr Gladstone resigned the leadership of his party in 1875, Bright was chairman of the party meeting which chose Lord Hartington as his successor. He took a less prominent part in political discussion, till the Eastern Question brought Great Britain to the verge of war with Russia, and his old energy flamed up afresh. In the debate on the Vote of Credit in February 1878, he made one of his impressive speeches, urging the Government not to increase the difficulties manufacturers had in finding employment for their workpeople by any single

word or act which could shake confidence in business. The debate lasted five days. On the fifth day a telegram from Mr Layard was published announcing that the Russians were nearing Constantinople. The day, said the *Times*, "was crowded with rumours, alarms, contradictions, fears, hopes, resolves, uncertainties." In both Houses Mr Layard's despatch was read, and in the excited Commons Mr Forster's resolution opposing the Vote of Credit was withdrawn. Bright, however, distrusted the ambassador at the Porte, and gave reasons for doubting the alarming telegram. While he was speaking a note was put into the hands of Sir Stafford Northcote, and when Bright sat down he read it to the House. It was a confirmation from the Russian prime minister of Bright's doubts: "There is not a word of truth in the rumours which have reached you." At the general election in 1880 he was re-elected at Birmingham, and joined Mr Gladstone's new government as Chancellor of the Duchy of Lancaster. For two sessions he spoke and voted with his colleagues, but after the bombardment of the Alexandria forts he left the ministry and never held office again. He felt most painfully the severance from his old and trusted leader, but it was forced on him by his conviction of the danger and impolicy of foreign entanglements. He, however, gave a general support to Mr Gladstone's government. In 1883 he took the chair at a meeting of the Liberation Society in Mr Spurgeon's chapel; and in June of that year was the object of an unparalleled demonstration at Birmingham to celebrate his twenty-five years of service as its representative. At this celebration he spoke strongly of "the Irish rebel party," and accused the Conservatives of "alliance" with them, but withdrew the imputation when Sir Stafford Northcote moved that such language was a breach of the privileges of the House of Commons. At a banquet to Lord Spencer he accused the Irish members of having "exhibited a boundless sympathy for criminals and murderers." He refused in the House of Commons to apologize for these words, and was supported in his refusal by both sides in the House. At the Birmingham election in 1885 he stood for the Central Division of the redistributed constituency; he was opposed by Lord Randolph Churchill, but was elected by a large majority. In the new Parliament he voted against the Home Rule Bill, and it was generally felt that in the election of 1886 which followed its defeat, when he was re-elected without opposition, his letters told with fatal effect against the Home Rule Liberals. His contribution to the discussion was a suggestion that the Irish members should form a Grand Committee to which every Irish bill should go after first reading. The break-up of the Liberal party filled him with gloom. His last speech at Birmingham was on 29th March 1888 at a banquet to celebrate Mr Chamberlain's return from his Peace Mission to the United States. He spoke of Imperial Federation as "a dream and an absurdity." In May his illness returned, he took to his bed in October and died on 27th March 1889. He was buried in the graveyard of the meeting-house of the Society of Friends in Rochdale.

Bright had much literary and social recognition in his later years. In 1882 he was elected Lord Rector of the University of Glasgow, and Dr Dale wrote of his Rectorial address, "It was not the old Bright." "I am weary of public speaking," he had told Dr Dale; "my mind is almost a blank." He was given an honorary degree of the University of Oxford in 1886, and in 1888 a statue of him was erected at Birmingham. Lord Salisbury said of him, and it sums up his character as a public man, "He was the greatest master of English oratory that this generation —I may say several generations—has seen. . . . At a time when much speaking has depressed, has almost exterminated eloquence, he maintained that robust, powerful, and vigorous style in which he gave fitting expression to the burning and noble thoughts he desired to utter."

No full biography of Bright has been published since his death. The fullest is *The Life and Speeches of the Right Hon. John Bright, M.P.*, by GEORGE BARNETT SMITH, 2 vols. 8vo., 1881. See also *The Life of John Bright, M.P.*, by JOHN M'GILCHRIST, in Cassell's Representative Biographies, 1868.—*John Bright*, by C. A. VINCE, 1898.—*Speeches on Parliamentary Reform by John Bright, M.P., revised by himself*, 1866.—*Speeches on Questions of Public Policy*, by JOHN BRIGHT, M.P., edited by J. E. Thorold Rogers, 2 vols. 8vo., 1868.—*Public Addresses*, edited by J. E. Thorold Rogers, 8vo., 1879.—*Public Letters of the Right Hon. John Bright, M.P.*, collected by H. J. Leech, 1885. (P. W. C.)

Brighton, a municipal, county (1888), and parliamentary borough of England, on the English Channel, 50½ miles by rail S. of London, 44 miles E. of Portsmouth, 34 miles W. of Hastings, in the county of Sussex, on the London, Brighton, and South Coast railway. The municipal borough of Hove, with which in 1893 was incorporated the parish of Aldrington, adjoins the county borough of Brighton. The parish of Hove forms part of the parliamentary borough of Brighton, but the parish of Aldrington is a part of the Mid or Lewes parliamentary division of Sussex. Preston to the north, formerly a distinct suburb, is now absorbed in the municipal and parliamentary borough of Brighton. Practically one town, Brighton and Hove extend 4 miles, east to west, along the coast, fronted, for a length of 3 miles, by a massive sea-wall, 60 feet high, 23 feet thick at the base, and 3 feet at the summit, and a fashionable promenade. Till 1894, when its boundaries were altered, Brighton was distributed into 7, but since then into 14 wards, under the government of a mayor, 14 aldermen, and 42 councillors. Incorporated by Royal Charter 1898, Hove is under a mayor, 10 aldermen, and 30 councillors. In continuous fast growth, Brighton now comprises more than 700 streets and squares. Recent improvements include the widening of King's Road (1888); improvements effected on the Marine Parade (1890); an electric railway along the beach; a railway (opened 1887) from Brighton to Devil's Dyke, 5½ miles distant; electric tramways (1901); "railway in the sea," from Kemp Town to Rottingdean, &c. The Corporation are erecting at Portslade, at a total cost of about £270,000, a large power station to enable them to meet the increasing demand for electricity in the borough. Extension works for augmenting the existing supply of water are being carried out at an estimated cost of over £100,000. There are 35 churches, and over 50 dissenting chapels. The more recent churches include St Paul's, with elaborate decorations, completed 1885; Trinity church, restored and partly rebuilt 1887; St Andrew's, St Nicholas' (the old parish church, dating from the 12th century), restored 1884; All Saints', the new parish church of Hove (1891), costing £19,400; St Augustine's (1896); the church of St Philip in Aldrington parish, erected since 1893, but still incomplete. The Brighton municipal school of science and technology, costing about £33,000, was opened in 1898. The same year the municipal school of science and art, erected in 1876 at a cost of £11,000, was enlarged and re-adapted, and St Mary's Hall (1836), for the education of daughters of poor clergymen, was also enlarged. Brighton grammar school now includes chemical and physical laboratories and a workshop, attended by between 300 and 400 boys. The Victoria lending library (1889) was rebuilt in 1901 at a cost of about £38,000, and the Hove free library was opened in 1892. Among the more recent erections are the terminus of the London, Brighton, and South Coast railway, covering 20 acres, entirely reconstructed in 1887; the west pier (1886),

lately enlarged and extended; a new pier, completed in 1900, 1700 feet long, with a three-deck landing-stage at its head, near the site of the chain pier, which was washed away in 1896; the town hall, entirely rebuilt in 1899 at a cost of nearly £48,000; the town hall of Hove (1882), costing £40,000; the new parochial offices (1894); the Booth collection of (1400) British birds (1893); the Victoria (1888), Cobden Road (1894), and Hove (1894) public baths. The wholesale and retail fruit and flower market was rebuilt in 1901 at a cost of over £10,000. Places of entertainment are a theatre, rebuilt 1894; another theatre (1891), rebuilt 1895; a variety theatre, reconstructed 1892 at a cost of £30,000; a concert hall (1892); an alhambra (1888). In 1876 the aquarium was enlarged, and in 1878 its roof was laid out as a terrace garden. Under the powers of their Act of 1901 the Corporation have purchased the aquarium, and are remodelling and rearranging the building, in order to carry it on as a high-class concert hall and winter garden. The hospitals comprise a fever hospital and sanatorium (1898); a children's hospital (1881); throat and ear hospital (1878), re-erected 1898. There are several public parks and recreation grounds. The Corporation acquired in 1900, for the purposes of a park, 180 acres of land on the east side of Ditchling Road. The mackerel and herring fishery is extensive. There are 4 daily, 1 tri-weekly, and 9 weekly newspapers. Area of municipal borough of Brighton in 1901, 2620 acres. Population (1881), 107,546; (1891), 115,873; (1901), 123,478. Area of municipal borough of Hove in 1901, 1694¾ acres; population (1881), 20,804; (1891), 26,097; (1901), 36,542. Area of parliamentary borough in 1891, 3715 acres; population (1881), 128,440; (1891), 142,129; (1901), 153,691.

Brighton, a watering-place in Victoria, Australia, in the county of Bourke, on the east shore of Port Phillip Bay, 7½ miles S.E. from Melbourne, of which it is practically a suburb connected by rail. Population (1881), 4755; (1901), 10,029.

Brin, Benedetto (1833-1898), Italian naval administrator, was born at Turin, 17th May 1833, and, until the age of 40, worked with distinction as a naval engineer. In 1873, Admiral Saint-Bon, Minister of Marine, appointed him under-secretary of state. The two men completed each other; Saint-Bon conceived a type of ship, Brin made the plans and directed its construction. On the advent of the Left to power in 1876, Brin was appointed Minister of Marine by Depretis, a capacity in which he continued the programme of Saint-Bon, while enlarging and completing it in such way as to form the first organic scheme for the development of the Italian fleet. The huge warships *Italia* and *Dandolo* were his work, though he afterwards abandoned their type in favour of smaller and faster vessels of the *Varese* and the *Garibaldi* class. By his initiative Italian naval industry, almost non-existent in 1873, made rapid progress. During his eleven years' ministry (1876-78 with Depretis, 1884-91 with Depretis and Crispi, 1896-98 with Rudini), he succeeded in creating large private shipyards, engine works, and metallurgical works for the production of armour, steel plates, and guns. In 1892 he entered the Giolitti cabinet as Minister for Foreign Affairs, accompanying, in that capacity, the king and queen of Italy to Potsdam, but showed weakness towards France on the occasion of the massacre of Italian workmen at Aigues-Mortes. He died on 24th May 1898, while Minister of Marine in the Rudini Cabinet. He, more than any other man, must be regarded as the practical creator of the Italian navy. (H. W. S.)

Brindaban, a town of British India, in the Muttra district of the North-West Provinces, on the right bank of the Jumna, 6 miles N. of Muttra. Population, about 26,000. The municipal income in 1897-98 was Rs.20,931. Brindaban is one of the most popular places of pilgrimage in India, being associated with the cult of Krishna as a shepherd. It contains handsome temples, bathing stairs, tanks, and wells.

Brindisi, a seaport town and archiepiscopal see of the province of Lecce, Apulia, Italy, on the shore of the Adriatic, near the S.E. extremity of the kingdom, 346 miles by rail from Ancona. The port has been gradually, but slowly, improved and dredged year by year, the intention being to go on with the work until there is a depth of 30 ft. all over the inner harbour; the eastern arm was dredged to 13 ft. in 1898.

In July 1898 the Peninsular and Oriental Company (who first used Brindisi as a port of embarkation in December 1870) began to start their main line boats from Marseilles instead of from Brindisi, chiefly with the view of decreasing the cost of the overland railway journey from Calais. But at Brindisi they substituted an express service of small boats for Port Said, principally to carry the mails. The Peninsular and Oriental Company's service from Venice *vid* Brindisi to Port Said was discontinued in March 1900. But there are mail services to Greek ports and to Constantinople. During the five years 1893-97 an average of 14,728 passengers sailed annually from this port; in 1898 the number fell to 2359. Adding to the mail boats the tonnage and number of the trading ships, we find that the port was cleared by an average of 1335 vessels of 1,385,000 tons annually during the years 1888-99. In 1898 the British entries numbered 155 vessels of 362,700 tons, but in 1899 only 128 vessels of 153,000 tons. The exports average £326,100 (£253,000 in 1899) annually, and the imports £300,100 (£298,400 in 1899). There is not much industrial activity. As regards the public buildings, the cathedral has been recently restored, the castle of Frederick II. is now a convict prison, and the baptistery of San Giovanni has been converted into a museum. There is also a new theatre (1899). Population, about 20,000.

Brionian Islands, The, in the Gulf of Venice, off the Istrian coast, from which they are separated by the narrow Canale di Jasana. They belong to Austria and are twelve in number. Up to a recent period they were chiefly noted for their quarries (on S. Girolamo and Brion minore), which have been worked for centuries and have supplied material not only for the palaces and bridges of Venice and the whole Adriatic coast, but latterly for Vienna and Berlin also. As they command the entrance to the naval harbour of Pola, a strong fortress, "Fort Tegethoff," has been erected on the largest of them, together with minor fortifications on some of the others. The islands are inhabited by about 100 Italian quarrymen.

Brisbane, the capital city of Queensland, Australia, about 25 miles from the mouth of the river Brisbane, in 27° 28′ 3″ S. lat., 153° 1′ 55″ E. long. The population has increased greatly since 1875, largely on account of the rapid growth of outlying suburbs; in 1901 the population of Brisbane metropolitan area was 119,907. The population of the city proper in 1901 was estimated at 28,830 persons, and of South Brisbane at 25,485. The most important suburbs are Kangaroo Point, Fortitude Valley, New Farm, Red Hill, Paddington, Milton, Toowong, Breakfast Creek, Bulimba, Woollongabba, Highgate, and Indooroopilly. The city is mostly built on a series of hills rising from the river, but some portions of it, such as Woollongabba and South Brisbane, are built on low-lying flats, and have from time to time been much damaged by floods. The plan of Brisbane is not in accordance with modern principles, and the streets are comparatively narrow, but they are well paved and fairly well lighted with gas. The public buildings are of an unusually fine order of architecture, such structures as the Parliament Houses, the new block of public offices, the Custom House, the General Post

Office, Government House (the residence of the Sovereign's representative), the General Museum, and the Supreme Court being conspicuous. Besides these there are many fine civic, commercial, religious, and private buildings. Both Brisbane proper and South Brisbane have town halls, and there are an Anglican pro-cathedral, a Roman Catholic cathedral, two grammar schools (one for boys and one for girls), a hospital, an opera house and two theatres, two museums (one attached to the mines department and the other to the agricultural department), and a national art gallery, with an annual government grant of £500, situated in the town-hall buildings. The old Victoria iron bridge connecting North and South Brisbane was swept away in the great floods of 1893. A new bridge was commenced in 1894, and completed in 1897, at a cost of £110,000. At this point the river is a quarter of a mile wide. The city is well provided with parks and open spaces. The largest is the Victoria Park, and there are five others besides the Botanical Gardens, and the gardens of the Acclimatization Society, wherein tropical vegetation is cultivated. The mean temperature of Brisbane during December, January, and February is about 76°; during June, July, and August, about 60°. The average rainfall over a period of 35 years was 50·01 inches.

The municipal government of Brisbane, and also of South Brisbane, is in the hands of a corporation consisting of a mayor and ten aldermen, representing five wards; the suburbs are under the control of shire councils and divisional boards. The sanitary arrangements of Brisbane are not worthy of so fine a city, but there is a splendid gravitation system of water-supply. The united storage capacity of the various reservoirs, one of which holds 1,000,000,000 gallons and another 400,000,000 gallons, is 225,700,000 cubic feet. Electric light has been installed by private enterprise, and is largely used. By the same means the city has been provided with a most convenient tramway service worked by electric power, which runs in all directions from the centre of the city to the suburbs. There is railway communication with Sydney to the south and Rockhampton to the north, while westwards a line runs almost as far as Cunnamulla, 560 miles distant. Telegraphic communication exists between Brisbane and, among other places, the French settlement of New Caledonia, a cable to which islands is in the hands of a French company. In 1899 nearly 1800 telephones were in use. Three daily newspapers are published. Brisbane is an important trading port, and the broad river, by careful dredging, has been rendered navigable for vessels of the largest size, ships of 5000 tons being easily able to come up to the town from the mouth. It is the terminal port of the line which carries the Queensland royal mail to Europe, and a calling port for lines of steamers to China, Japan, and Canada. The various intercolonial lines also call at Brisbane on their way to northern and southern Australian ports. As regards merchant shipping, 713 vessels with cargoes of 835,355 tons entered in 1900; 716 of 819,662 tons cleared. The value of the imports in 1900 was £7,184,112; of the exports, £9,581,562. As a manufacturing centre Brisbane has not yet attained any great importance. In the metropolitan district there are a number of boot factories, employing 1500 hands; soap factories, 130 hands; preserve and pickle factories, 300 hands; breweries, 270 hands; and tanneries, 250 hands. There are also several tobacco factories and various minor industries. North Brisbane is the principal business part, but South Brisbane is rapidly growing in population and importance. (J. D. F.)

Brisson, Eugène Henri (1835——), French statesman, was born at Bourges 31st July 1835. He followed his father's profession of advocate, and, having made himself conspicuous in opposition during the last days of the empire, was appointed deputy-mayor of Paris after its overthrow. He was elected to the Assembly in 1871 as a member of the Extreme Left, and after following a steady and consistent political course for nine years was chosen its president in 1881. He showed remarkable firmness and dignity in the discharge of his duties, and in March 1885 became prime minister upon the resignation of M. Jules Ferry; but he resigned when, after the general elections of that year, he only just obtained a majority for the vote of credit for the Tongking expedition. He remained conspicuous as a public man, took a prominent part in exposing the Panama scandals, was a powerful candidate for the presidency after the murder of President Carnot in 1894, and was again president of the chamber from 1894 to 1898. In June of the latter year he formed a Cabinet when the country was violently excited over the Dreyfus affair; his firmness and impartiality increased the respect in which he was already held by good citizens, but a chance vote on an occasion of especial excitement overthrew his ministry in October. No politician in France enjoys a higher public reputation than M. Brisson, owing to his known uprightness and austerity of character.

Bristol, a city and county in itself, municipal county (1888) and parliamentary borough, and seaport of England, on the tidal river Avon at its confluence with the Frome, 8 miles S.E. of its mouth in the Bristol Channel, 12 miles W.N.W. of Bath, 163 miles S. of Manchester, 118 miles, by the Great Western railway, W. of London, chiefly in the county of Gloucester but partly in that of Somerset. An important junction on the Great Western and Midland railways. In 1885 the parliamentary limits were extended, and the enlarged borough now returns 4 members, one for each of the four divisions. The government of the city consists of a mayor, 21 aldermen, 62 town councillors, and about 70 magistrates, together with a sheriff and other officers.

The see of Bristol was founded by Henry VIII. in 1542. In 1836 the sees of Gloucester and Bristol were united. In 1896 the sees were separated and a distinct diocese of Bristol was established. The Cathedral has been doubled in size since 1875. The Norman nave and aisles were restored in 1877; the Elder Lady Chapel and the Central Tower in 1894. About £80,000 has been spent on the Cathedral since 1861. The restoration of the parish church of St Mary Redcliff was completed in 1879 at a cost of upwards of £50,000. In the suburb of Clifton, included in the municipality of Bristol, are the churches of St Peter's (1882), All Saints' (1891), and St Anselm's (1897). There are in Bristol 18 churches of the original parishes, 24 ecclesiastical parish churches—in all 69 churches and Episcopal chapels, 6 Roman Catholic churches, besides 5 convents connected with the Cathedral at Clifton, 23 Congregational, 19 Wesleyan, 17 Baptist chapels, and numerous other dissenting places of worship. The Technical College, founded in 1885, of the Company of Merchant Venturers, supplies scientific, technical, and commercial education. University College, to which is attached the older Medical School, dates from 1876. Clifton College, opened in 1862 and incorporated in 1877, includes a physical science school with laboratories, a museum and observatory. Colston's Girls' Day School (1891) includes domestic economy and calisthenics. There are 5 grammar and collegiate schools, a Baptist College (1679), 9 endowed charity, 4 orphan, and 4 reformatory, besides numerous board and national schools. The harbour, formed in 1809 by the conversion of the Avon and a branch of the Frome into "the Float," by the cutting

of a new channel for the Avon and the formation of two basins, comprises about 63 acres of water. Altogether, the dammed-up water area, at fixed level, measures about 85 acres. In 1884 the Avonmouth and Portishead docks at the river entrance were bought up by the city. The dock gates have also been enlarged so as to admit first-class steamships and trading vessels of 2000 tons burden. The quay accommodation within the harbour is over a mile in length. Clifton Rocks railway, cut in a tunnel from the gorge of the Avon to the summit of the Clifton Rocks, was opened in 1893. The council house, fine arts academy and school of science and art, post office, and commercial rooms, have all been greatly enlarged, and recent new erections are the assize courts, a theatre seating 3500 persons, St Philip's Free Public Library, Cheltenham Road Library (1901), Colston Hall, and statues of Queen Victoria (1888), Samuel Morley (1888), Edmund Burke (1894), and Edward Colston (1895), in whose memory are held annual Colston banquets. The museum and reference library were transferred to the Corporation in 1893, in addition to which eight other libraries have been provided for the public use. Mr Vincent Stuckey Lean, who died in 1899, bequeathed to the Corporation of Bristol the sum of £50,000 for the further development of the free libraries of the city, and with especial regard to the formation and sustenance of a general reference library of a standard and scientific character. With a view to reviving interest in the once famous hot springs there, a new spa and pump-room has been opened in Clifton, where also two Established churches and a memorial tower (1897) to John Cabot, the explorer, have been erected. Among the many charitable institutions are the General Hospital, opened in 1858, and since repeatedly enlarged; Royal Hospital for sick children and women, Royal Victoria Home, and the Queen Victoria Jubilee Convalescent Home, opened by H.M. the Queen on 15th November 1899. The entire assessable value for poor rate in the union of Bristol, with a population of 55,549, was in the year 1897-98, £421,495 against £377,982 in the year 1887-88, with a population of 57,479. The amount of poor rate expended for the year 1897-98 was £34,029 against £29,300 in 1887-88. The local taxation expended by the town council of the county borough for the year 1897-98 was £183,026 against £111,190 for the year 1887-88. There are 5 daily and 5 weekly newspapers.

The principal industries are shipbuilding, ropewalks, chocolate factories, sugar refineries, tobacco mills and pipe-making, glass works, potteries, soaperies, shoe factories, leather works and tanneries, chemical works, saw mills, breweries, copper, lead, and shot works, iron works, machine works, stained paper works, anchors, chain cables, sail-cloth, buttons. A coal-field extending 16 miles south-east to Radstock avails much for Bristol manufactures.

Registered shipping in 1888—sailing vessels, 135 of 21,901 tons; steam vessels, 62 of 20,516 tons. In 1898—sailing vessels, 74 of 8925 tons; steam vessels, 87 of 31,488 tons. Ships entering port in 1888—8601 of 1,249,344 tons; clearances, 8223 of 1,246,981 tons. In 1898—entrances, 5136 of 1,254,023 tons; clearances, 5131 of 1,260,677 tons.

The following table will indicate the magnitude of the trade of Bristol:—

Imports of foreign and colonial produce for 1898—	
Grain of all sorts	£4,723,641
Sugar	886,623
Leather	341,828
Wine	142,917
Total value of imports of foreign and colonial produce for 1898	11,057,715
Against this may be set—	
Total value of imports of foreign and colonial produce for 1888	7,863,478
Exports of the produce and manufactures of the United Kingdom for 1898—	
Chemical products	£32,972
Corn, grain, meal, and flour	22,738
Metals of all sorts	873,806
Total value of exports of produce and manufactures of the United Kingdom for 1898	£1,372,815
Against this may be set:—	
Total value of exports of produce and manufactures of the United Kingdom for 1888	763,210
Gross customs revenue for 1898	1,617,220
,, ,, 1888	914,108

Area of city and municipal borough, 11,407 acres; population (1891), 289,280; (1901), 328,842. Area of parliamentary borough, 9675 acres; population (1891), 286,231; (1901), 321,908.

Nicholl and Taylor. *Bristol, Past and Present* (1881).—Hunt, *Bristol; Historic Towns Series* (1887).—Latimer. *Annals of Bristol in Nineteenth Century* (1887); ditto in the eighteenth century (1893).—Prout. *Picturesque Antiquities of Bristol* (1893).—Weare. *Collectanea relating to the Bristol Friars* (1893); *Burke's Connection with Bristol*, 1774-80 (1894).

Bristol, a town of Hartford county, Connecticut, U.S.A., situated in the central part of the state, includes an area of 27 square miles of hill country. It contains two villages, Bristol borough and Forestville, both on Pequanoc river, and on the New England railway. They have varied manufactures, chiefly of highly manufactured articles. Population of the town (1880), 5347; (1890), 7382; (1900), 9643; of the borough (1900), 6268.

Bristol, a borough of Bucks county, Pennsylvania, U.S.A., situated in the south-eastern part of the state, on Delaware river, and on a branch of the Pennsylvania railway, 19 miles N. of Philadelphia. Population (1880), 5273; (1890), 6553; (1900), 7104.

Bristol, capital of Bristol county, Rhode Island, U.S.A., situated on the east shore of Narragansett Bay, traversed by the New York, New Haven, and Hartford railway. The principal village, also known as Bristol, is a port of entry, with a capacious and deep harbour. It has manufactures of cotton, woollen, and rubber goods, and yards for the building of yachts, for the construction of which it is famous. Population of the town (1880), 6028; (1890), 5478; (1900), 6901.

Bristol, a city in Virginia and Tennessee, U.S.A. The state boundary follows the middle of the main street, dividing the city into two corporations, each bearing the same name. The Tennessee city is in Sullivan county; the Virginia city, formerly known as Goodson, lies within Washington county, but is independent of county jurisdiction. Bristol is situated in 36° 36′ N. lat. and 82° 11′ W. long., at an altitude of 1689 feet. It has some manufactures, especially of iron and tobacco. It is the site of several educational institutions, among them King's and Sullin's Colleges. Branches of the Norfolk and Western and the Southern railways join here, besides which the city is the terminus of two smaller railways. Population (1880), 3209; (1890), 6226; Virginia city (1900), 4579; Tennessee city (1900), 5271.

Bristow, Benjamin Helm (1832-1896), American lawyer and Secretary of the Treasury, was born in Elkton, Kentucky, in 1832. He received a college education, and was admitted to the bar in 1853. At the beginning of the Civil War he became lieutenant-colonel in the Union army, and afterwards was colonel of cavalry. He served throughout the war. He was state senator from 1863 to 1865; United States district attorney for the Louisville district, 1865-70; and Solicitor-General of the United States, 1870-72. President Grant nominated him Attorney-General of the United States in 1873, but the nomination was not confirmed. He was Secretary of the Treasury for two years after June 1874, when he vigorously prosecuted the whisky ring. He was an unsuccessful candidate for the Presidential nomination in 1876,

and removed in the same year to New York to practise his profession. He died in New York city on 22nd June 1896.

British Columbia, the western province of the Dominion of Canada. It is bounded to the eastward by the continental watershed in the Rocky Mountains, until this, in its north-westerly course, intersects the 120th meridian of west longitude, which is followed north to the 60th parallel, thus including within the province a part of the Peace river country to the east of the mountains. The southern boundary is formed by the 49th parallel and the strait separating Vancouver Island from the state of Washington. The northern boundary is the 60th parallel, the western, the Pacific Ocean, upon which the province fronts for about 600 miles, and the coast strip of Alaska for a farther distance of 400 miles. British Columbia is essentially a mountainous country, comprising practically the entire width of what has been designated the Cordillera or Cordilleran belt of North America between the parallels of latitude above indicated, its area has as yet been very imperfectly mapped, and many different mountain ranges are recognized under local names; but there are two ruling mountain systems, the Rocky Mountains proper on the north-east side and the coast ranges on the south-west or Pacific side. The general direction of all these ranges is fundamentally dependent upon successive foldings of the earth's crust that have occurred parallel to the corresponding portion of the border of the Pacific Ocean, and their trend is therefore from south-east to north-west. Along the south-western side of the Rocky Mountains is a very remarkable valley of considerable geological antiquity, in which several of the great rivers of the Pacific slope flow for parts of their upper courses, including the Kootenay, Columbia, Fraser, and Finlay. This valley can be traced continuously for a length of at least 800 miles. (For further details as to the geology and physical geography of British Columbia, see the article on CANADA.) One of the most important rivers of the province is the Fraser, which, rising in the Rocky Mountains, flows for a long distance to the north-west, and then turning south eventually crosses the coast ranges by a deep, cañon-like valley and empties into the Strait of Georgia, a few miles south of the city of Vancouver. The Columbia, which rises farther south in the same range, flows north for about 150 miles, and then taking a short bend to the west flows south through the Kootenay country into the United States, emptying into the Pacific near Portland in the state of Oregon. In the north-western part of the province the Skeena flows south-west into the Pacific, and still farther to the north the Stikine rises in British Columbia, but before entering the Pacific crosses the coast-strip of Alaska, of which the width has not yet been defined. The Liard, rising in the same district, flows east and falls into the Mackenzie, which empties into the Arctic Ocean. The head-waters of the Yukon are also situated in the northern part of the province. All these rivers are swift and are interrupted by rapids at frequent intervals, so that, as means of communication for commercial purposes, they are of indifferent value. Wherever lines of railway are constructed they lose whatever importance they may have held in this respect previously.

At an early stage in the Glacial period British Columbia was covered by the Cordilleran glacier, which moved south-eastwards and north-westwards, in correspondence with the ruling features of the country, from a gathering-ground situated in the vicinity of the 57th parallel. Ice from this glacier poured through passes in the coast ranges and to a lesser extent debouched upon the edge of the great plains, beyond the Rocky Mountain range. The great valley between the coast ranges and Vancouver Island was also occupied by a glacier that moved in both directions from a central point in the vicinity of Valdez Island. The effects of this glacial action and of the long periods of erosion preceding it and of other physiographic changes connected with its passing away, have most important bearings on the distribution and character of the gold-bearing alluviums of the province.

History.—The discovery of British Columbia was made by the Spaniard Perez in 1774. With Cook's visit the geographical exploration of the coast began in 1778. Vancouver, in 1792-94, surveyed almost the entire coast of British Columbia with much of that to the north and south, for the British Government. The interior, about the same time, was entered by Mackenzie and traders of the N.W. Company, which at a later date became amalgamated with the Hudson Bay Company. In 1859, consequent on the discovery of gold and the large influx of miners, the mainland territory was erected into a separate colony under the name of British Columbia, and in 1866 this was united with Vancouver Island, under the same name. In 1859 some extension of responsible government was given to the colonies, and in 1871 British Columbia entered confederation and became part of the Dominion of Canada, sending three senators and six members of the House of Commons to the federal parliament. One of the conditions under which the colony entered the Dominion was the speedy construction of the Canadian Pacific railway, and in 1876 the non-fulfilment of this promise and the apparent indifference of the Government at Ottawa to the representations of British Columbia created strained relations, which were only ameliorated when the construction of a transcontinental road was begun. In subsequent years the founding of the city of Vancouver by the C.P.R., the establishment of the first Canadian steamship line to China and Japan, and that to Australia, together with the disputes with the United States on the subject of pelagic sealing, and the discovery of the Kootenay mining districts, have been the chief events in the history of the province.

Area and Population.—The area of British Columbia is 382,300 square miles, and its population by the census of 1891 was 98,173. Since that date this has been largely increased by the influx of miners and others, consequent upon the discovery of precious metals in the Kootenay, Columbia, and Atlin districts. Much of this is a floating population, but the opening up of the valleys by railway and new lines of steamboats, together with the settlements made in the vicinity of the Canadian Pacific railway, has resulted in a considerable increase of the permanent population. The white population comprises men of many nationalities. There is a large Chinese population, the census of 1891 giving 9000, but since that date the number has greatly increased despite the tax of $50 per head on all Chinamen entering the seaports, and of late years many Japanese have also come in. The Japanese are as yet mainly in the towns, but the Chinese are found everywhere in the province. Great objection is taken by the white population to the increasing number of "Mongolians," and legislative efforts have been made to hinder their competition with whites in the labour markets. The Japanese do not appear to be so much disliked, as they adapt themselves to the ways of white men, but they are equally objectionable on the score of cheap labour.

The Indian population is returned at 24,973, that of the coast numbering 13,392 and of the interior 11,581. Of the total, 19,586 are professing Christians and 5387 pagans. The Indians are divided into very many tribes, under local names, but fall naturally on linguistic grounds into a few large groups. Thus the southern part of the interior is occupied by the Salish and Kootenay, and the northern interior by the Tinneh or Athapackan people. On the coast are the Haida, Tsimshian, Kwakiatl, Nootka, and about the Gulf of Georgia various tribes related to the Salish proper.

There is no treaty with the Indians of British Columbia, as with those of the plains, for the relinquishment of their title to the land, but the Government otherwise assists them. There is an Indian superintendent at Victoria, and under him are nine agencies throughout the province to attend to the Indians—relieving their sick and destitute, supplying them with seed and implements, settling their disputes, and administering justice. The Indian

fishing stations and burial grounds are reserved, and other land has been set apart for them for agricultural and pastoral purposes. A number of schools have been established for their education; but it is questionable whether great benefit is derived from these. Though at one time a dangerous element they are now quiet and peaceable.

In 1891 there was a large disparity between the sexes in British Columbia, the figures showing 63,003 males to 35,170 females; the average size of a family being four to seven. The chief cities are Victoria, the capital, on Vancouver Island, and Vancouver on the mainland, New Westminster on the Fraser, Nanaimo on Vancouver Island. Rossland and Nelson in West Kootenay are also places of importance.

Climate.—The subjoined figures relating to temperature and precipitation are from a table prepared by Mr. R. F. Stupart, director of the meteorological service. The station at Victoria may be taken as representing the conditions of the southern part of the coast of British Columbia, although the rainfall is much greater on exposed parts of the outer coast. Agassiz represents the Fraser delta, and Kamloops the southern interior district. The mean temperature naturally decreases to the northward of these selected stations, both along the coast and in the interior, while the precipitation increases.

Mean Temperature, Highest and Lowest Temperature, Mean Daily Range, and Precipitation at three stations in British Columbia.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
VICTORIA.													
Mean temperature	37·2	38·7	43·3	47·0	52·8	56·5	59·6	59·3	54·6	49·5	43·2	41·3	48·6
Mean daily range	9·0	10·2	13·5	15·4	17·5	17·7	20·1	19·5	17·4	13·1	9·9	8·9	14·4
Absolute highest	56	60	68	74	82	86	89	86	80	70	60	59	89
Absolute lowest	−1	6	20	24	30	36	37	37	31	22	18	8	−1
Precipitation	5·13	3·53	2·57	2·11	1·21	1·16	0·46	0·59	1·98	3·11	6·13	7·53	35·51
AGASSIZ.													
Mean temperature	33·0	37·6	44·0	46·7	53·9	58·9	63·9	64·7	57·0	51·7	39·3	36·3	48·9
Mean daily range	9·7	11·8	16·1	16·9	18·1	21·2	25·7	28·5	20·7	19·2	10·3	8·9	17·3
Absolute highest	57	64	74	82	90	95	95	97	90	82	73	58	97
Absolute lowest	−13	−12	16	28	30	36	38	38	32	29	9	8	−13
Precipitation	7·29	6·68	5·47	5·49	4·85	3·97	1·55	1·62	5·25	6·56	8·69	9·43	66·85
KAMLOOPS.													
Mean temperature	22·3	24·3	38·1	48·2	56·8	63·6	68·8	68·3	57·1	47·7	33·3	29·0	46·5
Mean daily range	14·6	17·4	22·0	23·1	22·9	27·4	28·3	29·4	25·0	18·2	12·3	11·3	21·0
Absolute highest	56	64	69	75	86	101	101	97	87	82	65	56	101
Absolute lowest	−27	−27	−5	24	26	39	44	39	31	16	−22	−17	−27
Precipitation	0·75	1·26	0·63	0·50	1·45	1·49	1·42	0·53	1·00	0·72	1·00	0·80	11·55

Government.—The province is governed by a lieutenant-governor, appointed by the governor-general in council for five years, but subject to removal for cause, an executive council of five ministers, and a single legislative chamber. The executive council is appointed by the lieutenant-governor on the advice of the first minister, and retains office so long as it enjoys the support of a majority of the legislature. The powers of the lieutenant-governor in regard to the provincial Government are analogous to those of the governor-general in respect of the Dominion Government.

The British North America Act (1867) confederating the colonies, defines the jurisdiction of the provincial legislature as distinguished from that of the federal parliament, but within its own jurisdiction the province makes the laws for its own governance. The Act of the legislature may be disallowed, within one year of its passage, by the governor-general in council, and is also subject to challenge as to its legality in the Supreme Court of Canada, or on appeal by the judicial committee of the Privy Council of the United Kingdom.

Justice.—There is a supreme court of British Columbia presided over by a chief justice and five puisne judges, and there are small-debt courts for amounts up to $100. In British Columbia the Supreme Court has jurisdiction in divorce cases, this right having been invested in the colony before confederation.

Religion.—In 1891 the population was divided by creeds into—Church of England, 23,619; Methodist, 14,298; Presbyterian, 15,284; Roman Catholic, 20,843; other denominations, 21,031; not stated, 3098; total, 98,173. These figures are now much larger, but there is no reason to suppose that the proportions have materially changed. Except in the cities a large proportion of the religious work of the province is performed by the aid of the missionary societies of England.

Education.—The educational system of British Columbia differs slightly from that of other provinces of Canada. There are three classes of schools—common, graded, and high—all maintained by the Government, and all free and undenominational. There is no university, and only one collegiate establishment—the Methodist college at Vancouver—and that is affiliated with the M'Gill University in Montreal. The schools are controlled by trustees selected by the ratepayers of each school district, and there is a superintendent of education acting under the provincial secretary. In 1899 there were 280 schools in operation, the expenditure for educational purposes proper being $268,653, in addition to $67,362 spent by the public works department on school buildings.

Finance.—Under the terms of union with Canada, British Columbia receives an annual subsidy of $242,689. This with provincial taxes on real property, personal property, income tax, sales of public land, timber dues, &c., amounted in the year 1899 to $1,531,638. The expenditure for the year was $2,156,473. The deficit, however, was due to special expenditure. The gross debt of the province in 1899 was $8,243,083, with assets $5,480,248, or a net debt of $2,762,835. These assets do not include new legislative buildings or other public works. The income tax is on a sliding scale, and all taxes are subject to a discount of about ¼ of 1 per cent. on payment being made before a specified date. In 1899 a fairly close estimate was made of the capital invested in the province, which amounted to $307,385,000, including timber, $100,000,000; railways and telegraphs, $47,500,000; mining plant and smelters, $10,500,000; municipal assessments, $45,000,000; provincial assessments, $51,500,000; in addition to private wealth, $280,000,000.

Postal.—The number of letters mailed in British Columbia for 1898 was 6,700,000; of post cards, 525,000; registered letters, 165,000; free letters, 156,000; transient newspapers, parcels, periodicals, &c., 836,000.

Mining is the principal industry of British Columbia. The country is rich in gold, silver, copper, and coal, and has some large iron deposits. From 1888 to 1898 the mining output increased from $2,608,803 to $10,906,861. By 1900 it had reached $16,344,751. For 1897-98 the figures are:—

	1897.	1898.
Gold placer	$513,520	$643,346
Gold lode	2,122,820	2,201,217
Silver	3,272,836	2,375,841
Copper	266,258	874,781
Lead	1,390,517	1,077,581
Coal	2,648,562	3,407,595
Coke	89,155	175,000
Other materials[1]	151,600	151,500
Total	$10,455,268	$10,906,861

Between 1858—the year of the placer discoveries on the Fraser river and in the Cariboo district—and 1882 the placer yields were much heavier than in subsequent years, running from one to nearly four million dollars annually, but there was no quartz mining. At the present time the greater part of the return is from lode mining, though the use of hydraulic plant has produced a fair proportion and promises to be still more productive, gravel beds of apparent richness having been recently discovered in many districts. The Kootenay districts are at present the chief centres of vein-mining, yielding free-milling gold quartz, auriferous and cupriferous pyrrhotites, as at Rossland, and large quantities of silver-bearing lead ores. Ores of copper and the precious metals are being prospected and worked in the boundary district, and also in several places along the coast and on Vancouver Island. The mining laws are liberal, and being based on the experience gained in the adjacent mining centres of the

[1] Accurate returns of these materials being unobtainable, the figures given are estimated.

Western States, are convenient and effective. There are several smelting and reducing plants in operation at Trail and Nelson in the Kootenay country, and on Texada Island. In the Stocan division of the Kootenay there are five concentrating plants, and another and a cyanide plant at Phillip's Arm on the mainland. Others are being built. Mining machinery of the most modern types is being introduced wherever required.

Coal.—In 1888 the output of coal was 489,301 tons of $1,467,903 value; in 1898 it had increased to 1,135,865 tons of $3,407,595 value. Nearly all this was the output of the coal-mines at Nanaimo and Comox on Vancouver Island; 765,811 tons of the 1898 output were exported, 752,686 tons going to the United States.

Fisheries.—A large percentage of the commerce is derived from the sea, the chief product being salmon. Halibut, cod (several varieties), oolachan, sturgeon, herring, and many other fishes are also plentiful, but with the exception of the halibut these have not yet become the objects of extensive industries. There are several kinds of salmon, and they run in British Columbia waters at different seasons of the year. The quinnat or spring salmon is the largest and best table fish, and is followed in the latter part of the summer by the sockeye, which runs in enormous numbers up the Fraser river. This is the fish preferred for canning. It is of brighter colour, more uniform in size, and comes in such quantities that a constant supply can be reckoned upon by the canneries. About the mouth of the Fraser river from 1500 to 2000 boats are occupied during the run. The silver salmon or cohoe arrives a little later than the sockeye, but is not much used for packing except when required to make up deficiencies. The dog-salmon and the humpbacked have no commercial value, and are only used by Indians. Great Britain is the chief but not the only market for British Columbia salmon. The years vary in productiveness, 1897 having been unusually large and 1898 the smallest in five years, but the average pack is about 500,000 cases of 48 one-lb tins. The value of the salmon export for 1899 was $2,740,124, the greater part of all returns being from the Fraser river canneries, the rivers of the Inlets and Skeena river coming next in order. There are between fifty and sixty canneries, of which about fifty are on the banks of the Fraser river. The total value of the fisheries product from 1876 to 1896 inclusive was $45,912,686, of which salmon is represented at $28,873,083, all other kinds, including fur-seals and fish oils, making up the balance. The fish oils are extracted chiefly from several species of dog-fish, and sometimes from the basking shark, as well as from the oolachan, which is also an edible fish.

The fur-seal fishery is an important industry, though apparently a declining one, the average value of late years having been about $700,000. Owing to the low price of seal-skins and international difficulties concerning pelagic sealing in Bering Sea, where the greatest number have been taken, the business of seal-hunting is losing favour. The amount of capital invested in vessels, plant, &c., in 1897 for fishing and sealing was $2,514,660.

The Dominion Government has established a fish-hatchery, and another is to be added, and oysters and lobsters from the Atlantic coast have been planted in British Columbia waters.

Timber.—The province is rich in forest growth, and there is now a steady demand for its lumber in South America, Africa, Australia, and China. The following is a list of some of the more important trees of a commercial kind—large-leaved maple (*Acer macrophyllum*), red alder (*Alnus rubra*), western larch (*Larix occidentalis*), white spruce (*Picea alba*), Engelmann's spruce (*Picea Engelmanii*), Menzie's spruce (*Picea sitchensis*), white mountain pine (*Pinus monticola*), black pine (*Pinus murrayana*), yellow pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga Douglasii*), western white oak (*Quercus garryana*), giant cedar (*Thuya gigantea*), yellow cypress or cedar (*Thuya excelsa*), western hemlock (*Tsuga mertensiana*). The principal timber of commerce is the Douglas fir, which grows to a very great size in the neighbourhood of the coast, and has great weight-bearing power. Red or giant cedar is plentiful, and is used for shingles. The western white spruce is also much employed for various purposes. There are about eighty sawmills—large and small—in the province. In 1898 the export of timber amounted to 52,531,458 feet; Australia taking 25,928,877 feet, South America 7,342,818, South Africa 5,316,587, China 7,116,350, Japan 1,152,894, Great Britain or Europe 4,401,767, and Vladivostok 1,272,165. The whole cut for the year, excluding railway and Dominion lands, was 124,546,658 feet.

Agriculture.—British Columbia is not in the main a farming country, but there are many localities admirably suited for the cultivation of cereals, hay, and fruit. The lower Fraser is the principal part where farming is carried on without irrigation, but in all parts of the southern interior below a certain level farming can be carried on where water for irrigating is convenient. In the northern interior and Spallumsheen valley, irrigation is not necessary. Cattle, horse, and sheep "ranches" are numerous and important in the southern interior, where the climate and conditions are especially favourable. A great deal of the farm produce and fruit at present used is imported, but in 1899 the exports show $61,239 of agricultural produce and $355,323 of animals, the greater part of the latter being beef cattle.

Imports and Exports.—The value of the imports of 1899 was $8,714,733, of which $7,101,735 was dutiable and $1,612,998 free. The duties collected for the year amounted to $2,350,738. Exports, being the produce of Canada, from the province amounted in 1899 to $14,748,025, the largest amount yet reached with the exception of 1898, when $16,919,717 was exported. The exports of 1899 comprised products of the mine, $10,467,502; of the fisheries, $2,740,124; of the forest, $527,820; animals and their produce, $355,323; agricultural products, $61,239; miscellaneous, $420,689. The exports of 1899 show an increase of $10,413,719 over those of 1889.

Railways.—The Pacific division of the Canadian Pacific railway enters British Columbia through the Rocky Mountains on the east, and runs for about 500 miles before reaching the terminus at Vancouver. From that port steamers convey the mails and passengers for Vancouver Island to Victoria. The same company have built a southern branch line from Lethbridge in Alberta through the Crow's Nest Pass, near the international boundary line, into the Kootenay country, opening up extensive coal-fields from which the mines in southern British Columbia will in the future be supplied with coal and coke for smelting, a development of the country's resources which must add greatly to the value of its mines, from which most of the ore has heretofore been exported in a crude state. This road has several branches to mining towns on the south of its main line, and there are several other short lines not connected with the Canadian Pacific system. On Vancouver Island there are two railways, the Esquimalt and Nanaimo railway (78 miles), connecting the coal-fields with the southern ports, and the Victoria and Sydney of about 16 miles in length. Apart from the Canadian Pacific railway, the bonded debt of the lines in British Columbia is about five and a half million dollars, and the total cost of them, including rolling stock, about $49,000,000.

Shipping.—The Canadian Pacific railway company has two lines of mail steamers running from Vancouver and Victoria—(1) the Empress line, which runs to Japan and China once in three weeks, and (2) the Australian line to Honolulu, Fiji, and Sydney once a month. 1272 sea-going ships with 1,239,470 tons of cargo cleared from the four ports—Victoria, Vancouver, Nanaimo, and New Westminster; and 1108 vessels, carrying 931,416 tons of cargo, entered at the same ports during the year 1899. In ballast 754 of 498,557 tonnage cleared outwards, and 890 of 818,919 entered. In the coasting trade 5758 vessels of 1,408,973 tonnage cleared outwards, and 5702 with 1,375,914 entered. During the year 51 vessels, aggregating 4954 tons, were built in the province, and 49, aggregating 4641 tons, were registered.

Fauna.—Among the larger mammals are the big-horn or mountain sheep (*Ovis canadensis*), the Rocky Mountain goat (*Mazama montana*), the grizzly bear, moose, woodland caribou, black-tailed or mule deer, white-tailed deer, and coyote. All these are to be found only on the mainland. The black bear, wolf, puma, lynx, wapiti, and Columbian or coast deer are common to parts of both mainland and islands. Of marine mammals the most characteristic are the sea-lion, fur-seal, sea-otter, and harbour-seal. About 340 species of birds are known to occur in the province, among which, as of special interest, may be mentioned the burrowing owl of the dry, interior region, the American magpie, Steller's jay, and a true nut-cracker, Clark's crow (*Picicorvus columbianus*). True jays and orioles are also well represented. The gallinaceous birds include the large blue grouse of the coast, replaced in the Rocky Mountains by the dusky grouse. The western form of the "spruce partridge" of Eastern Canada is also abundant, together with several forms referred to the genus *Bonasa*, generally known as "partridges" or ruffed grouse. Ptarmigans also abound in many of the higher mountain regions. Of the *Anatidæ* only passing mention need be made. During the spring and autumn migrations many species are found in great abundance, but in the summer a smaller number remain to breed, chief among which are the teal, mallard, wood-duck, spoon-bill, pin-tail, buffle-head, red-head, canvas-back, scaup-duck, &c.

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(G. M. D.; M. ST. J.)

BRITISH EMPIRE, THE.

THE land surface of the earth is estimated to extend over about 52,500,000 square miles. Of this area the British empire occupies nearly one-quarter, extending over an area of about 12,000,000 square miles. By far the greater portion lies within the temperate zones, and is suitable for white settlement. The notable exceptions are the southern half of India and Burma; East, West, and Central Africa; the West Indian Colonies; the northern portion of Australia; New Guinea, British Borneo, and that portion of North America which extends into Arctic regions. The area of the territory of the empire is divided almost equally between the southern and the northern hemispheres, the great divisions of Australasia and South Africa covering between them in the southern hemisphere 5,308,506 square miles, while the United Kingdom, Canada, and India, including the native states, cover between them in the northern hemisphere 5,271,375 square miles. The alternation of the seasons is thus complete, one-half of the empire enjoying summer, while one-half is in winter. The division of territory between the eastern and western hemispheres is less equal, Canada occupying alone in the western hemisphere 3,653,946 square miles, while Australasia, South Africa, India, and the United Kingdom occupy together in the eastern hemisphere 6,925,975 square miles. As a matter of fact, however, the eastern portions of Australasia border so nearly upon the western hemisphere that the distribution of day and night throughout the empire is, like the alternations of the seasons, almost complete, one-half enjoying daylight, while the other half is in darkness. These alternations of time and of seasons, combined with the variety of soils and climates, are calculated to have an increasingly important effect upon the material and industrial, as well as upon the social and political developments of the empire. This will become evident in considering the industrial productions of the different divisions, and the harvest seasons which permit the summer produce of one portion of the empire to supply the winter requirements of its other markets, and conversely.

Extent.

The empire contains or is bounded by some of the highest mountains, the greatest lakes, and the most important rivers of the world. Its climates may be said to include all the known climates of the world; its soils are no less various. In the prairies of Central Canada it possesses some of the most valuable wheat-producing land; in the grass lands of the interior of Australia the best pasture country; and in the uplands of South Africa the most valuable gold- and diamond-bearing beds which exist. The United Kingdom at present produces more coal than any other single country except the United States (which exceeded the British output in 1900). The effect of climate throughout the empire in modifying the type of the Anglo-Saxon race has as yet received only partial attention, and conclusions regarding it are of a somewhat empiric nature. The general tendency in Canada is held to be towards somewhat smaller size, and a hardy active habit; in Australia to a tall, slight, pale development locally known as "cornstalkers," characterized by considerable nervous and intellectual activity. In New Zealand the type preserves almost exactly the characteristics of the British isles. The South African, both Dutch and British, is readily recognized by an apparently sun-dried, lank, and hard habit of body. In the tropical possessions of the empire where white settlement does not take place to any considerable extent the individual alone is affected. The type undergoes no modification. It is to be observed in reference to this interesting aspect of imperial development, that the multiplication and cheapening of channels of communication and means of travel throughout the empire will tend to modify the future accentuation of race difference, while the variety of elements in the vast area occupied should have an important, though as yet not scientifically traced, effect upon the British imperial type.

The white population of the empire reaches a total of upwards of 52,000,000, or about one-eighth of its entire population, which, including native races, is estimated at something over 430,000,000. The white population includes some French, Dutch, and Spanish peoples, but is mainly of Anglo-Saxon race. It is distributed roughly as follows:—

Population.

United Kingdom and Ireland		41,454,578
Australia		4,600,000
Canada—French	1,400,000	
English	3,800,000	
		5,200,000
Africa—Dutch, British		1,000,000
India		100,000
West Indies and Bermuda		100,000
		52,454,578

These figures must be taken only as approximate. In some cases census details are out of date, and official estimates have been accepted.

The native population of the empire includes types of the principal black, yellow, and brown races, classing with these the high-type races of the East, which may almost be called white. It is distributed as follows:—

India.

British Provinces	Mainly high type, brown	231,085,132
Native States		63,181,569
British Tracts		607,710
		294,874,411

The population of India is divided into 118 groups, on the basis of language. These may, however, be collected into twelve principal groups as follows:—

Aryo-Indic	Khasi	Sinitic
Dravidian	Tibeto-Burman	Aryo-Iranic
Kolarian	Mon Annam	Semitic
Gypsy	Shan	Aryo-European

Eastern Colonies.

Ceylon	High type, brown and mixed	3,391,000
Straits Settlements—Brown and mixed		267,073
Chinese yellow		228,000
Hong-Kong—Chinese yellow		211,000
Brown		1,901
North Borneo—Mixed brown		200,000
		4,298,974

Of the various races which inhabit these Eastern dependencies the most important are the 2,000,000 Sinhalese and the 750,000 Tamil that make up the population of Ceylon. The rest is made up of Malays, Chinese (in the Straits Settlements and Hong-Kong), Dyaks, Eurasians, and others.

West Indies.

The West Indies, including the continental colonies of British Guiana and Honduras, and seventeen islands or groups of islands, have a total coloured population of about 1,600,000. The colonies of this group which have the largest coloured populations are:—

Jamaica—Chiefly black, some brown and yellow	625,000
Trinidad—Black and brown	244,000
British Guiana—Black and brown	270,000
	1,139,000

The populations of the West Indies are very various, being made up largely of imported African negroes. In Jamaica these contribute four-fifths of the population. There are also in the islands a considerable number of imported East Indian coolies and some Chinese. The aboriginal races include American Indians of the mainland and Caribs. With these there has been intermixture of Spanish and Portuguese blood, and many mixed types have appeared. The total European population of this group of colonies amounts to upwards of 80,000, to which 15,000 on account of Bermuda may be added.

Africa.

South	Chiefly black	. . .	5,000,000
Central		. . .	3,000,000

The aboriginal races of South Africa were the Hottentots and Bushmen. The Hottentots are a yellow-skinned race with crisp light hair. The Bushmen, who appear to have been a lower order of the same race, are believed to be the aboriginal type of the Abatwa or pigmy race of Central Africa. Both these races are rapidly diminishing in numbers, and in British South Africa it is expected that they will in the course of the twentieth century become extinct. Besides these primitive races there are the dark-skinned negroids of Bantu stock, commonly known in their tribal groups as Kaffirs, Zulus, Makalakas, Bechuanas, and Damaras, which are again subdivided into many lesser groups. The Bantu compose the greater part of the native population. There are also in South Africa Malays and Indians and others, who during the last two hundred years have been introduced from Java, Ceylon, Madagascar, Mozambique, and British India, and by intermarriage with each other and with the natives have produced a hybrid population generally classed together under the heading of the Mixed Races. These are of all colours, varying from yellow to dark brown. The tribes of Central Africa are as yet less known. Many of them exhibit racial characteristics allied to those of the tribes of South Africa, but with in some cases an admixture of Arab blood.

East Africa.

Protectorate—Black and brown	Natives	2,485,000
	Asiatics	15,000
Zanzibar—Black and brown		250,000
Uganda—Estimated in 1899		3,800,000
		6,550,000

West Africa.

Nigeria	Black and brown	Estimated in 1900	35,000,000
Lagos	Chiefly black		3,000,000
Gold Coast			1,500,000
Sierra Leone			260,000
Gambia			14,000
			4,774,000

From east to west across Africa the aboriginal nations are mostly of the black negroid type, their varieties being only imperfectly known. The tendency of some of the lower negroid types has been to drift towards the west coast, where they still practise cannibalistic and fetish rites. On the east coast are found much higher types approaching to the Christian races of Abyssinia, and from east to west there has been a wide admixture of Arab blood producing a light brown type. In Uganda and Nigeria a large proportion of the population is Arab and relatively light-skinned.

Australasia.

Australia—Black, very low type	200,000
Chinese and half castes, yellow	50,000
New Zealand—Maoris, brown	40,000
Fiji—Polynesian, black and brown	121,700
New Guinea—Polynesian, black and brown	250,000
	661,700

The native races of Australia and the Polynesian groups of islands are divided into two main types known as the dark and light Polynesian. The dark type, which is black, is of a very low order, and in some of the islands still retains its cannibal habits. The aboriginal tribes of Australia are of a low-class black tribe, but generally peaceful and inoffensive in their habits. The white Polynesian races are of a very superior type, and exhibit, as in the Maoris of New Zealand, characteristics of a high order. The natives of New Guinea are in a very low state of civilization. The estimate given of their numbers is approximate, as no census has been taken.

Canada.

Indians—Brown	100,000

The only coloured native races of Canada are the Red Indians, many in tribal variety, but few in numbers.

Summary.

NATIVE POPULATIONS OF PRINCIPAL DIVISIONS OF THE EMPIRE.

India	294,874,411
Ceylon and Eastern Colonies	4,298,974
West Indies	1,650,000
South Africa	5,000,000
British Central Africa	3,000,000
East Africa	6,550,000
West Africa	40,000,000
Australasia and Islands	661,000
Canada	100,000
	356,134,385
White populations	52,454,578
Giving a total of	408,588,963

This is without taking into account the population of the lesser Crown colonies or allowing for the increase likely to be shown by a later census. Throughout the empire, and notably in the United Kingdom, there is among the white races a considerable sprinkling of Jewish blood.

The latest calculation of the entire population of the world, including a liberal estimate of 650,000,000 for peoples not brought under any census, gives a total of something over 1,500,000,000. The population of the empire may therefore be calculated as amounting to something more than one-fourth of the population of the world.

It is a matter of first importance in the geographical distribution of the empire that the five principal divisions, the United Kingdom, South Africa, India, Australia, and Canada are separated from each other by the three great oceans of the world. The distance as usually calculated in nautical miles: from an English port to the Cape of Good Hope is 5840 miles; from the Cape of Good Hope to Bombay is 4610; from Bombay to Melbourne is 5630; from Melbourne to Auckland is 1830; from Auckland to Vancouver 6210; from Halifax to Liverpool is 2744. From a British port direct to Bombay by way of the Mediterranean it is 6272; from a British port by the same route to Sydney 11,548 miles. These great distances have necessitated the acquisition of intermediate ports suitable for coaling stations on the trade routes, and have determined the position of many of the lesser Crown colonies which are held simply for military and commercial purposes. Such are the Bermudas, Gibraltar, Malta, Aden, Ceylon, the Straits Settlements, Labuan, Hong-Kong, which complete the chain of connexion on the eastern route, and such on other routes are the lesser West African stations,—Ascension, St Helena, the Mauritius, and Seychelles, the Falklands, Tristan d'Acunha, and the groups of the Western Pacific. Some of the latest annexations of the British empire have been rocky islets of the Northern Pacific required for the purpose of telegraph stations in connexion with an all-British cable.

Divisions.

For purposes of political administration the empire falls into the three sections of the United Kingdom of Great Britain and Ireland, with the dependencies of the Channel Islands and the Isle of Man; the Indian empire, consisting of British India and the feudatory native states; and the Colonial empire comprising all other colonies and dependencies.

Growth.

In the modern sense of extension beyond the limits of the United Kingdom the growth of the empire is of comparatively recent date. The Channel Islands became British as a part of the Norman inheritance of William the Conqueror. The Isle of Man, which was for a short time held in conquest by Edward I. and restored, was sold by its titular sovereign to Sir William Scroop, earl of Wiltshire, in the year 1393, and by his subsequent attainder for high treason and the confiscation of his estates, became a fief of the English Crown. It was granted by Henry IV. to the earls of Stanley, and held by them and their collateral descendants until the sovereignty and revenues of the island were finally surrendered to the Crown in 1765. With these exceptions and the nominal possession taken of Newfoundland by Sir Humphrey Gilbert in 1583, all the territorial acquisitions of the empire have been made in the 17th, 18th, and 19th centuries.

The following list of British colonies and dependencies shows the date and manner of their acquisition:—

Name.	Date.	Method of Acquisition.
Newfoundland	1583	Possession taken by Sir H. Gilbert for the Crown.
17th Century.		
St Helena	1600	Captured. Settled by East India Coy. 1651. Government vested in British Crown, 1833.
Barbados	1605	Settlement.
Bermudas	1609	,,
Prince Edward Is.	1626	,, Ceded to France 1632; recovered 1713.
Nova Scotia	1626	,, Ceded to France 1632; recovered 1713.
New Brunswick	1626	,, Ceded to France 1632; recovered 1713.
St Christopher	1623	,, Ceded to France; recovered 1713.
Nevis	1628	,, Ceded to France; recovered 1713.
Bahamas	1629	,,
Gambia	1631	,, A second time in 1817.
Antigua	1632	,,
Leeward Is.	1632	,,
Jamaica	1655	Conquered.
Gold Coast	1661	Settlement.
N.-W. Territories of Canada	1670	Settlement under Royal Charter of Hudson Bay Coy. Purchased from Imp. Govt. 1869, and transferred to Canada 1870.
18th Century.		
Name.	Date.	Method of Acquisition.
Gibraltar	1704	Capitulation.
Ontario	1759-90	,,
Quebec	1759-90	,,
Dominica	1763	,,
St Vincent	1763	,,
Grenada	1763	,,
Windward Is.	1763	,,
Tobago	1763	,,
Falkland Is.	1765	Settlement.
Honduras	1783-86	Treaty.
Sierra Leone	1787	Settlement.
N. S. Wales	1788	,,
Ceylon	1795	Capitulation.
Trinidad	1797	,,
19th Century.		
Malta	1800	Capitulation.
B. Guiana	1803	,,
St Lucia	1803	,,
Tasmania	1803	Settlement.
Cape of Good Hope	1806	Capitulation.
Seychelles	1806	,,

19th Century—continued.

Name.	Date.	Method of Acquisition.
Mauritius	1810	Capitulation.
Ascension and Tristan d'Acunha	1815	Military occupation.
West Australia	1829	Settlement.
South Australia	1836	,,
New Zealand	1840	Settlement and treaty.
Hong-Kong	1843-61	Treaties. Kowloon on the mainland added in 1861.
Natal	1844	By separation from Cape.
Labuan	1846	Cession.
Turks and Caicos Is.	1848	Separation from Bahamas.
Victoria	1851	Separation from N. S. Wales.
B. Columbia	1858	Settlement under Hudson Bay Coy. Transferred to Crown 1869. Entered Canadian Confederation 1871.
Straits Settlements	1858	Vested in Crown by E. I. Coy. Transferred from Indian to Colonial possessions, 1867.
Queensland	1859	By separation from N. S. Wales.
Lagos	1861	Cession.
Manitoba	1870	By separation from N.-W. Territory.
Fiji	1874	Cession.
W. Pacific Islands, including Union, Ellice, Gilbert, Southern Solomon, and other groups	1877	By international agreement. High commission created by Order in Council, giving jurisdiction over islands not included in other Colonial Governments, nor within jurisdiction of other civilized powers. Tonga and Cook Islands annexed to New Zealand 1900.
Cyprus	1878	Occupied by treaty.
North Borneo	1881	Treaty and settlement under Royal Charter.
Niger Coast or S. Nigeria	1884	Protectorate declared.
B. New Guinea	1884	,, ,,
Bechuanaland	1885	,, ,,
Nigeria	1886	Treaty, conquest, and settlement under Royal Charter. Transferred to Crown, incorporated with Niger Coast Protectorate and divided into N. and S. Nigeria, 1900.
Somaliland	1887	Protectorate declared.
Sarawak	1888	,, ,,
Brunei	1888	,, ,,
British East Africa	1888	Treaty, conquest, and settlement under Royal Charter. Transferred to Crown 1895.
Rhodesia	1889	Treaty, conquest, and settlement under Royal Charter.
British Central Africa	1891	Protectorate declared.
Federated Malay States	1874-95	Treaty.
Uganda	1894-96	Protectorate declared.
Pacific Islands—Christmas, Fanning, Penrhyn, Suwarrow	1898	Annexed for purposes of projected Pacific cable.
Wei-hai-Wei	1898	Lease from China.
Orange River Colony	1900	Annexation.
Transvaal	1900	Annexation.

In the Pacific there are, in addition to the possessions already mentioned, Bauman Islands, Bakir Island, Bell Cay, Bird Island, Bramble Cay, Caroline Island, Cato Island, Coral Island and Dudosa, Danger Island, Ducie Island, Flint Island, Howland Island, Humphrey Island, Jarvis Island, Lihow Island, Little Scrub Island, Malden Island, Manihiki Islands, Nassau Island, Palmerston Island, Palmyra Island, Phœnix Group of Islands, Pitcairn Island, Purdy Group, Raine Island, Rierson Island, Roggewein Island, Sophia Island, Starbuck Island, Surprise Island, Teinhoven Island, Vestoc, Washington or New York Island, Willis Group, Wreck Reef, Macquarie Island, Rotuma Island, and islands adjacent to British New Guinea. Among the dependencies of New Zealand should be mentioned the Kermadec Islands.

In the Indian Ocean there are, besides the colonies already mentioned, Seychelles, Rodrigues, the Chagos

Islands, St Brandon Islands, Amirante Islands, Aldabra and some other small groups. There are also the Kuria-Muria Islands, the Maldive Islands, and the Ashmore Islands.

In America there is all land which lies to the north of the Canadian provinces, with the exception of the United States territory of Alaska and its dependencies.

The Indian section of the empire was acquired during the same three centuries under a royal charter granted to the East India Company by Queen Elizabeth in 1600. It was transferred to the Imperial Government in 1858, and Queen Victoria was proclaimed empress under the Royal Titles Act in 1877. The following list gives the dates and method of acquisition of the centres of the main divisions of the Indian empire. They have, in most instances, grown by general process of extension to their present dimensions.

The nine provinces are :—

Name.	Date.	Method of Acquisition.
Madras .	1639 to 1748	By treaty and subsequent conquest. Fort St George, the foundation of Madras, was the first territorial possession of the E. I. Coy. in India. It was acquired by treaty with its Indian ruler. Madras was raised into a presidency in 1683 ; ceded to France 1746 ; recovered 1748.
Bombay .	1608 to 1685	Treaty and cession. Trade first established 1608. Ceded to British Crown by Portugal 1661. Transferred to E. I. Coy. 1668. Presidency removed from Surat 1685.
Bengal .	1633 to 1765	Treaty and subsequent conquests. First trade settlement established by treaty at Pipli in Orissa 1633. Erected into presidency by separation from Madras 1681. Virtual sovereignty announced by E. I. Coy., as result of conquests of Clive, 1765.
N.-W. Provinces and Oudh	1764 to 1856	By conquests and treaty through successive stages, of which the principal dates were 1801-3-14-15. In 1832 the nominal sovereignty of Delhi, till then retained by the Great Mogul, was resigned into the hands of the E. I. Coy. Oudh, of which the conquest may be said to have begun with the battle of Baxar in 1768, was finally annexed in 1856. It was attached as a commissionership to the N.-W. Provinces in 1879.
Central Provinces	1802-17	By conquest and treaty.
Assam .	1825-26	Conquest and cession.
Burma .	1824-52	Conquest and cession.
Punjaub .	1849	Conquest and annexation. Made into distinct province 1859.
N.-W. Frontier Province	1901	Subdivision.

The senior commissionerships are :—

Ajmere and Merwara	1818	By conquest and cession.
Coorg .	1834	Conquest and annexation.
British Baluchistan	1841-76	Conquest and treaty.
Andaman Islands	1858	Annexation.

The following is a list of the principal Indian states or agencies which are more or less under the control of the British Government :—

Haidarabad. Kashmir.
Baroda. Sikkim.
Mysore. Shan States.

Rajputana States, including
Udaipur. Dholpur.
Jodhpur. Alwar.
Bikaner. Jhalawar.
Jaipur (and feudatories). Tonk.
Bhurtpur. Kotah.

Central Indian States, including
Indore. Bhopal.
Rewa. Gwalior.

Bombay States, including
Cutch. Khairpur (Sind).
Kolhapur (and dependencies).

Madras States, including
Travancore. Cochin.

Central Provinces States
Bastar.

Bengal States
Cooch Behar. Hill Tipperah.

N.-W. Provinces States, including
Rampur. Garhwal.

Punjaub States, including
Patiala. Sirmur (Nahan).
Bahawulpur. Maler Kotla.
Jind. Faridkot.
Nabha. Chamba.
Kapurthala. Suket.
Mandi. Kalsia.

In addition to these there are British tracts known as the Upper Burma frontier and the Burma frontier. There is also a sphere of British influence in the border of Afghanistan. The state of Nepal, though independent, has been since the campaign of 1814-15 in close relations with Great Britain. All these native states have come into relative dependency upon Great Britain as a result of conquest or of treaty consequent upon the annexation of the neighbouring provinces. The settlement of Aden, with its dependencies of Perim and Socotra Island, forms part of the government of Bombay.

Administration.

This vast congeries of states, widely different in character, and acquired by many different methods, holds together under the supreme headship of the Crown on a generally acknowledged triple principle of self-government, self-support, and self-defence. The principle is more fully applied in some parts of the empire than in others ; there are some parts which have not yet reached their full political evolution ; some others in which the principle is temporarily or for special reasons in abeyance ; others, again—chiefly those of very small extent, which are held for purposes of the defence or advantage of the whole—to which it is not applicable ; but the principle is generally acknowledged as the structural basis upon which the constitution of the empire exists.

In its relation to the empire the home section of the British Isles is distinguished from the others as the place of origin of the British race and the residence of the Crown. The history and constitutional development of this portion of the empire will be found fully treated under separate headings. (See ENGLAND AND WALES; ENGLISH HISTORY; IRELAND, SCOTLAND, UNITED KINGDOM, &c.)

The total revenue, expenditure, and trade of the home section of the empire in 1900 were as follows :—

Revenue	£119,839,905
Expenditure	133,976,920
Imports	563,146,659
Exports	387,522,633

For full information with regard to the constitution and history of India and the Colonies reference must also be made to the respective headings. (See INDIA, AFRICA, AUSTRALIA, CANADA, &c.)

It is enough to say that for purposes of administration the Indian empire is divided into nine great provinces (of which the ninth, the N.-W. Frontier, was proclaimed in 1901) and four minor commissionerships. The nine great provinces are presided over by two governors (Bombay and Madras), four lieut.-governors (Bengal, North-West Provinces, the Punjaub, and Burma), and three chief commissioners (Assam, the Central Provinces, and the N.-W. Frontier Province). The four minor commissionerships are presided over each by a chief commissioner. Above

these the supreme executive authority in India is vested in the Viceroy in Council. The Council consists of five ordinary members besides the existing Commander-in-Chief. For legislative purposes the Governor-General's Council is increased by the addition of sixteen members nominated by the Crown, and has power under certain restrictions to make laws for British India, for British subjects in the Native States, and for native Indian subjects of the Crown in any part of the world. The administration of the Indian empire in England is carried on by a Secretary of State for India assisted by a council of not less than ten members. The expenditure of the revenues is under the control of the Secretary in Council.

The total revenue, expenditure, and trade of India for 1900 were as follows :—

Revenue	£67,617,800
Expenditure	64,976,920
Imports	64,185,440
Exports	78,646,690

The Colonial empire—exclusive of the Transvaal and Orange River Colonies—comprises forty-three district governments. It is divided into colonies of three classes and dependencies; these, again, are in some instances associated for administrative purposes in federated groups. The three classes of colonies are Crown Colonies, Colonies possessing representative institutions but not responsible government, and Colonies possessing representative institutions and responsible government. In Crown Colonies the Crown has entire control of legislation, and the public officers are under the control of the Home Government. In representative Colonies the Crown has only a veto on legislation, but the Home Government retains control of the public officers. In responsible Colonies the Crown retains a veto upon legislation, but the Home Government has no control of any public officer except the Governor.

In Crown Colonies—with the exception of Gibraltar and St Helena, where laws may be made by the Governor alone—laws are made by the Governor with the concurrence of a council nominated by the Crown. In some Crown Colonies, chiefly those acquired by conquest or cession, the authority of this council rests wholly on the Crown; in others, chiefly those acquired by settlement, the council is created by the Crown under the authority of local or Imperial laws. The Crown council of Ceylon may be cited as an example of the first kind, and the Crown council of Jamaica of the second.

In colonies possessing representative institutions without responsible government, the Crown cannot (generally) legislate by Order in Council, and laws are made by the Governor with the concurrence of the legislative body or bodies, one at least of these bodies in cases where a second chamber exists possessing a preponderance of elected representatives. The Bahamas, Barbados, and Bermuda have two legislative bodies—one elected and one nominated by the Crown; Malta and the Leeward Islands have but one, which is partly elected and partly nominated.

Under responsible government legislation is carried on by parliamentary means exactly as at home, with a cabinet responsible to parliament, the Crown reserving only a right of veto which is exercised at the discretion of the Governor in the case of certain Bills. The executive councils in those colonies designated as at home by parliamentary choice are appointed by the Governor alone, and the other public officers only nominally by the Governor on the advice of his executive council.

Colonial governors are classed as governors-general; governors; lieut.-governors; administrators; high commissioners; and commissioners, according to the status of the colony and dependency, or group of colonies and dependencies over which they preside. Their powers vary according to the position which they occupy. In all cases they represent the authority of the Crown.

As a consequence of this organization the finance of Crown Colonies is under the direct control of the Imperial Government; the finance of representative Colonies, though not directly controlled, is usually influenced in important departures by the opinion of the Imperial Government. In responsible Colonies the finance is entirely under local control, and the Imperial Government is dissociated from either moral or material responsibility for colonial debts.

The total revenue, expenditure, and trade of the Colonial empire for 1900 were as follows :—

Revenue	£58,815,700
Expenditure	56,563,660
Imports	181,846,110
Exports	192,330,040

In federated groups of colonies and dependencies matters which are of common interest to a given number of separate governments are by mutual consent of the federating communities adjudged to the authority of a common government, which, in the case of self-governing colonies, is voluntarily created for the purpose. The associated states form under the federal government one federal body, but the parts retain control of local matters, and exercise all their original rights of government in regard to these. The advantages of united action are thus secured for larger questions without impairing the vigour of independent initiative in matters of individual concern. The two great self-governing groups of federated colonies within the empire are the Dominion of Canada and the Commonwealth of Australia. India, of which the associated provinces are under the control of the central Government, may be given as an example of the practical federation of dependencies. Examples of federated Crown Colonies and lesser dependencies are to be found in the Leeward Island group of the West Indies and the federated Malay States.

This rough system of self-government for the empire has been evolved not without some strain and friction, by the recognition through the vicissitudes of three hundred years of the value of independent initiative in the development of young countries. Queen Elizabeth's first patent to Sir Walter Raleigh permitted British subjects to accompany him to America, "with guarantee of a continuance of the enjoyment of all the rights which her subjects enjoyed at home."

This guarantee may presumably have been intended at the time only to assure the intending settlers that they should lose no rights of British citizenship at home by taking up their residence in America. Its mutual interpretation in a wider sense, serving at once to establish in the colony rights of citizenship equivalent to those enjoyed in England, and to preserve for the colonist the status of British subject at home and abroad, has formed in application to all succeeding systems of British colonization the unconscious charter of union of the empire.

The first American colonies were all settled under royal grants. Each had its own constitution, and looked to no other head but the king. Their governments were free—the executive being responsible to the elective element in the legislature, as now in the colonies which enjoy responsible self-government. The immense distance which in those days separated America from Great Britain secured them from interference on the part of the home authorities. They paid their own most moderate governing expenses, and they contributed largely to their own defence. From the middle of the 17th century their trade was not free, but this was the only restriction from which

was afforded by the support given to the Imperial forces by the Colonies and India in the South African war. It remains only to be seen by what process of evolution the further consolidation of the empire will find expression in the machinery of government.

The question of self-government is closely associated with the question of self-support. Plenty of good land and the liberty to manage their own affairs were the causes assigned by Adam Smith for the marked prosperity of the British Colonies towards the end of the 18th century. The same causes are still to be observed to produce the same effects, and it may be pointed out that since the date of the latest of Adam Smith's writings, upwards of 6,000,000 square miles of virgin soil, rich with possibilities of agricultural, pastoral, and mineral wealth, have been added to the empire. In the same period the white population has grown from about 12,000,000 to 52,000,000, and the developments of agricultural and industrial machinery have multiplied, almost beyond computation, the powers of productive labour.

It is scarcely possible within this article to deal with so widely varied a subject as that of the productions and industry of the empire. For the purposes of a general statement, it is interesting to observe that concurrently with the acquisition of the vast continental areas during the 19th century, the progress of industrial science in application to means of transport and communication brought about a revolution of the most radical character in the accepted laws of economic development. Railways did away with the old law that the spread of civilization is necessarily governed by facilities for water carriage and is consequently confined to river valleys and sea-shores. Steam and electricity opened to industry the interior of continents previously regarded as unapproachable. The resources of these vast inland spaces which have lain untouched since history began became available to individual enterprise, and over a great portion of the earth's surface were brought within the possessions of the British empire. The production of raw material within the empire increased at a rate which can only be appreciated by a careful study of figures, some of which will be found under the headings of the UNITED KINGDOM and the principal British colonies and dependencies, and by a comparison of the total of these figures with the total figures of the world. The tropical and temperate possessions of the empire include every field of production which can be required for the use of man. There is no main staple of human food which is not grown; there is no material of textile industry which is not produced. The British empire gives occupation to more than one-third of the persons employed in mining and quarrying in the world. It may be interesting, as an indication of the relative position in this respect of the British empire to the world, to state that at present it produces one-third of the coal-supply of the world, one-sixth of the wheat supply, and very nearly two-thirds of the gold supply. But while these figures may be taken as in themselves satisfactory, it is far more important to remember that as yet the potential resources of the new lands opened to enterprise have been barely conceived, and their wealth has been little more than scratched. Population as yet has been only very sparsely sprinkled over the surface of many of the areas most suitable for white settlement. In the wheat lands of Canada, the pastoral country of Australasia, and the mineral fields of South Africa and Western Canada alone, the undeveloped resources are such as to insure employment to the labour and satisfaction to the needs of at least as many millions as they now contain thousands of the British race. In respect of this promise of the future the position of the British empire is unique.

Industry and trade.

In regard to the distribution of existing industry, although the more important Colonies have established manufactures of their own, of which the prosperity is assured, the general conditions have hitherto been maintained under which Great Britain has remained the manufacturing centre for the raw material of the whole. The primary production of the Colonies and the industrial development of Great Britain are still, therefore, the important divisions of the subject. These subjects are dealt with elsewhere in detail.

It is not too much to say that trade has been at once the most active cause of expansion and the most potent bond of union in the development of the empire. Trade with the tropical and settlement in the temperate regions of the world formed the basis upon which the foundations of the empire were laid. Trading companies founded most of the American and West Indian colonies; a trading company won India; a trading company colonized the north-western districts of Canada; commercial wars during the greater part of the 18th century established the British command of the sea, which rendered the settlement of Australasia possible. The same wars gave Great Britain South Africa, and chartered companies in the 19th century carried the British flag into the interior of the African continent from south and east and west. Trading companies produced Borneo and Fiji. The bonds of prosperous trade have kept the Australasian colonies within the empire. The protection of colonial commerce by the Imperial navy is one of the strongest of material links which connect the Crown with the outlying possessions of the empire.

The trade of the empire, like the other developments of Imperial public life, has been profoundly influenced by the variety of local conditions under which it has flourished. In the early settlement of the North American colonies their trade was left practically free; but by the famous Navigation Act of 1660 the importation and exportation of goods from British colonies were restricted to British ships, of which the master and three-fourths of the mariners were English. This Act, of which the intention was to encourage British shipping and to keep the monopoly of British colonial trade for the benefit of British merchants, was followed by many others of a similar nature up to the time of the repeal of the Corn Laws in 1846 and the introduction of free trade into Great Britain. And the Navigation Acts were repealed in 1849. Thus for very nearly two hundred years British trade was subject to restrictions, of which the avowed intention was to curtail the commercial intercourse of the empire with the world. During this period the commercial or mercantile system, of which the fallacies were exposed by the economists of the latter half of the 18th century, continued to govern the principles of British trade. Under this system monopolies were common, and among them few were more important than that of the East India Company. In 1813 the trade of India was, however, thrown open to competition, and in 1846, after the introduction of free trade at home, the principal British colonies which had not yet at that date received the grant of responsible government were specially empowered to abolish differential duties upon foreign trade. A first result of the commercial emancipation of the Colonies was the not altogether unnatural rise in the manufacturing centres of a school known as the Manchester school, which was disposed to question the value to Great Britain of the retention of colonies which were no longer bound to give her the monopoly of their commercial markets. An equally natural desire on the part of the larger colonies to profit by the opportunity which was opened to them of establishing local manufactures of their own, combined with the convenience in new countries

of using the customs as an instrument of taxation, led to something like a reciprocal feeling of resentment, and there followed a period during which the policy of Great Britain was to show no consideration for colonial trade, and the policy of the principal colonies was to impose heavy duties upon British trade. By a gradual process of better understanding, largely helped by the development of means of communication, the antagonistic extreme was abandoned, and a tendency towards a system of preferential duties within the empire displayed itself. At the Colonial Conference held in London in 1887, a proposal was formally submitted by the South African delegate for the establishment within the empire of a preferential system, imposing a duty of 2 per cent. upon all foreign goods, the proceeds to be directed to the maintenance of the Imperial navy. To this end it was requested that certain treaties with foreign nations which imposed restrictions on the trade of various parts of the empire with each other should be denounced. Some years later the treaties in question were denounced, but simultaneously with the movement in favour of reciprocal fiscal advantages to be granted within the empire by the many local governments to each other, there was a growth of the perception that an increase of the foreign trade of Great Britain, which is carried on chiefly in manufactured goods, was accompanied by a corresponding enlargement of the home markets for colonial raw material, and consequently that injury to the foreign trade of Great Britain must necessarily react upon the Colonies. This view was definitely expressed at the Colonial Conference at Ottawa in 1894, and made itself felt in the relinquishment of the demand that in return for colonial concessions there should be an imposition on the part of Great Britain of a differential duty upon foreign goods. Canada was the first important British colony to give substantial expression to the new Imperial sentiment in commercial matters by the introduction in 1897 of an Imperial tariff, granting without any reciprocal advantage a deduction of 25 per cent. upon customs duties imposed upon British goods. The same advantage is offered to all British colonies trading with her upon equal terms. Although in Great Britain trade is free, and customs duties are only imposed for purposes of revenue on a few selected articles, about half the national income is derived from customs and excise. In most of the Colonies customs form of necessity one of the important sources of revenue. It is, however, worthy of remark that in the self-governing colonies, even those which are avowedly Protectionist, a smaller proportion of the public revenue is derived from customs and excise than is derived from these sources at home. The proportion in Australasia before federation was about one-quarter. In Canada it is more difficult to estimate it, as customs and excise form the principal provision made for federal finance, and note must therefore be taken of the separate sources of revenue in the provinces. With these reservations it will still be seen that customs, or, in other words, a tax upon the movements of trade, forms one of the chief sources of Imperial revenue. The development of steam shipping and electricity gave to the movements of trade a stimulus no less remarkable than that given by the introduction of railroads and industrial machinery to production and manufactures. Whereas at the beginning of the 19th century the journey to Australia occupied eight months, and business communications between Sydney and London could not receive answers within the year, the journey can now be accomplished in thirty-one days, and telegraphic despatches enable the most important business to be transacted within twenty-four hours. For one cargo carried in the year at the beginning of the 19th century at least six may now be carried by the same ship, and from the point of view of trade the difference of a venture which realizes its profits in two months, as compared with one which occupied a whole year, does not need to be insisted on. The increased rapidity of the voyage and the power of daily communication by telegraph with the most distant markets have introduced a wholly new element into the national trade of the empire, and commercial intercourse between the southern and the northern hemispheres has received a development from the natural alternation of the seasons, of which until quite recent years the value was not even conceived. Fruit, eggs, butter, meat, poultry, and other perishable commodities pass in daily increasing quantities between the northern and the southern hemispheres with an alternate flow which contributes to raise in no inconsiderable degree the volume of profitable trade. Thus the butter season of Australasia is from October to March, while the butter season of Ireland and Northern Europe is from March to October. In three years after the introduction of ice-chambers into the steamers of the great shipping lines, Victoria and New South Wales built up a yearly butter trade of £1,000,000 with Great Britain without seriously affecting the Irish and Danish markets whence the summer supply is drawn. These facilities, combined with the enormous additions made to the public stock of land and labour, contributed to raise the volume of trade of the empire from a total of less than £100,000,000 in the year 1800 to a total of nearly £1,500,000,000 in 1900. The declared volume of British exports to all parts of the world in 1800 was £38,120,120, and the value of British imports from all parts of the world was £30,570,605; total, £68,690,725. As in those days the Colonies were not allowed to trade with any other country this must be taken as representing Imperial trade. The exact figures of the trade of India, the Colonies, and the United Kingdom for 1900 were: imports, £809,178,209; exports, £657,899,363; total, £1,467,077,572.

The foregoing statements are summarized in statistical form in the following table:—

	The World.	The British Empire.	Proportion.
Area	52,000,000 sq. m.	12,000,000	Something less than one-fourth
Population	1,500,000,000	403,000,000	Something more than one-fourth
Trade	2,862,143,000 (excluding Brit. empire)	1,467,077,572	About one-third
Revenue	£950,203,000 (excluding Brit. empire)	246,273,405	,, one-fifth
Production of—			
Gold	15,911,280 oz.	9,034,226	,, two-thirds
Wheat	346,000,000 qrs.	53,500,000	,, two-thirteenths
Coal	723,617,836 net tons	239,995,148	,, one-third

Defence.

A question of sovereign importance to the continued existence of the empire is the question of defence. A country of which the main thoroughfares are the oceans of the world demands in the first instance a strong navy. It has of late years been accepted as a fundamental axiom of defence that the British navy should exceed in strength any reasonable combination of foreign navies which could be brought against it. The expense of maintaining

such a floating armament is colossal, and until within the decade 1890-1900 it was borne exclusively by the taxpayers of the United Kingdom. As the benefits of united empire have become more consciously appreciated in the Colonies, and the value of the fleet as an insurance for British commerce has been recognized, a desire manifested itself on the part of the self-governing colonies to contribute towards the formation of a truly Imperial navy. As yet the movement remains in its infancy. In 1895 the Australasian colonies voted a small subsidy of £126,000 per annum for the maintenance of an Australasian squadron, and in 1897 the Cape Colony also offered a contribution of £30,000 a year to be used at the discretion of the Imperial Government for naval purposes. The Colonies have also contributed in some degree to their own naval defence by the erection of fortifications at selected points upon their shores. The net cost of the navy to the Imperial exchequer, as estimated for the year 1900-1901, was £27,522,600. Though available for service throughout the empire, and forming the principal bulwark of colonial defence, the cost, with the trivial exceptions named, is still borne exclusively by the Home Government, and recruiting for the navy is carried on wholly in the British isles.

The following comparative list of the navies of the world is taken from the *Statesman's Year-Book* for 1901 :—

Strength of the Principal Navies of the World in April 1901.

	United Kingdom.		France.		Russia.		Germany.		U.S.A.		Japan.		Italy.	
	Afloat.	Bldg.	Afloat.	Bldg.	Afloat.	Bldg.	Afloat.	Bldg.	Afloat.	Bldg.	Afloat.	Bldg.	Afloat.	Bldg.
Battleships, 1st class	21	8	5	2	2	5	...	7	5	8	1	...	...	4
,, 2nd ,,	12	...	9	...	15	...	9	...	4	...	2	...	3	...
,, 3rd ,,	11	...	7	...	2	...	...	...	1	...	1	...	4	...
Seagoing, 4th class	9	...	4	...	...	...	8	..	...	...	...	...	...	...
Coast defence (modern)	...	...	8	...	3	1	8	...	1	4	...	...	...	...
,, ,, (old)	13	...	13	...	5	...	11	...	7	...	2	...	5	1
Armoured cruisers	4	...	12	8	1	1	...	2	2	9	6	...	7	...
1st class cruisers	21	...	1	...	2	...	...	...	...	...	...	...	2	...
Other cruisers, protected or belted	100	2	38	...	12	4	16	2	28	6	14	2	15	...
Torpedo gunboats, &c.	15	2	15	...	9	...	8	...	1	...	3	1	16	...
Destroyers	100	10	18	14	20	10	27	16	21	...	11	8	14	...
1st class torpedo boats	15	2	37	4	40	(?)10	47	...	25	...	17	26	7	...
2nd and 3rd class torpedo boats	175	...	143	36	151	...	98	...	6	...	25	14	138	...
Submarines	1	4	11	28	Unknown		...	...	2	6	...	...	1	...
Rams (special)	1	...	...	...	...	...	...	...	1	...	...	...	...	...
Torpedo depot ships (special)	1	...	1	...	...	...	...	...	...	...	...	...	...	...

Under the head of "afloat" all ships ready or nearly ready for sea are included. "Building" covers those still on the stocks or only just launched, which will not be completed for a year.

Land defence has hitherto been regarded as forming a secondary branch of the great question of Imperial defence. But though secondary it has been intimately connected with the development and internal growth of the empire. In the case of the first settlement of the American colonies they were expected to provide for their own land defence. To some extent in the early part of their career they carried out this expectation, and even on occasion, as in the taking of Louisburg, which was subsequently given back at the peace of Aix-la-Chapelle as the price of the French evacuation of Madras, rendered public service to the empire at large. In India the principle of local self-defence was from the beginning carried into practice by the East India Company. But in America the claim of the French wars proved too heavy for local resources. In 1755 Great Britain intervened with troops sent from home under General Braddock, and up to the outbreak of the American war the cost of the defence of the North American colonies was borne by the Imperial exchequer. To meet this expense the Imperial parliament took upon itself the right to tax the American colonies. In 1765 a Quartering Act was passed by which 10,000 Imperial troops were quartered in the colonies. As a result of the American war which followed and led to the loss of the colonies affected, the Imperial authorities accepted the charge of the land defences of the empire, and with the exception of India and the Hudson Bay territories, where the trading companies determined to pay their own expenses, the whole cost of Imperial defence was borne, as the cost of the navy still is, by the taxpayers of the United Kingdom. This condition of affairs lasted till the end of the Napoleonic wars. During the thirty years' peace which followed there came time for reconsideration. The fiscal changes which towards the middle of the 19th century gave to the self-governing colonies the command of their own resources very naturally carried with them the consequence that a call should be made on colonial exchequers to provide for their own governing expenses. Of these defence is obviously one of the most essential. Coincidently, therefore, with the movements of free trade at home, the renunciation of what was known as the mercantile system and the accompanying grants of constitutional freedom to the colonies, a movement for the reorganization of Imperial defence was set on foot. In the decade which elapsed between 1846 and 1856 the movement as regards the colonies was confined chiefly to calls made upon them to contribute to their own defence by providing barracks, fortifications, &c., for the accommodation of Imperial troops, and in some cases paying for the use of troops not strictly required for Imperial purposes. In 1857 the Australian colonies agreed to pay the expenses of the Imperial garrison quartered in Australia. This was a very wide step from the Imperial attempt to tax the American colonies for a similar purpose in the preceding century. Nevertheless, in evidence given before a departmental committee in 1859, it was shown that at that time the Colonies of Great Britain were free from almost every obligation of contributing either by personal service or money payment towards their own defence, and that the cost of military expenditure in the Colonies in the preceding year had amounted in round figures to £4,000,000. A committee of the House of Commons sat in 1861 to consider the question, and in 1862 it was resolved without a division, that "colonies exercising the right of self-government ought to undertake the main responsibility of providing for their own internal order and security, and

ought to assist in their own external defence." The decision was accepted as the basis of Imperial policy. The first effect was the gradual withdrawing of Imperial troops from the self-governing colonies, together with the encouragement of the development of local military systems by the loan, when desired, of Imperial military experts. A call was also made for larger military contributions from some of the Crown colonies. The committee of 1859 had emphasized in its report the fact that the principal dependence of the Colonies for defence is necessarily upon the British navy, and in 1865, exactly 100 years after the Quartering Act, which had been the cause of the troubles that led to the independence of the United States, a "Colonial Naval Defence" Act was passed which gave power to the Colonies to provide ships of war, steamers, and volunteers for their own defence, and in case of necessity to place them at the disposal of the Crown. In 1868 the Canadian Militia Act gave the fully organized nucleus of a local army to Canada. In the same year the Imperial troops were withdrawn from New Zealand, leaving the colonial militia to deal with the native war still in progress. In 1870 the last Imperial troops were withdrawn from Australia, and in 1873 it was officially announced that military expenditure in the Colonies was almost "wholly for Imperial purposes." In 1875 an Imperial officer went to Australia to report for the Australian Government upon Australian defence. The appointment in 1879 of a royal commission to consider the question of Imperial defence, which presented its report in 1882, led to a considerable development and reorganization of the system of Imperial fortifications. Coaling stations were also selected with reference to the trade routes. In 1885 rumours of war roused a very strong feeling in connexion with the still unfinished and in many cases unarmed condition of the fortifications recommended by the commission of 1879. Military activity was stimulated throughout the empire, and the Colonial Defence Committee was created to supply a much-felt need for organized direction and advice to colonial administrations acting necessarily in independence of each other. The question of colonial defence was among the most important of the subjects discussed at the Colonial Conference held in London in 1887, and it was at this Conference that the Australasian colonies first agreed to contribute to the expense of their own naval defence. From this date the principle of local responsibility for self-defence has been fully accepted. With the exception of Natal all the self-governing colonies have provided practically for their own military requirements. India has its own native army, and pays for the maintenance within its frontiers of an Imperial garrison. Early in the summer of 1899, when hostilities in South Africa appeared to be imminent, the governments of the principal Colonies took occasion to express their approval of the policy pursued by the Imperial Government, and offers were made by the governments of India, the Australasian colonies, Canada, Hong-Kong, the Federal Malay states, some of the West African and other colonies, to send contingents for active service in the event of war. On the outbreak of hostilities these offers, on the part of the self-governing Colonies, were accepted, and colonial contingents upwards of 30,000 strong were among the most efficient sections of the British fighting force. The manner in which these colonial contingents were raised, their admirable fighting qualities, and the service rendered by them in the field, have disclosed altogether new military possibilities within the empire, and the reorganization of the army on an Imperial footing is among the more probable developments of the near future.

As at present organized the army is divided into two main sections, namely, the British and the Indian armies, of which the strength is roughly as follows, though for fuller details reference should be made to the article ARMIES :—

British.

Regular forces, home and colonial	203,852
Army reserve, 1st class	90,000
Militia	139,237
Yeomanry	11,907
Volunteers	265,061
Total, home and colonial	710,057
Regular forces on Indian establishment	73,484
	783,541

Indian Army.

Regular forces on Indian establishment already noted.

Native Army.

	European Officers.	Native Officers.	Non-commissioned Officers and Privates.	Total.
Artillery	33	54	2,001	2,088
Cavalry	358	619	21,955	22,932
Sappers and miners	65	488	3,142	3,695
Infantry	1122	2048	108,755	111,925
Total native army	1578	3209	135,853	140,640

The feudatory and dependent native states have native armies of their own which, according to the latest available estimates, number about 350,000 men, with upwards of 4000 guns. Offers of military service in South Africa in 1900 were received from some of the principal feudatory states.

Special expenditure has been made by the Indian Government upon coast defences armed with modern breechloading guns. Large sums have also been spent upon external and border defences, and an establishment of two coast-defence ironclads, a despatch vessel, two first-class torpedo gunboats, seven first-class torpedo boats, as well as armed gunboats, &c., is maintained.

With the exceptions of Natal and the garrisons of the naval stations of Cape Town and Halifax, no imperial garrisons are under normal conditions maintained in the self-governing Colonies. In the Crown Colonies garrisons are maintained in Gibraltar, Malta, Mauritius, Sierra Leone, St Helena, Ceylon, Straits Settlements, Hong-Kong, and the West Indies. There are Imperial naval stations at Simon's Bay, Trincomalee, Bermuda, Esquimalt, Halifax, Malta, Gibraltar, St Lucia, Ascension, Hong-Kong, and Wei-hai-Wei.

The important questions of justice, religion, and instruction will be found dealt with in detail under the headings of separate sections of the empire. Systems of justice throughout the empire have a close resemblance to each other, and the Privy Council of the House of Lords, on which the self-governing colonies and India are represented, constitutes a Supreme Court of Appeal for the entire empire; but common law varies according to its origin in some important divisions. Religion, of which the forms are infinitely varied, is everywhere free, except in cases where the exercise of religious rites leads to practices foreign to accepted laws of humanity. Systems of instruction of which the aim is generally similar in the white portions of the Empire, and is directed towards giving to every individual the basis of a liberal education, are governed wholly by local requirements. Native schools are established in all settled communities under British rule. (F. L. S.)

Briton-Ferry, a seaport and railway station in the Mid parliamentary division of Glamorganshire, Wales, at the mouth of the Neath river, 2½ miles S. of Neath. There are four Episcopalian churches, and Baptist, Congregational, Methodist, and Bible Christian chapels. There are coal mines and iron, steel, and tin-plate works. The dock belongs to the Great Western Railway Company, and is 13 acres in extent. Area of parish (an urban district), 1593 acres. Population (1881), 6061; (1901), 7000.

Brive, or **Brive-la-Gaillarde,** chief town of arrondissement, department Corrèze, France, 18 miles S.W. of Tulle; an important railway centre on the main line from Paris to Toulouse. A statue has been erected to Marshal Brune, a native of the town. Manufactures include straw work in great variety. Population (1881), 9598; (1891), 11,142; (1901), 19,496.

Brixen (Italian, *Bressanone*), chief town of a district of the same name in Tirol. Population of district (1890), 27,050, (1900), 27,691; and of commune (1890), 5525, (1900), 5767. Corn, fruit and viticulture, and the breeding of the silk-worm, are the leading industries. It is a favourite health resort in spring and autumn, on account of its mild climate.

Brixham, a market town in the Torquay parliamentary division of Devonshire, England, on the south side of Tor Bay, 30 miles S. of Exeter. The Western Counties Home for the orphan boys of seamen (1859) has been enlarged and a market building erected. Area of parish (an urban district), 5612 acres. Population (1881), 7033; (1901), 8622.

Broach, or BHARUCH, an ancient city and modern district of British India, in the Gujarat division of Bombay. The city is on the right bank of the Narbada, about 30 miles from the sea, and 203 miles N. of Bombay. The area, including suburbs, occupies 3 square miles. Population (1881), 37,281; (1891), 40,168; (1901), 42,298. The sea-borne trade is now confined to a few coasting vessels. Handloom weaving is almost extinct, but four cotton mills have been opened, with 800 looms and 70,000 spindles, employing 1450 hands. There are also five large flour mills. The English high school, called after a munificent Parsee, was attended in 1896-97 by 290 pupils.

The district of BROACH contains an area of 1463 square miles. The population in 1891 was 341,490, being 233 persons per square mile. According to religion, Hindus numbered 245,422; Mahommedans, 71,263; Parsees, 3273; Jains, 3576; Christians, 128, including 31 Europeans; "others," 17,828. In 1901 the population was 291,428, showing a decrease of 15 per cent., compared with an increase of 5 per cent. in the preceding decade. The total amount of land revenue and rates was returned as Rs.28,31,477, the incidence of assessment being Rs.4:2:5 per acre; the number of police was 508. In 1897-98, out of a total cultivated area of 567,228 acres, only 879 were irrigated from wells, &c. The principal crops are cotton, millet, wheat, and pulse. Dealing in cotton is the chief industry, the dealers being organized in a guild. Besides the cotton mills in Broach city there are about 20 factories for ginning and pressing cotton, some of them on a very large scale. The district is traversed throughout its length by the Bombay and Baroda railway, which crosses the Narbada opposite Broach city on an iron girder bridge of 67 spans. In 1897-98 there were 263 schools, with 19,773 pupils, showing one village with a school to every 7 square miles of area, and 6·12 pupils to every hundred of the population. There were four printing-presses, issuing three newspapers in the vernacular. The municipalities had a total income of Rs.1,69,959, the incidence of taxation being R.1:8:8 per head. For 1897 the death-rate was 34 per thousand, rising to 41 in Broach city. The district suffered severely from the famine of 1899-1900.

Broadstairs, a town and watering-place in the Isle of Thanet parliamentary division of Kent, 3 miles S.W. of Margate, on the South-Eastern and Chatham railway. From 1837 to 1851 Broadstairs was a favourite summer resort of the novelist Dickens, who, in a sketch called "Our English Watering-Place," described it as a place "left high and dry by the tide of years." This sea-side village, with its "semi-circular sweep of houses," has grown into a considerable town owing to the influx of summer visitors, for whose entertainment there are, besides the "Albion" mentioned by Dickens, a Grand Hotel, numerous inns and boarding-houses, libraries, a bathing establishment, and a fine promenade. Area of urban district, 1442 acres. Population (1881), 4322; (1891), 5234; (1901), 6460.

Brockton, a city of Plymouth county, Massachusetts, U.S.A., 20 miles S. of Boston, and containing an area of 21 square miles of rolling surface. One of the many lines of the New York, New Haven, and Hartford railway passes through it. It is an important manufacturing place, the making of boots and shoes being the most important branch of industry. Brockton was settled about 1700, and was incorporated as a town under the name of North Bridgewater. This was changed to Brockton in 1874. In 1881 it received a city charter. The assessed valuation of real and personal property in 1900 was $27,868,799, the tax-rate $20.10 per $1000, and the net debt $1,946,872. Population (1880), 13,608; (1890), 27,294; (1900), 40,063, of whom 9484 were foreign-born. The death-rate in 1900 was 13·2.

Brockville, a town and port of entry of Ontario, Canada, and capital of Leeds county, situated 119 miles S.W. of Montreal, on the left bank of the St Lawrence, and on the Grand Trunk, Canadian Pacific, and Brockville and Westport railways. It has steamer communication with the St Lawrence and Lake Ontario ports. The principal manufactures are hardware, furnaces, agricultural implements, carriages, sulphuric acid, &c. The value of imports for 1899-1900 was $1,111,461; exports, $460,948. Population (1881), 7609; (1891), 8791; (1901), 8940.

Bród, a town of Croatia Slavonia, Hungary, near the river Save. As chief town for the transit trade in cereals, prunes, wood, and wine between Hungary and Bosnia, it is rapidly rising in importance. The railway crosses the river at this point. Population, 7310.

Brody, chief town of district of same name in the Austrian crown-land of Galicia, near the Russian frontier. Population of district (1890), 130,707; (1900), 133,865; of town (1890), 17,534; (1900), 17,360. The latter is for the most part German-speaking, about two-thirds being Jews. There is a garrison of 888 men. It is one of the most important commercial centres in Galicia, particularly for the trade with Russia, which furnishes corn, furs, and wool, receiving in return Austrian cottons, silks, agricultural implements, leather goods, jewellery, &c. There has, however, been a marked decline both in imports and exports since 1879, when its charter as a free commercial city was withdrawn, its position being further damaged by the construction of the railway *vid* Tarnopol.

Broglie, Jacques Victor Albert, DUC DE (1821-1901), French statesman and historian, the eldest son of Achille Charles Léonce Victor, duc de Broglie, was born in Paris on 13th June 1821. After a brief

diplomatic career at Madrid and Rome, the revolution of 1848 caused him to withdraw from public life and devote himself to literature. He had already published a translation of the religious system of Leibnitz (1846). He now at once made his mark by his contributions to the *Revue des Deux Mondes*, and the Orleanist and clerical organ *Le Correspondant*, which were afterwards collected under the titles of *Etudes morales et littéraires* (1853), and *Questions de religion et d'histoire* (1860). These were supplemented in 1869 by a volume of *Nouvelles études de littérature et de morale*. His *L'Église et l'Empire romain au IVe siècle* (1856-66) brought him the succession to Lacordaire's seat in the Academy in 1862. In 1870 he succeeded his father in the dukedom, having previously been known as the prince de Broglie. In the following year he was elected to the National Assembly for the department of the Eure, and a few days later (19th February) was appointed ambassador to the Court of St James's; but in March 1872, in consequence of criticisms upon his negotiations concerning the commercial treaties between England and France, he resigned his post and took his seat in the National Assembly, where he became the leading spirit of the monarchical campaign against Thiers. On the replacement of the latter by Marshal MacMahon, the duc de Broglie became president of the Council and minister for Foreign Affairs (May 1873), but in the reconstruction of the ministry on 26th November, after the passing of the septennate, transferred himself to the ministry of the Interior. His tenure of office was marked by an extreme Clericalism and Conservatism, which roused the bitter hatred of the Republicans, while he alienated the Legitimist party by his friendly relations with the Bonapartists, and the Bonapartists by an attempt to effect a compromise between the rival claimants to the monarchy. The result was a coalition, which overthrew the Cabinet on 16th May 1874. Three years later (16th May 1877) he was entrusted with the formation of a new Cabinet, with the object of appealing to the country and securing a new Chamber more favourable to the reactionaries than its predecessor had been. The result, however, was a decisive Republican majority. The duc de Broglie was defeated in his own district, and resigned office on 20th November. From this time he gradually dropped out of politics and reverted to his former historical studies. Besides editing the *Souvenirs* of his father (1886, &c.), the *Mémoires* of Talleyrand (1891, &c.) and the letters of the Duchess Albertine de Broglie (1896), he published *Le secret du Roi. Correspondance secrète de Louis XV. avec ses agents diplomatiques, 1752-74* (1878); *Frédéric II. et Marie Thérèse* (1883); *Frédéric II. et Louis XV.* (1885); *Marie Thérèse Impératrice* (1888); *Histoire et diplomatie* (1889); *Le père Lacordaire* (1889); *Maurice de Saxe et le marquis d'Argenson* (1891); *La Paix d'Aix-la-Chapelle* (1892); *Le Concordat* (1893); *L'Alliance Autrichienne* (1895); *La Mission de M. de Gontaut-Biron à Berlin* (1896); *Histoire et politique* (1897); *La Journée de Fontenoy* (printed for private circulation, 1897); *Malherbe*, in the series of "Les grands Ecrivains Français" (1897); *Voltaire avant et pendant la Guerre de Sept Ans* (1898); *Saint Ambroise*, translated by Margaret Maitland in the series of "The Saints" (1899). He died in Paris on 19th January 1901. (H. SY.)

Broken Hill, a silver-mining town in New South Wales, Australia, about 925 miles W. of Sydney. One of the neighbouring mines is the most prolific in the world. Gold is associated with the silver, and fairly good copper lodes are found. The problem of the profitable treatment of the sulphide ores has been practically solved here. The Barrier mines employ over 7000 men, and claim 27 per cent. of the lead production of the world. Population (1901), 27,518.

Brokers.—In the primary sense of the word a broker is a mercantile agent, of the class known as general agents, whose office is to bring together intending buyers and sellers and make a contract between them, for a remuneration called brokerage or commission; *e.g.*, cotton brokers, wool brokers, or produce brokers. Originally the only contracts negotiated by brokers were for the sale or purchase of commodities; but the word in its present use includes other classes of mercantile agents, such as stock-brokers, insurance-brokers, ship-brokers, or bill-brokers. Pawnbrokers are not brokers in any proper sense of the word; they deal as principals and do not act as agents. In discussing the chief questions of modern legal interest in connexion with brokers we shall deal with them, firstly, in the original sense.

1. *Relations between Broker and Principal.*—A broker has not, like a factor, possession of his principal's goods, and cannot buy or sell in his own name; his business is to bring into privity of contract his principal and the third party. When the contract is made ordinarily he drops out altogether. Brokers very frequently act as factors also, but, when they do so, their rights and duties as factors must be distinguished from their rights and duties as brokers. It is a broker's duty to carry out his principal's instructions with diligence, skill, and perfect good faith. He must see that the terms of the bargain accord with his principal's orders from a commercial point of view, *e.g.* as to quality, quantity, and price; he must ensure that the contract of sale effected by him be legally enforceable by his principal against the third party; and he must not accept any commission from the third party, or put himself in any position, in which his own interest may become opposed to his principal's. As soon as he has made the contract which he was employed to make, ordinarily his duty to, and his authority from, his principal alike cease; and consequently the law of brokers relates principally to the formation of contracts by them.

The most important formality in making contracts for the sale of goods, with which a broker must comply, is contained in section 4 of the Sale of Goods Act, 1893, which (in substance re-enacting section 17 of the Statute of Frauds) provides as follows:—"A contract for the sale of any goods of the value of ten pounds or upwards shall not be enforceable by action unless the buyer shall accept part of the goods as sold, and actually receive the same, or give something in earnest to bind the contract, or in part payment, or *unless some note or memorandum in writing of the contract be made and signed by the party to be charged or his agent in that behalf.*"

From the reign of James I. till 1884 brokers in London were admitted and licensed by the Corporation, and regulated by statute; and it was common to employ one broker only, who acted as intermediary between, and was the agent of both buyer and seller. When the Statute of Frauds was passed in the reign of Charles II., it became the practice for the broker, acting for both parties, to insert in a formal book kept for the purpose a memorandum of each contract effected by him, and to sign such memorandum on behalf of both parties, in order that there might be a written memorandum of the contract of sale, signed by the agent of the parties as required by the statute. He would then send to the buyer a copy of this memorandum, called the "bought note," and to the seller a "sold note," which would run as follows:—

"I have this day bought for you from A B [or "my principal"] ....." [signed] "M, *Broker.*"

"I have this day sold for you to A B [or "my principal"] ....." [signed] "M, *Broker.*"

There was in the earlier part of the 19th century considerable discussion in the courts as to whether the entry in a broker's book, or the bought and sold notes (singly or together), constituted the statutory memorandum; and judicial opinion was not unanimous on the point. But at the present day brokers are no longer regulated by statute, either in London or elsewhere, and keep no formal book; and as an entry made in a private book kept by the brokers for another purpose, even if signed, would probably not be regarded as a memorandum signed by the agent of the parties in that behalf, the old discussion is now of little practical interest.

Under modern conditions of business the written memorandum of the contract of sale effected by the broker is usually to be found in a "contract note"; but the question whether, in the particular circumstances of each case, the contract note affords a sufficient memorandum in writing, depends upon a variety of considerations—*e.g.*, whether the transaction is effected through one or through two brokers; whether the contract notes are rendered by one broker only, or by both; and, if the latter, whether exchanged between the brokers, or rendered by each broker to his own client; for under present practice any one of these methods may obtain, according to the trade in which the transaction is effected, and the nature of the particular transaction.

Where one and the same broker is employed by both seller and buyer, bought and sold notes rendered in the old form provide the necessary memorandum of the contract. Where two brokers are employed, one by the seller and one by the buyer, sometimes one drops out as soon as the terms are negotiated, and the other makes out, signs, and sends to the parties the bought and sold notes. The latter thus becomes the agent of both parties for the purpose of signing the statutory memorandum, and the position is the same as if one broker only had been employed. On the other hand, if one broker does not drop out of the transaction, each broker remains to the end the agent of his own principal only, and neither becomes the agent of the other party for the purpose of signing the memorandum. In such a case it is the usual practice for the buyer's broker to send to the seller's broker a note of the contract,—"I, acting on account of A. B. [or, "of my principal,"], have this day bought *from* you, acting on account of C. D. [or "of your principal"],"—and to receive a corresponding note from the seller's broker. Thus each of the parties receives through his own agent a memorandum signed by the other party's agent. These contract notes, as they are called, are not "bought" and "sold" notes, as originally understood; for the "bought note" proper was sent to the buyer, and ran:—"I have this day bought *for* you" and the sold note was sent to the seller, and ran—"I have this day sold *for* you." But they are usually known as, and serve the purpose of, "bought" and "sold" notes.

In all the above three cases the broker's duty of compliance with all formalities necessary to make the contract of sale legally enforceable is performed, and both parties obtain a written memorandum of the contract upon which they can sue. But in certain Exchanges governed by a close association which excludes strangers from its market, all members of the association, whether brokers or merchants, are by the custom or rules of the Exchange treated as principals amongst themselves; and the bargains they make are enforced on the market by the governing body of the Exchange, whether legal formalities such as the signed memorandum are complied with or not; and it thus becomes, from the broker's point of view, unnecessary to comply with legal requirements which are not insisted upon on the market. If he complies with the rules of the association he knows his contracts will be enforced. The domestic takes the place of the public forum. So the practice has arisen on certain Exchanges, at least in reference to certain classes of transactions, for the brokers making contracts on the market, instead of rendering to each other duly signed contract notes, merely to enter the bargain each in his own private market book. Such entries are usually checked by subsequent comparison, and bargains so made are enforced by the governing body. So long as the two brokers remain solvent, the contract is, as between them, performed on the market.

In contracts for future delivery, at each periodical "settlement" up to the date of delivery, "differences" are paid, by one broker to the other, through the clearing house of the exchange, *i.e.*, the difference between the contract price and the market price at the settlement, or between the last and the present settlement prices. When the date of delivery arrives, if the selling principal be a stranger to the market and fail to deliver, his broker is compelled by the rules of the Exchange to make good to the buying broker any loss due to a rise of the market. Similarly if the buying principal refuses to take delivery, and the market has fallen, the buying broker must make good to the selling broker the consequent loss. But when an agent receives money on his principal's behalf, it is his duty to account for it, and the statutory requirement of a memorandum in writing does not apply to prevent a principal from suing his agent for money received to his use. Thus, so long as the two brokers remain solvent, the contract of sale, though by reason of the absence of any statutory memorandum, legally unenforceable by one principal against the other, is, in fact, indirectly enforced. But if the selling broker becomes insolvent, the seller must suffer loss; for *ex hypothesi* the seller cannot enforce the contract directly against the buyer, and his remedy against his broker becomes a mere right of proof against an insolvent estate. Again, should the buying broker become insolvent, then, if the seller has employed his broker on the terms that all rules and customs of the market are to be read into the contract of employment (which question is dealt with below), the seller cannot complain that his broker has, in conformity to those rules and customs, omitted to make for him a contract which he can enforce at law directly against the buyer; and his only right will be to recover from his broker the money which the latter receives on his account, viz., the dividends paid by the insolvent estate of the buying broker. On the principal markets it also very often happens in dealings in "futures" that one purchase may be made through several intermediate brokers, who sell first, and then buy against their contract of sale from another broker. In such a case, the first buying broker and the last selling broker are alone in direct relations with the two principals. The intermediate brokers act as principals towards each other according to the rules of the Exchange, and when their bargain is made, drop out of the transaction, usually at the next periodical settlement. Ultimately the position is precisely the same as if only two brokers had been employed from the start, and the remarks made above as to that position apply.

Differences.

When two brokers are employed, it is commonly the practice (except when one broker drops out, and the other signs bought and sold notes on behalf of both parties) for each broker to send to his principal a contract note, either in the form of the old bought and sold notes—"I have $\begin{matrix}\text{bought}\\\text{sold}\end{matrix}$ for you,"—or in a form which purports to make himself a principal instead of agent in relation to his client,—"I have this day $\begin{matrix}\text{sold to}\\\text{bought from}\end{matrix}$ you." These contract notes, though often so spoken of, are not really bought and sold notes; for the buying broker is not the agent of the seller, and the selling broker is not the agent of the buyer, for the purpose of signing such notes. They are memoranda not of the contract of sale, but of the contract of employment, and contain the terms upon which the broker is employed by his principal. Sometimes they are accompanied by a detachable form, known as the "client's return contract note," to be filled in, signed, and returned by the client; but even the "client's return contract note" is retained by the client's own broker, and is only a memorandum of the terms of employment. The following is a form of contract note rendered by a broker to his client for American cotton, bought on the Liverpool Cotton Exchange for future delivery. The client's contract note is attached to it, and is in precisely corresponding form.

AMERICAN COTTON,
Delivery Contract Note.

Liverpool,.....

M.....

DEAR SIRS,

We have this day..... $\begin{matrix}\text{to}\\\text{from}\end{matrix}$ you .....lbs American Cotton, net weight, to be contained in.....American Bales, more or less, to be delivered in Liverpool, during.....on the basis of.....per lb for.....on the terms of the rules, bye-laws, and Clearing House regulations of the Liverpool Cotton Association, Limited, whether endorsed hereon or not.

The contract, of which this is a note, is made between ourselves and yourselves, and not by or with any person, whether disclosed or not, on whose instructions or for whose benefit the same may have been entered into. Yours faithfully,

.....

The contract, of which the above is a note, was made on the date specified, within the business hours fixed by the Liverpool Cotton Association, Limited.

.....per cent. to us.

Please confirm by signing and returning the contract attached.

Primâ facie, as already stated, it is the duty of a broker, employed to buy, to make with an actual seller, either direct or through another broker, a contract of sale which is legally enforceable at the instance of the buyer. And if the buyer did not consent to employ his broker on the terms that he should act according to the rules and customs of the market, the broker would be guilty of a breach of duty, if, in obedience to such rules or customs, he omitted to procure a statutory memorandum. Such consent may be given expressly by the client, before he instructs his broker to execute any order. He may say, "I consent to your following all the rules and customs of your Exchange and am willing to be bound by them." In such a case the client could not complain if his broker did follow those rules and customs, and he would be bound by them, whether the rules and customs were expressed *in extenso* in the contract of employment, or incorporated by reference as in the above form of contract note for "delivery cotton." But it is also a rule of law, that trade contracts are to be construed subject to trade usages, and the contract of employment of the broker is therefore impliedly made subject to the usages of the broker's trade, whether the client is already aware of these usages or not. This legal implication is, however, subject to the limitation,

Customary usage.

that the contract shall not be construed as incorporating any custom or usage which, in the opinion of the court, is unreasonable, unless the party to be bound by it actually knew of it beforehand, or by his conduct is precluded from saying that he did not know of it. A custom which is inconsistent with the fundamental nature of the contract is considered by the courts as unreasonable; *e.g.*, a custom that a broker employed to buy as broker may convert himself into a principal contracting party and sell to his client on his own account. The "principal" clause in the above form of contract note would not be binding unless assented to. So also the practice above mentioned by which the broker omits to obtain a properly signed memorandum of the contract upon which his principal can sue, would be held unreasonable. The important question therefore which arises in considering the duty of a broker to his client, is, in practice usually, whether the client has actually consented (or must be taken to have consented) to be bound by some usage which is unreasonable, and would not bind him without that consent. This is a question of fact in each case, and depends on what notice the client has had of the particular usage. It is chiefly as evidence of consent, or at any rate of notice, that the printed forms of contract notes sent by brokers to their clients incorporating the rules and customs of the Exchange or market, are important. If in any case it appears that the printed forms have been brought to the previous notice of the client, there will be evidence (of which the force will no doubt differ according to the circumstances of every case) from which to infer the client's consent to the customs and rules referred to in the form. If the client receives and signs a "return note," the evidence of his consent becomes practically conclusive. In this context, however, the rule of evidence should not be forgotten, that a contract in writing cannot be varied by extrinsic evidence; and therefore if the terms upon which the broker is employed have previously been reduced to writing, evidence whether oral or written of usages or rules inconsistent with those terms will be inadmissible; and even if a client signed such a "return note" as above mentioned, the reference therein to the rules and usages of the particular market would not serve to alter the contract already made; nor would it constitute a new contract, for there would be no fresh consideration.

Brokerage.

The broker, on performing his duty in accordance with the terms upon which he is employed, is entitled to be paid his brokerage. This usually takes the form of a percentage, varying according to the nature of business, upon the total price of the goods bought or sold through him. When he guarantees the solvency of the other party, he is said to be employed upon *del credere* terms, and is entitled to a higher rate of remuneration. If he fails to perform his duty, he loses his right to remuneration, reimbursement, and indemnity, and further becomes liable to an action for damages for breach of his contract of employment, at the suit of his principal. The measure of damages will, in the absence of any special arrangement, be the difference between the contract price and the market price at the time of the breach. In some trades it is the custom for the selling broker to receive payment from the buyer or his broker; and in such case it is his duty to account to his principal for the purchase money. A broker who properly expends money or incurs liability on his principal's behalf in the course of his employment, is entitled to be reimbursed the money, and indemnified against the liability. Not having, like a factor, possession of the goods, a broker has no lien by which to enforce his rights against his principal.

2. *Relations between Broker and Third Party.*—A broker who signs a contract note *as broker* on behalf of a principal, whether named or not, is not personally liable on the contract to the third party. But if he makes the contract in such a way as to make himself a party to it, the third party may sue either the broker or his principal, subject to the limitation that the third party, by his election to sue one, precludes himself from suing the other. In this respect the ordinary rules of the law of agency apply to a broker. Brokers who are members of Exchanges are personally liable to any member with whom they contract, whether he be a merchant or a broker; because by joining the association each member contracts to be bound by the rules, one of which is that all members are between themselves principals. Generally, a broker has not authority to receive payment, but in certain trades it is customary for him to do so, and in such trades if the buyer pays the seller's broker, and is then sued by the seller for the price by reason of the broker having become insolvent or having absconded, he may set up the payment to the broker as a defence to the action by the broker's principal. A payment by the buyer to his own broker is no defence to an action by the seller unless the seller has led the buyer to believe that he has already settled with the buyer's broker. Brokers may render themselves liable for damages in tort for the conversion of the goods at the suit of the true owner if they negotiate a sale of the goods for a selling principal who has no title to the goods.

A stockbroker is a broker who contracts for the sale of stocks and shares. Stockbrokers differ from brokers proper chiefly in that stocks and shares are not "goods," and the requirement of a memorandum in writing, enacted by the Sale of Goods Act, 1893, does not apply. Hence actions may be brought by the principals to a contract for the sale of stocks and shares although no memorandum in writing exists. For instance, the jobber, on failing to recover from the buyer's broker the price of shares sold, by reason of the broker having failed and been declared a defaulter, may sue the buyer whose "name was passed" by the broker. The employment of a stockbroker is subject to the rules and customs of the Stock Exchange, in accordance with the principles discussed above, which apply to the employment of brokers proper. A custom which is illegal, such as the Stock Exchange practice of disregarding Leeman's Act, which enacts that contracts for the sale of joint-stock bank shares shall be void unless the registered numbers of the shares are stated therein, is not binding on the client to the extent of making the contract of sale valid. But if a client choose to instruct his broker to buy bank shares in accordance with that practice, the broker is entitled to be indemnified by his client for money which he pays on his behalf, even though the contract of sale so made is unenforceable. For further information the reader is referred to the article and to the treatises on the law of the STOCK EXCHANGE.

An insurance broker is an agent whose business is to effect policies of marine insurance. He is employed by the person who has an interest to insure, pays the premiums to the underwriter, takes up the policy, and receives from the underwriter payment in the event of a loss under the policy. By the custom of the trade the underwriter looks solely to the broker for payment of premiums, and has no right of action against the assured; and, on the other hand, the broker is paid his commission by the underwriter, although he is employed by the assured. Usually the broker keeps a current account with the underwriter, and premiums and losses are dealt with in account. It is only in the event of the underwriter refusing to pay on a loss, that the broker drops out and the assured sues the underwriter direct.

Ship-brokers are, firstly, "commission agents," and, secondly, very often also ships' managers. Their office is to act as agents for owners of ships to procure purchasers for ships, or ships for intending purchasers, in precisely the same manner as house-agents act in respect of houses. They also act as agents for ship-owners in finding charterers for their ships, or for charterers in finding ships available for charter, and in either case they effect the charter-party (see AFFREIGHTMENT).

Chartering brokers are customarily paid by the ship-owner, when the charter-party is effected, whether originally employed by him or by the charterer. Charter-parties effected through brokers often contain a provision—"2½ *per cent. on estimated amount of freight to be paid to* A B, *broker, on the signing of this charter-party, and the ship to be consigned to him for ship's business at the port of* X [inserting the name of the port where A B carries on business]." The broker cannot sue on the charter-party contract because he is not a party to it, but the insertion of the clause practically prevents his right from being disputed by the ship-owner. When the broker does the ship's business in port, it is his duty to clear her at the customs and generally to act as "ship's husband."

A bill-broker was originally an agent who, for a commission, procured for country bankers the discounting of their bills in London. But the practice arose of the broker guaranteeing the London banker or financier; and finally the brokers ceased to deposit with the London bankers the bills they received, and at the present day a bill-broker, as a rule, buys bills on his own account at a discount, borrows money on his own account and upon his own security at interest, and makes his profit out of the difference between the discount and the interest. When acting thus the bill-broker is not a broker at all, as he deals as principal and does not act as agent.

See STORY. *Commentaries on the Law of Agency.* Boston, 1882.—BRODHURST. *Law and Practice of the Stock Exchange.*

London, 1897.—Gow. *Handbook of Marine Insurance.* London, 1900.—Arnould. *On Marine Insurance.* Edited by Messrs Hart and Sinney, 1901. (L. F. S.)

Bromberg, a town of Prussia, province of Posen, 32 miles by rail W.N.W. from Thorn, 7 miles W. from the bank of the Vistula. The new buildings include a theatre (1896) and a synagogue (1884). The town possesses a bronze statue of Frederick the Great (1862), a bronze equestrian statue of the Emperor William I. (1893), a monument of the war of 1870-71 (1880), and a statue of Benkenhoff (1894), the constructor of the Bromberg Canal (1773-74), connecting the Vistula and the Netze, with a length of 17 miles. There is also an archæological collection belonging to the Historical Society of the Netze District. The principal industrial works are iron foundries and machine shops, paper factories, and flour mills; the town has an active trade in agricultural and other products. Population (1885), 36,294; (1900), 52,082.

Bromley, a suburban market town in the Sevenoaks parliamentary division of Kent, England, 10 miles S.S.E. of London by rail. Recent erections are a science and art school, a drill-hall, a public library, and four new churches, besides a Roman Catholic church and several chapels. The cottage hospital has been enlarged and a recreation ground purchased. Population of parish (an urban district) (1881), 15,154; (1891), 21,684; (1901), 27,358.

Bromsgrove, ancient market town in the Bromsgrove parliamentary division of Worcestershire, England, 13 miles S.W. by S. of Birmingham by rail, and 13 miles N. by W. of Worcester. Amongst recent erections are a cottage hospital and a school of art. Birmingham Sanatorium stands in the parish. Near the town are carriage works belonging to the Midland railway. Area of urban district, 1122 acres. Population (1901), 8416.

Brongniart, Adolphe Théodore (1801-1876) French botanist, was born in Paris on 14th January 1801. His father, Alexander Brongniart, at that time director of the imperial pottery at Sèvres, being a well-known scientific man, young Adolphe grew up in a scientific atmosphere. He soon showed an inclination toward the study of the natural sciences, devoting himself at first more particularly to geology, and later, to botany, thus equipping himself for what was to be the main occupation of his life—the investigation of fossil plants. In 1826 he graduated as Doctor of Medicine with a dissertation on the Rhamnaceæ; but the career which he adopted was botanical, not medical. In 1831 he became assistant to Desfontaines at the Muséum d'Histoire Naturelle, and two years later succeeded him as professor, a position which he continued to hold until his death on 18th February 1876. Brongniart was an indefatigable investigator and a prolific writer, so that he left behind him, as the fruit of his labours, a large number of books and memoirs. Of these, the great majority refer to palæobotany, a study with which his name will ever be associated. As early as 1822 he published a paper on the classification and distribution of fossil plants (*Mém. Mus. Hist. Nat.* viii.). This was followed by several papers chiefly bearing upon the relation between extinct and existing forms; a line of research which culminated in the publication of the *Histoire des Végétaux Fossiles,* which has earned for him the title of "father of palæobotany." This great work was heralded by a small but most important "Prodrome" (contributed to the *Grand Dictionnaire d'Hist. Nat.,* 1828, t. lvii.) which brought order into chaos by a classification in which the fossil plants were arranged, with remarkably correct insight, along with their nearest living allies, and which forms the basis of all subsequent progress in this direction. It is of especial botanical interest, because, in accordance with Robert Brown's discoveries, the Cycadeæ and Coniferæ are here placed in the new group *Phanérogames gymnospermes.* In this book attention is also directed to the succession of forms in the various geological periods, with the important result (stated in modern terms) that in the Palæozoic period the Pteridophyta are found to predominate; in the Mesozoic, the Gymnosperms; in the Cainozoic, the Angiosperms, a result subsequently more fully stated in his "Tableau des Genres de Végétaux Fossiles" (D'Orbigny, *Dict. Univ. d'Hist. Nat.,* 1849). But the great *Histoire* itself was not destined to be more than a colossal fragment; the publication of successive parts proceeded regularly from 1828 to 1837, when the first volume was completed; but after that only three parts of the second volume appeared. Brongniart no doubt was overwhelmed with the continually increasing magnitude of the task that he had undertaken. Apart from his more comprehensive works, his most important palæontological contributions are perhaps his observations on the structure of *Sigillaria* (*Arch. Mus. Hist. Nat.* i., 1839) and his researches (almost the last he undertook) on fossil seeds of which a full account was published posthumously in 1880. His activity was by no means confined to palæobotany, but extended into all branches of botany, more particularly anatomy and phanerogamic taxonomy. Among his achievements in these directions, the most notable is the memoir "Sur la génération et le développement de l'embryon des Phanérogames" (*Ann. Sci. Nat.* xii., 1827). This is remarkable in that it contains the first account of any value of the development of the pollen; as also a description of the structure of the pollen-grain, the confirmation of Amici's (1823) discovery of the pollen-tube, the confirmation of R. Brown's views as to the structure of the unimpregnated ovule (with the introduction of the term "sac embryonnaire"); and in that it shows how nearly Brongniart anticipated Amici's subsequent (1846) discovery of the entrance of the pollen-tube into the micropyle, fertilizing the female cell which then develops into the embryo. Of his anatomical works, those of the greatest value are probably the "Recherches sur la structure et les fonctions des feuilles" (*Ann. Sci. Nat.* xxi., 1830), and the "Nouvelles Recherches sur l'Épiderme" (*Ann. Sci. Nat.* i., 1834), in which, among other important observations, the discovery of the cuticle is recorded; and, further, the "Recherches sur l'organisation des tiges des Cycadées" (*Ann. Sci. Nat.* xvi., 1829), giving the results of the first investigation of the anatomy of those plants. His systematic work is represented by a large number of papers and monographs, many of which relate to the flora of New Caledonia; and by his *Énumération des genres de plantes cultivées au Muséum d'Histoire Naturelle de Paris,* 1843, which is an interesting landmark in the history of classification in that it forms the starting-point of the system, modified successively by A. Braun, Eichler, and Engler, which is now adopted in Germany. In addition to his scientific and professorial labours, Brongniart was actively engaged in other directions. He held various important official posts in connexion with the Department of Education, and interested himself greatly in agricultural and horticultural matters. With Audouin the geologist and Dumas the chemist, his future brothers-in-law, he established the *Annales des Sciences Naturelles* in 1824; he also founded the Société Botanique de France in 1854, and was its first president.

Accounts of his life and work have been given by M. de Saporta (*Bull. de la Soc. Géol. de France,* 1876), and by M. Poisson (*La Nature,* 1876); the *Bulletin de la Soc. Bot. de France* for 1876 (vol. xxiii.) contains a list of his works and the orations pronounced at his funeral. (S. H. V.*)

Bronx, The, the northernmost of the five boroughs of New York city (*q.v.*)

Bronze.—Bronze alloys have in recent years come to be largely used in mechanical engineering. The principal bronzes are phosphor bronze, aluminium bronze, delta metal, and manganese bronze.

Phosphor bronze, in the ingot, has the composition—copper, 87·8 parts; tin, 11·17; phosphorus, 1·03, although this proportion may vary somewhat. After casting from the ingot, the phosphorus may be reduced to the merest trace, but its presence while melting is useful. If overheated in casting, phosphor bronze loses many of its valuable properties. Phosphor bronze is used for pump plungers, valves, bushes of bearings, &c., and generally for purposes where a hard, strong metal is needed. It is less well suited than other bronzes for bearing heavy vibratory loads. The tensile strength of phosphor bronze in the ingot ranges from 22 to 25 tons per square inch, with an elongation of from 4 to 8 per cent. in 2 inches' length. This strength is usually reduced in the casting to about 16 tons, and may be increased by the process of rolling to from 25 to 40 tons, with from 8 to 20 per cent. elongation in 2 inches.

Aluminium bronze has a considerable tendency in casting to draw in the mould. It possesses a tensile strength of about 25 tons per square inch, with 17 per cent. elongation in 2 inches in the casting, and this may be further increased by rolling to 40 tons with 15 per cent. elongation. This alloy will take a very high polish, and it is claimed for it that it does not readily corrode. It is difficult, if not impossible, to solder satisfactorily together articles made of aluminium bronze.

Bronzes termed *Delta metal* are variously composed to suit the particular purpose for which the alloy will be used, and give generally excellent results. Some of these bronzes possess high tensile strength and ductility. They resist corrosion from sea-water to a remarkable extent, and are well suited for manufacture of pump plungers, pistons, glands, and for screw propellers. Propellers of this material have in actual use withstood a remarkable amount of deformation without fracture, while, on account of its malleability, a limited amount of bending of the propeller blade, resulting from accident, may be corrected by heating and setting. Delta metal heated to a dull red becomes malleable, and can be worked under the hammer, press, or stamps, the strength being very much increased by the process. When so treated an ultimate tensile strength of 30 tons per square inch has been obtained, with the remarkable elongation of 32 per cent. in 2 inches and a contraction of area of 30 per cent. Mr Alex. Dick, of the Delta Metal Company, has made the discovery that copper and its alloys can be separated while in a heated and plastic condition, and, provided no air is allowed to come into contact with the surfaces to produce oxidation, they will reunite under pressure, becoming perfectly welded together. This has led to the laying down of plant for the manufacture of bronze tubes and pipes, and other sections, by the process of extension, the resulting products being of high quality and strength, and perfectly sound. The process of manufacture is carried on by means of a hydraulic press; the metal, which is at a high temperature, that of plasticity, about 1000 deg. Fah., is placed in a compressing cylinder or container, into which the hydraulic ram enters. The ram is provided with a dished steel check-disc at the forward end, which expands under the pressure and fits the bore of the cylinder. The die-plates are formed with openings representing the section required for the article to be produced, and in the case of tubes there is a mandril in the central opening in the die-plate, which is attached by ribs to the die. The plastic metal when flowing is divided by the ribs of the die, but becomes reunited and firmly welded together after passing the ribs. This action is dependent on the exclusion of the air. The process improves the quality of the metal, and some tests of delta metal bars made by extension show a tensile strength of 48 tons per square inch, with 32 per cent. elongation in 2 inches.

The limit of elasticity of the alloys of copper and zinc increases with the proportion of zinc. The amount of elongation before fracture also increases with the proportion of zinc, reaching a maximum at 30 per cent. of zinc, and then decreasing rapidly. The tenacity increases with the proportion of zinc, attains a maximum at 45 per cent. of zinc, and then decreases rapidly. The alloys become fragile when they contain 50 per cent. of zinc. By varying the proportion of zinc between 30 and 43 per cent. a series of alloys may be prepared presenting very varied properties. The most malleable of the series elongates about 60 per cent., with a tensile strength of 17·5 tons per square inch. Higher tensile strength may be obtained by increasing the proportion of zinc, but the percentage of elongation is reduced thereby and the tendency to produce unsound castings materially increased. The addition of a small quantity of iron improves the quality of copper zinc alloys.

Manganese bronze is a copper zinc alloy of high value, on account of the possibility of obtaining a material in which the elastic limit more nearly approaches the ultimate strength than is usually the case with bronzes. The composition of manganese bronze in the ingot may be taken as:—Copper, 56·52 per cwt.; tin, ·85; lead, ·35; iron, 1·5; zinc, 40·78, with a trace of manganese. The fracture when broken by tension has a fine silky appearance. In the ingot the material may possess a tensile strength of 32 tons per square inch, with 35 per cent. elongation in 2 inches, which is usually reduced by casting to about 29·5 tons per square inch, with 20 per cent. elongation. By rolling, the tensile strength is increased to 35 to 40 tons per square inch, with from 10 to 35 per cent. elongation in 2 inches. In casting there is considerable tendency to volatilize the zinc from overheating, rendering it somewhat difficult to secure sound castings with high tensional strength; there is also a large amount of shrinkage in the mould when cooling, which is objectionable. Speaking generally, there is risk of unsoundness with high-tension bronze, rendering it somewhat untrustworthy for the purpose of retaining water or air under pressure; but a low-tension bronze, with a tenacity of about 12 tons per square inch, will give sound castings. Thus, a bronze composed of copper, 85·5 per cent.; tin, 12·0 per cent.; zinc, 2·5 per cent., gives satisfactory results. (G. H. Ba.)

Brookfield, a city of Linn county, Mo., U.S.A., situated in the northern part of the state, on the Chicago, Burlington, and Quincy railway, at an altitude of 757 feet. Population (1880), 2264; (1890), 4547; (1900), 5484.

Brookings, capital of Brookings county, South Dakota, U.S.A., situated in the eastern part of the state, on the Chicago and North-Western railway, and on Big Sioux river, at an altitude of 1636 feet. It is the seat of the State Agricultural College. This institution, maintained at the joint expense of the state and the United States, had, in 1900, 29 instructors and 508 students. Population (1890), 1518; (1900), 2346.

Brookline, a town of Norfolk county, Massachusetts, U.S.A., adjoining Boston on the south-west. It is a residential suburb of Boston, containing several small villages, and is traversed by the Boston and Albany railway. Population (1880), 8057; (1890), 12,103; (1900), 19,935.

Brooklyn, formerly a city of New York State, U.S.A., but since 1st January 1898 a borough of the city of New York. It is situated at the west end of Long Island, in the south-eastern part of the state, and is separated from Manhattan borough, formerly New York city, by the East river. The borough of Brooklyn includes all of King's county, the township of New Lots having been annexed to the then city of Brooklyn in 1886, and Flatbush, Gravesend, New Utrecht, and Flatlands in 1894. These additions gave the city an area of 65·77 square miles, extending from the East river across the island to the south coast, and including the summer resorts of Coney Island. It retains under its present organization as a borough, practically the same area as it had before as a city. The borough contains thirty-two wards. It is connected (1901) with Manhattan borough by numerous ferries and by the Brooklyn suspension bridge, opened in 1883, and will in the near future be connected by additional bridges. Means of transportation are ample; there are five lines of elevated railway, and there are trolley lines on many of the streets. The summer resorts on Coney Island on the south coast are connected with the city by trolley and steam railway lines. The borough contains thirty-two parks, ranging in size from a part of an acre to 516 acres, and with a total area of 1027 acres; the principal and best known of these is Prospect Park, a little west of the centre of the borough, containing 516 acres, and having the soldiers' and sailors' memorial arch at its entrance. There is also Brooklyn Forest Park situated in Queen's borough, containing 535 acres, and Fort Green Park in the heart of the city, besides which may be mentioned in this connexion the beautiful Greenwood Cemetery, of 474 acres, and a number

London, 1897.—Gow. *Handbook of Marine Insurance.* London, 1900.—Arnould. *On Marine Insurance.* Edited by Messrs Hart and Simey, 1901. (L. F. S.)

Bromberg, a town of Prussia, province of Posen, 32 miles by rail W.N.W. from Thorn, 7 miles W. from the bank of the Vistula. The new buildings include a theatre (1896) and a synagogue (1884). The town possesses a bronze statue of Frederick the Great (1862), a bronze equestrian statue of the Emperor William I. (1893), a monument of the war of 1870-71 (1880), and a statue of Benkenhoff (1894), the constructor of the Bromberg Canal (1773-74), connecting the Vistula and the Netze, with a length of 17 miles. There is also an archæological collection belonging to the Historical Society of the Netze District. The principal industrial works are iron foundries and machine shops, paper factories, and flour mills; the town has an active trade in agricultural and other products. Population (1885), 36,294; (1900), 52,082.

Bromley, a suburban market town in the Sevenoaks parliamentary division of Kent, England, 10 miles S.S.E. of London by rail. Recent erections are a science and art school, a drill-hall, a public library, and four new churches, besides a Roman Catholic church and several chapels. The cottage hospital has been enlarged and a recreation ground purchased. Population of parish (an urban district) (1881), 15,154; (1891), 21,684; (1901), 27,358.

Bromsgrove, ancient market town in the Bromsgrove parliamentary division of Worcestershire, England, 13 miles S.W. by S. of Birmingham by rail, and 13 miles N. by W. of Worcester. Amongst recent erections are a cottage hospital and a school of art. Birmingham Sanatorium stands in the parish. Near the town are carriage works belonging to the Midland railway. Area of urban district, 1122 acres. Population (1901), 8416.

Brongniart, Adolphe Théodore (1801-1876) French botanist, was born in Paris on 14th January 1801. His father, Alexander Brongniart, at that time director of the imperial pottery at Sèvres, being a well-known scientific man, young Adolphe grew up in a scientific atmosphere. He soon showed an inclination toward the study of the natural sciences, devoting himself at first more particularly to geology, and later, to botany, thus equipping himself for what was to be the main occupation of his life—the investigation of fossil plants. In 1826 he graduated as Doctor of Medicine with a dissertation on the Rhamnaceæ; but the career which he adopted was botanical, not medical. In 1831 he became assistant to Desfontaines at the Muséum d'Histoire Naturelle, and two years later succeeded him as professor, a position which he continued to hold until his death on 18th February 1876. Brongniart was an indefatigable investigator and a prolific writer, so that he left behind him, as the fruit of his labours, a large number of books and memoirs. Of these, the great majority refer to palæobotany, a study with which his name will ever be associated. As early as 1822 he published a paper on the classification and distribution of fossil plants (*Mém. Mus. Hist. Nat.* viii.). This was followed by several papers chiefly bearing upon the relation between extinct and existing forms; a line of research which culminated in the publication of the *Histoire des Végétaux Fossiles*, which has earned for him the title of "father of palæobotany." This great work was heralded by a small but most important "Prodrome" (contributed to the *Grand Dictionnaire d'Hist. Nat.*, 1828, t. lvii.) which brought order into chaos by a classification in which the fossil plants were arranged, with remarkably correct insight, along with their nearest living allies, and which forms the basis of all subsequent progress in this direction. It is of especial botanical interest, because, in accordance with Robert Brown's discoveries, the Cycadeæ and Coniferæ are here placed in the new group *Phanérogames gymnospermes*. In this book attention is also directed to the succession of forms in the various geological periods, with the important result (stated in modern terms) that in the Palæozoic period the Pteridophyta are found to predominate; in the Mesozoic, the Gymnosperms; in the Cainozoic, the Angiosperms, a result subsequently more fully stated in his "Tableau des Genres de Végétaux Fossiles" (D'Orbigny, *Dict. Univ. d'Hist. Nat.*, 1849). But the great *Histoire* itself was not destined to be more than a colossal fragment; the publication of successive parts proceeded regularly from 1828 to 1837, when the first volume was completed; but after that only three parts of the second volume appeared. Brongniart no doubt was overwhelmed with the continually increasing magnitude of the task that he had undertaken. Apart from his more comprehensive works, his most important palæontological contributions are perhaps his observations on the structure of *Sigillaria* (*Arch. Mus. Hist. Nat.* i., 1839) and his researches (almost the last he undertook) on fossil seeds of which a full account was published posthumously in 1880. His activity was by no means confined to palæobotany, but extended into all branches of botany, more particularly anatomy and phanerogamic taxonomy. Among his achievements in these directions, the most notable is the memoir "Sur la génération et le développement de l'embryon des Phanérogames" (*Ann. Sci. Nat.* xii., 1827). This is remarkable in that it contains the first account of any value of the development of the pollen; as also a description of the structure of the pollen-grain, the confirmation of Amici's (1823) discovery of the pollen-tube, the confirmation of R. Brown's views as to the structure of the unimpregnated ovule (with the introduction of the term "sac embryonnaire"); and in that it shows how nearly Brongniart anticipated Amici's subsequent (1846) discovery of the entrance of the pollen-tube into the micropyle, fertilizing the female cell which then develops into the embryo. Of his anatomical works, those of the greatest value are probably the "Recherches sur la structure et les fonctions des feuilles" (*Ann. Sci. Nat.* xxi., 1830), and the "Nouvelles Recherches sur l'Épiderme" (*Ann. Sci. Nat.* i., 1834), in which, among other important observations, the discovery of the cuticle is recorded; and, further, the "Recherches sur l'organisation des tiges des Cycadées" (*Ann. Sci. Nat.* xvi., 1829), giving the results of the first investigation of the anatomy of those plants. His systematic work is represented by a large number of papers and monographs, many of which relate to the flora of New Caledonia; and by his *Énumération des genres de plantes cultivées au Muséum d'Histoire Naturelle de Paris*, 1843, which is an interesting landmark in the history of classification in that it forms the starting-point of the system, modified successively by A. Braun, Eichler, and Engler, which is now adopted in Germany. In addition to his scientific and professorial labours, Brongniart was actively engaged in other directions. He held various important official posts in connexion with the Department of Education, and interested himself greatly in agricultural and horticultural matters. With Audouin the geologist and Dumas the chemist, his future brothers-in-law, he established the *Annales des Sciences Naturelles* in 1824; he also founded the Société Botanique de France in 1854, and was its first president.

Accounts of his life and work have been given by M. de Saporta (*Bull. de la Soc. Géol. de France*, 1876), and by M. Poisson (*La Nature*, 1876); the *Bulletin de la Soc. Bot. de France* for 1876 (vol. xxiii.) contains a list of his works and the orations pronounced at his funeral. (S. H. V.*)

Bronx, The, the northernmost of the five boroughs of New York city (*q.v.*)

Bronze.—Bronze alloys have in recent years come to be largely used in mechanical engineering. The principal bronzes are phosphor bronze, aluminium bronze, delta metal, and manganese bronze.

Phosphor bronze, in the ingot, has the composition—copper, 87·8 parts; tin, 11·17; phosphorus, 1·03, although this proportion may vary somewhat. After casting from the ingot, the phosphorus may be reduced to the merest trace, but its presence while melting is useful. If overheated in casting, phosphor bronze loses many of its valuable properties. Phosphor bronze is used for pump plungers, valves, bushes of bearings, &c., and generally for purposes where a hard, strong metal is needed. It is less well suited than other bronzes for bearing heavy vibratory loads. The tensile strength of phosphor bronze in the ingot ranges from 22 to 25 tons per square inch, with an elongation of from 4 to 8 per cent. in 2 inches' length. This strength is usually reduced in the casting to about 16 tons, and may be increased by the process of rolling to from 25 to 40 tons, with from 8 to 20 per cent. elongation in 2 inches.

Aluminium bronze has a considerable tendency in casting to draw in the mould. It possesses a tensile strength of about 25 tons per square inch, with 17 per cent. elongation in 2 inches in the casting, and this may be further increased by rolling to 40 tons with 15 per cent. elongation. This alloy will take a very high polish, and it is claimed for it that it does not readily corrode. It is difficult, if not impossible, to solder satisfactorily together articles made of aluminium bronze.

Bronzes termed *Delta metal* are variously composed to suit the particular purpose for which the alloy will be used, and give generally excellent results. Some of these bronzes possess high tensile strength and ductility. They resist corrosion from sea-water to a remarkable extent, and are well suited for manufacture of pump plungers, pistons, glands, and for screw propellers. Propellers of this material have in actual use withstood a remarkable amount of deformation without fracture, while, on account of its malleability, a limited amount of bending of the propeller blade, resulting from accident, may be corrected by heating and setting. Delta metal heated to a dull red becomes malleable, and can be worked under the hammer, press, or stamps, the strength being very much increased by the process. When so treated an ultimate tensile strength of 30 tons per square inch has been obtained, with the remarkable elongation of 32 per cent. in 2 inches and a contraction of area of 30 per cent. Mr Alex. Dick, of the Delta Metal Company, has made the discovery that copper and its alloys can be separated while in a heated and plastic condition, and, provided no air is allowed to come into contact with the surfaces to produce oxidation, they will reunite under pressure, becoming perfectly welded together. This has led to the laying down of plant for the manufacture of bronze tubes and pipes, and other sections, by the process of extension, the resulting products being of high quality and strength, and perfectly sound. The process of manufacture is carried on by means of a hydraulic press; the metal, which is at a high temperature, that of plasticity, about 1000 deg. Fah., is placed in a compressing cylinder or container, into which the hydraulic ram enters. The ram is provided with a dished steel check-disc at the forward end, which expands under the pressure and fits the bore of the cylinder. The die-plates are formed with openings representing the section required for the article to be produced, and in the case of tubes there is a mandril in the central opening in the die-plate, which is attached by ribs to the die. The plastic metal when flowing is divided by the ribs of the die, but becomes reunited and firmly welded together after passing the ribs. This action is dependent on the exclusion of the air. The process improves the quality of the metal, and some tests of delta metal bars made by extension show a tensile strength of 48 tons per square inch, with 32 per cent. elongation in 2 inches.

The limit of elasticity of the alloys of copper and zinc increases with the proportion of zinc. The amount of elongation before fracture also increases with the proportion of zinc, reaching a maximum at 30 per cent. of zinc, and then decreasing rapidly. The tenacity increases with the proportion of zinc, attains a maximum at 45 per cent. of zinc, and then decreases rapidly. The alloys become fragile when they contain 50 per cent. of zinc. By varying the proportion of zinc between 30 and 43 per cent. a series of alloys may be prepared presenting very varied properties. The most malleable of the series elongates about 60 per cent., with a tensile strength of 17·5 tons per square inch. Higher tensile strength may be obtained by increasing the proportion of zinc, but the percentage of elongation is reduced thereby and the tendency to produce unsound castings materially increased. The addition of a small quantity of iron improves the quality of copper zinc alloys.

Manganese bronze is a copper zinc alloy of high value, on account of the possibility of obtaining a material in which the elastic limit more nearly approaches the ultimate strength than is usually the case with bronzes. The composition of manganese bronze in the ingot may be taken as:—Copper, 56·52 per cwt.; tin, ·85; lead, ·35; iron, 1·5; zinc, 40·78, with a trace of manganese. The fracture when broken by tension has a fine silky appearance. In the ingot the material may possess a tensile strength of 32 tons per square inch, with 35 per cent. elongation in 2 inches, which is usually reduced by casting to about 29·5 tons per square inch, with 20 per cent. elongation. By rolling, the tensile strength is increased to 35 to 40 tons per square inch, with from 10 to 35 per cent. elongation in 2 inches. In casting there is considerable tendency to volatilize the zinc from overheating, rendering it somewhat difficult to secure sound castings with high tensional strength; there is also a large amount of shrinkage in the mould when cooling, which is objectionable. Speaking generally, there is risk of unsoundness with high-tension bronze, rendering it somewhat untrustworthy for the purpose of retaining water or air under pressure; but a low-tension bronze, with a tenacity of about 12 tons per square inch, will give sound castings. Thus, a bronze composed of copper, 85·5 per cent.; tin, 12·0 per cent.; zinc, 2·5 per cent., gives satisfactory results. (G. H. Ba.)

Brookfield, a city of Linn county, Mo., U.S.A., situated in the northern part of the state, on the Chicago, Burlington, and Quincy railway, at an altitude of 757 feet. Population (1880), 2264; (1890), 4547; (1900), 5484.

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of broad, park-lined streets of differing length, the best known of which is the drive from Prospect Park to Coney Island. Brooklyn has long been known as the city of churches, probably from the famous clergymen who formerly lived there. In 1900 there were in the borough 466 churches, of which the Protestant numbered 364 with 129,413 members, and property valued at $16,925,781. The Roman Catholic churches numbered 84, with 307,975 parishioners, and property valued at $10,086,000. The borough contains a large number of hospitals and other eleemosynary institutions, and numerous libraries and educational institutions. Among its libraries are the Brooklyn Library, with (1901) 153,000 volumes; the Brooklyn Public Library, with 40,000; and the Long Island Historical Society Library with 66,000. Among its educational institutions is the Pratt Institute, largely for technical and industrial education, with 3000 students. This school has a fine library of 70,543 volumes. The Brooklyn Institute, founded in 1824, and reorganized in 1890 as the Brooklyn Institute of Arts and Sciences, has a fine building erected by the city, a membership (1900) of 6250, and gives lectures and laboratory practice in twenty-six departments of art and science. The public school system of Brooklyn consisted in 1901 of 1 training, 6 high, 121 elementary, and 1 truant schools; employed 3961 teachers and supervisors, and gave elementary and high school education to 154,542 scholars. In 1900 there were in the borough 354,612 persons of school age (5 to 20 years inclusive). Of a total street mileage of 722 miles, all but 162 miles were paved as follows:—granite blocks, 117 miles; Belgian blocks, 47 miles; asphalt, 82 miles; cobble stone, 227 miles; macadam, 82 miles; brick, 5 miles. Order is maintained by a force of 1838 police, including officers and privates. The provision against fire consists of 62 engines and 17 hook and ladder companies. The water-supply is in public hands; it is derived from streams flowing southwards in the sparsely settled area east of the borough, and also from driven wells in the same region; it is pumped at Ridgewood to a reservoir having a capacity of 375,000,000 gallons, while a small part is re-pumped to a high-service reservoir for the service of the most elevated part of the borough. Besides this system the towns recently annexed have their own water-supply. Within the limits of the borough are 597 miles of public distributing mains. The borough has seven markets, including the immense Wallabout market, which is situated on the water front and has a large wholesale trade.

Although in great part a residential suburb of her greater neighbour on the other side of the East river, Brooklyn has large manufacturing and commercial interests of her own. By the census of 1890 she had 10,583 industrial establishments employing capital to the amount of $161,730,500. The number of employees was 109,292, and to them was paid $65,247,119 in wages. Raw material to the value of $151,060,710 was used, and the value of the products was $269,244,147. These products were varied, no class greatly preponderating; the following list contains the principal items, with the value of the product:—bread and other bakery products, $9,331,523; chemicals, $9,091,609; clothing, $13,941,636; cordage, $6,535,792; foundry and machine-shop products, $15,627,536; malt liquors, $12,004,529; lumber, $5,930,829; slaughtering and meat packing, $13,087,354; sugar refining, $16,629,982. Besides the above, oil refining and shipbuilding are important industries, and at the present time probably half the sugar supply of the country is refined here. As a commercial port Brooklyn is surpassed only by the borough of Manhattan and by Jersey city. It has 33 miles of water front, that portion bordering on the East river and New York harbour being lined with wharves, docks, warehouses, and elevators, constructed at a cost of hundreds of millions of dollars. Among its docks are the Atlantic Basin, containing 40 acres, and having seven elevators, and the Erie Basin, enclosing about 100 acres, and containing two dry docks, respectively 510 and 610 feet long, besides three floating dry docks. Brooklyn is the principal port in the U.S. for the export of grain, four-fifths of that exported from the port of New York being shipped here. Its elevators have a capacity of 20,000,000 bushels. Steamships of more than twenty regular lines land here, besides many "tramps" and sailing vessels. The U.S. Navy Yard, located here, is the largest in the country, and contains three dry docks, respectively 338, 440, and 627 feet in length on the floor. The borough contains also a U.S. Naval Hospital. Most of the financial operations are carried on upon the opposite side of the East river, yet the borough contains 5 national banks, 16 state banks, 16 savings banks, and 10 trust companies. The assessed valuation of real estate in 1901 was $658,962,119, and of personal property, $89,241,624, a total of $748,203,743. The tax rate for municipal purposes (*i.e.* expenses of New York city as a whole) was 2·03869 per cent.; for local county purposes (expenses of King's county), 0·14908 per cent. additional. The number of marriages in 1900 was 8087, of births 23,073, and of deaths 23,473, showing a death-rate of 20 per thousand. The population of what is now Brooklyn, then King's county, was in 1880, 599,495; in 1890, 838,547; and in 1900, 1,166,582. The towns added to it in 1894 had in 1890 a population as follows:—Flatbush, 12,338; Flatlands, 4075; Gravesend, 6937; New Utrecht, 8854. Of the total population in 1900, 355,697 were foreign-born and 19,673 were coloured, of whom 18,367 were negroes. Of the white population, 1,146,909, comprising 98 3 per cent. of the total population, 353,750 were foreign-born, 482,658 were native-born but of foreign parents, leaving only 310,501, or 27 per cent., native-born of native parents. Out of 332,715 males of voting age (21 years and over), 15,415 were illiterate (unable to write), of whom 14,159 were foreign-born. The death-rate, which in 1890 was 24, had fallen to 19·9 in 1900. (See also NEW YORK CITY.)

Brooks, Phillips (1835-1893), American clergyman and author, was born in Boston, Mass., 13th December 1835. He was son of William Gray and Mary Ann (Phillips) Brooks. Through his father he was descended from the Rev. John Cotton; through his mother, a woman of rare force of character and religious faith, he was a great-grandson of the founder of Phillips Academy, Andover, Mass. Of the six sons, four—Phillips, Frederic, Arthur, and John Cotton—entered the ministry of the Protestant Episcopal Church. He was educated in the Boston Latin School and Harvard College, graduating in 1855. After a short and unsuccessful experience as a teacher in the Boston Latin School, he began in 1856 to study for the ministry of the Protestant Episcopal Church in the Seminary at Alexandria, Virginia. In 1859 he was ordained deacon by Bishop Meade of Virginia, and became rector of the Church of the Advent, Philadelphia. In 1860 he was ordained priest, and in 1862 became rector of the Church of the Holy Trinity, Philadelphia, where he remained seven years, gaining an increasing name as preacher and patriot. Endowed by inheritance with a rich religious character, evangelical traditions, ethical temper, and strong intellect, he developed, by wide reading in ancient and modern literature, a personality and an attitude of mind which appealed to the characteristic thought and life of the period. With Tennyson, Coleridge, Maurice, and F. D. Robertson he was in strong sympathy. During the Civil War he upheld with power the cause of the North and the negro, and his sermon on the death of President Lincoln was an eloquent expression of the character of both men. In 1869 he became rector of Trinity Church, Boston. In 1877 the present church was built, the architect being his friend H. H. Richardson. Here Phillips Brooks preached Sunday after Sunday to great congregations, until he was consecrated bishop of Massachusetts in 1891. In 1886 he declined an election as assistant bishop of Pennsylvania. He was for many years an overseer and preacher of Harvard University. In 1881 he declined an invitation to be the sole preacher to the University and professor of Christian Ethics. His influence upon the religious life of the University was deep and wide. In the hearts of the people of his own city and commonwealth, and as years passed, of the whole country, he held a position of unique influence. His character was pure, simple, and great. Just, endowed

"Work" (A Street Scene in Hampstead). By Ford Madox Brown.

(By permission of the Corporation of Manchester.)

of broad, park-lined streets of differing length, the best known of which is the drive from Prospect Park to Coney Island. Brooklyn has long been known as the city of churches, probably from the famous clergymen who formerly lived there. In 1900 there were in the borough 466 churches, of which the Protestant numbered 364 with 129,413 members, and property valued at $16,925,781. The Roman Catholic churches numbered 84, with 307,975 parishioners, and property valued at $10,086,000. The borough contains a large number of hospitals and other eleemosynary institutions, and numerous libraries and educational institutions. Among its libraries are the Brooklyn Library, with (1901) 153,000 volumes; the Brooklyn Public Library, with 40,000; and the Long Island Historical Society Library with 66,000. Among its educational institutions is the Pratt Institute, largely for technical and industrial education, with 3000 students. This school has a fine library of 70,543 volumes. The Brooklyn Institute, founded in 1824, and reorganized in 1890 as the Brooklyn Institute of Arts and Sciences, has a fine building erected by the city, a membership (1900) of 6250, and gives lectures and laboratory practice in twenty-six departments of art and science. The public school system of Brooklyn consisted in 1901 of 1 training, 6 high, 121 elementary, and 1 truant schools; employed 3961 teachers and supervisors, and gave elementary and high school education to 154,542 scholars. In 1900 there were in the borough 354,612 persons of school age (5 to 20 years inclusive). Of a total street mileage of 722 miles, all but 162 miles were paved as follows:—granite blocks, 117 miles; Belgian blocks, 47 miles; asphalt, 82 miles; cobble stone, 227 miles; macadam, 82 miles; brick, 5 miles. Order is maintained by a force of 1838 police, including officers and privates. The provision against fire consists of 62 engines and 17 hook and ladder companies. The water-supply is in public hands; it is derived from streams flowing southwards in the sparsely settled area east of the borough, and also from driven wells in the same region; it is pumped at Ridgewood to a reservoir having a capacity of 375,000,000 gallons, while a small part is re-pumped to a high-service reservoir for the service of the most elevated part of the borough. Besides this system the towns recently annexed have their own water-supply. Within the limits of the borough are 597 miles of public distributing mains. The borough has seven markets, including the immense Wallabout market, which is situated on the water front and has a large wholesale trade.

Although in great part a residential suburb of her greater neighbour on the other side of the East river, Brooklyn has large manufacturing and commercial interests of her own. By the census of 1890 she had 10,583 industrial establishments employing capital to the amount of $161,730,500. The number of employees was 109,292, and to them was paid $65,247,119 in wages. Raw material to the value of $151,060,710 was used, and the value of the products was $269,244,147. These products were varied, no class greatly preponderating; the following list contains the principal items, with the value of the product:—bread and other bakery products, $9,331,523; chemicals, $9,091,609; clothing, $13,941,636; cordage, $6,535,792; foundry and machine-shop products, $15,627,536; malt liquors, $12,004,529; lumber, $5,930,829; slaughtering and meat packing, $13,087,354; sugar refining, $16,629,982. Besides the above, oil refining and ship-building are important industries, and at the present time probably half the sugar supply of the country is refined here. As a commercial port Brooklyn is surpassed only by the borough of Manhattan and by Jersey city. It has 33 miles of water front, that portion bordering on the East river and New York harbour being lined with wharves, docks, warehouses, and elevators, constructed at a cost of hundreds of millions of dollars. Among its docks are the Atlantic Basin, containing 40 acres, and having seven elevators, and the Erie Basin, enclosing about 100 acres, and containing two dry docks, respectively 510 and 610 feet long, besides three floating dry docks. Brooklyn is the principal port in the U.S. for the export of grain, four-fifths of that exported from the port of New York being shipped here. Its elevators have a capacity of 20,000,000 bushels. Steamships of more than twenty regular lines land here, besides many "tramps" and sailing vessels. The U.S. Navy Yard, located here, is the largest in the country, and contains three dry docks, respectively 338, 440, and 627 feet in length on the floor. The borough contains also a U.S. Naval Hospital. Most of the financial operations are carried on upon the opposite side of the East river, yet the borough contains 5 national banks, 16 state banks, 16 savings banks, and 10 trust companies. The assessed valuation of real estate in 1901 was $658,962,119, and of personal property, $89,241,624, a total of $748,203,743. The tax rate for municipal purposes (*i.e.* expenses of New York city as a whole) was 2·03869 per cent.; for local county purposes (expenses of King's county), 0·14908 per cent. additional. The number of marriages in 1900 was 8087, of births 23,073, and of deaths 23,473, showing a death-rate of 20 per thousand. The population of what is now Brooklyn, then King's county, was in 1880, 599,495; in 1890, 838,547; and in 1900, 1,166,582. The towns added to it in 1894 had in 1890 a population as follows:—Flatbush, 12,338; Flatlands, 4075; Gravesend, 6937; New Utrecht, 8854. Of the total population in 1900, 355,697 were foreign-born and 19,673 were coloured, of whom 18,367 were negroes. Of the white population, 1,146,909, comprising 98 3 per cent. of the total population, 353,750 were foreign-born, 482,658 were native-born but of foreign parents, leaving only 310,501, or 27 per cent., native-born of native parents. Out of 332,715 males of voting age (21 years and over), 15,415 were illiterate (unable to write), of whom 14,159 were foreign-born. The death-rate, which in 1890 was 24, had fallen to 19·9 in 1900. (See also NEW YORK CITY.)

Brooks, Phillips (1835-1893), American clergyman and author, was born in Boston, Mass., 13th December 1835. He was son of William Gray and Mary Ann (Phillips) Brooks. Through his father he was descended from the Rev. John Cotton; through his mother, a woman of rare force of character and religious faith, he was a great-grandson of the founder of Phillips Academy, Andover, Mass. Of the six sons, four—Phillips, Frederic, Arthur, and John Cotton—entered the ministry of the Protestant Episcopal Church. He was educated in the Boston Latin School and Harvard College, graduating in 1855. After a short and unsuccessful experience as a teacher in the Boston Latin School, he began in 1856 to study for the ministry of the Protestant Episcopal Church in the Seminary at Alexandria, Virginia. In 1859 he was ordained deacon by Bishop Meade of Virginia, and became rector of the Church of the Advent, Philadelphia. In 1860 he was ordained priest, and in 1862 became rector of the Church of the Holy Trinity, Philadelphia, where he remained seven years, gaining an increasing name as preacher and patriot. Endowed by inheritance with a rich religious character, evangelical traditions, ethical temper, and strong intellect, he developed, by wide reading in ancient and modern literature, a personality and an attitude of mind which appealed to the characteristic thought and life of the period. With Tennyson, Coleridge, Maurice, and F. D. Robertson he was in strong sympathy. During the Civil War he upheld with power the cause of the North and the negro, and his sermon on the death of President Lincoln was an eloquent expression of the character of both men. In 1869 he became rector of Trinity Church, Boston. In 1877 the present church was built, the architect being his friend H. H. Richardson. Here Phillips Brooks preached Sunday after Sunday to great congregations, until he was consecrated bishop of Massachusetts in 1891. In 1886 he declined an election as assistant bishop of Pennsylvania. He was for many years an overseer and preacher of Harvard University. In 1881 he declined an invitation to be the sole preacher to the University and professor of Christian Ethics. His influence upon the religious life of the University was deep and wide. In the hearts of the people of his own city and commonwealth, and as years passed, of the whole country, he held a position of unique influence. His character was pure, simple, and great. Just, endowed

"Work" (A Street Scene in Hampstead). By Ford Madox Brown.

(By permission of the Corporation of Manchester.)

with excellent judgment and a keen sense of humour, he was at the same time quick to respond to any call for sympathy. In physique he was tall and well proportioned, his height being six feet four inches, his weight over 21 stones. When kindled by his subject it seemed to take possession of him and pour itself out with overwhelming speed of utterance, with heat and power. His sympathy with men of other ways of thought and with the truth in other ecclesiastical systems gained for him the confidence and affection of men of varied habits of mind and religious traditions, and was thus a great factor in gaining for the Episcopal Church the devotion of many people and in extending its influence throughout the nation. On 20th April 1891 he was elected sixth bishop of Massachusetts, and on 14th October was consecrated to that office in Trinity Church, Boston. After a brief but great episcopate of fifteen months, he died, unmarried, on 23rd January 1893. The degree of Doctor of Divinity had been conferred upon him by the universities of Harvard, U.S.A., and of Cambridge, England. In 1877 he published a course of lectures upon preaching, which he delivered at the Theological School of Yale University, and which are an expression of his own experience. In 1879 appeared the Bohlen Lectures on "The Influence of Jesus." In 1878 he published his first volume of sermons, and from time to time issued other volumes, including *Sermons Preached in English Churches* in the summer of 1882.

In 1901 was published, in two volumes, *Phillips Brooks, Life and Letters*, by the Rev. A. V. G. Allen, D.D., Professor of Ecclesiastical History, Episcopal Theological School, Cambridge, Mass. (W. L.)

Broughty Ferry, a police burgh and watering-place of Forfarshire, Scotland, on the north shore of the Firth of Tay, 3½ miles E. of Dundee by rail. The Castle of Broughty (Burgh Tay, 1498) is mounted with some heavy guns and garrisoned by a few artillerymen. There is a small fishing industry. There are a Dundee Convalescent Home, three public parks, and also several high-class private schools. Population (1881), 7407; (1901), 10,482.

Brown, Ford Madox (1821-1893), English painter, was born at Calais on 16th April 1821. His father was Ford Brown, a retired purser in the navy; his mother, Caroline Madox, of an old Kentish family. His paternal grandfather had been Dr John Brown, a Scotsman of humble origin, who established the so-called Brunonian Theory of Medicine, introducing principles and practice which are now allowed to be in great measure reforms. Ford Madox Brown was the only child of his parents, save for a daughter who died young. In childhood he was shifted about a good deal between France and England; and having shown from the age of six or seven a turn for drawing, he was taken, when aged fourteen and with meagre acquirements in the way of general tuition, to Bruges, and placed under the instruction of Gregorius, a pupil of the celebrated David. His principal instructor however, from about 1837, was Baron Wappers, of Antwerp, then regarded as a great light of the Belgian school. From him the youth learned the technique not only of oil painting but of various other branches of art. At a very early age Brown attained a remarkable degree of force in drawing and painting, as attested by an extant oil-portrait of his father, done at an age not exceeding fifteen. His first composition, towards 1836, represented a blind beggar and his child; his first exhibited work, 1837, was "Job on the Ash-heap"; the first exhibited work in London (at the Royal Academy, 1840), "The Giaour's Confession," from Byron's poem. Both his parents died before 1840, leaving to the young painter a moderate competence, which soon was materially reduced. In 1840 Brown completed a large picture, "The Execution of Mary Queen of Scots," strong in dramatic effect and in handling, with rather sombre colour; from this time forth he must be regarded as a proficient artist, independent in his point of view, and strenuous in execution. He contributed to the cartoon competitions, 1844 and 1845, for the Houses of Parliament—"Adam and Eve after the Fall," "The Body of Harold brought to William the Conqueror," and "The Spirit of Justice." These highly remarkable cartoons passed not wholly unobserved, but not one of them obtained a prize. The years 1840 to 1845 were passed in Paris, London, and Rome: towards the middle of 1846 Brown settled permanently in London. In 1841 he married his cousin Elizabeth Bromley, who died of consumption in 1846, leaving a daughter, Lucy, who in 1874 became the wife of William M. Rossetti. Not long after being left a widower, Brown took a second wife, Emma Hill, who figures in many of his pictures. She had two children who grew up: Catherine, who married Dr Franz Hueffer, the musical scholar and critic, and Oliver, who died in 1874 in his twentieth year. All the three children showed considerable ability in painting, and Oliver in romance as well. The second Mrs Brown died in 1890.

The most marked distinction of Brown as an artist may be defined as vigorous invention of historic or dramatic scenes, carried out with a great regard to individuality in the personages, expressions, and accessories of incident and detail, not excluding the familiar, the peculiar, and the semi-grotesque, when these seem to subserve the general intent. Owing, however, to his association with artists of the so-called "pre-Raphaelite" movement (which began late in 1848), and especially with Dante Gabriel Rossetti, who received some training in his studio in the spring of that year, he has been regarded sometimes as the precursor or initiator of this movement, and sometimes as a direct co-operator in it. His claim to be regarded as a precursor or initiator is not strong; though it is true that even before 1841 he had pondered the theory (not then much in vogue) that a picture ought to present the veritable light and shade proper to some one moment in the day, and his "Manfred on the Jungfrau" (1841) exemplifies this principle to some extent; it re-appears in his very large picture of "Chaucer at the Court of Edward III." (now in the public gallery of Sydney, Australia), which, although projected in 1845, was not brought to completion until 1851. As to becoming a direct co-operator in the pre-Raphaelite movement, he did not join the "Brotherhood," though it would have been open to him to do so; but for some years his works exhibited a marked influence derived from the movement, not on the whole to their clear advantage. The principal pictures of this class are: "The Pretty Baa-lambs"; "Work" (a street scene at Hampstead, see Plate); and "The Last of England" (an emigration subject, one of his most excellent achievements); dating between 1851 and 1863. "Christ Washing Peter's Feet" (now in the National Gallery of British Art) comes within the same range of dates, and is a masterly work; here the pre-Raphaelite influence is less manifest. Altogether it may be averred that the conception and introduction of the pre-Raphaelite scheme, such as it appeared to the public eye in 1849 and 1850, belong to Millais, Holman Hunt, and Rossetti, rather than to Brown.

Other leading pictures by Brown are the following:—"Cordelia at the Bedside of Lear"; "Shakespeare"; "Jacob and Joseph's Coat"; "Elijah and the Widow's Son"; "Cordelia's Portion"; "The Entombment"; "Romeo and Juliet" (the parting on the balcony); "Don Juan and Haidee"; "Crom-

well on his Farm"; "Cromwell, Protector of the Vaudois":—covering the period from 1849 to 1877. "Sardanapalus and Myrrha," begun within the same period, was finished later. He produced, moreover, a great number of excellent cartoons for stained glass, being up to 1874 a member of the firm of decorative art, Morris, Marshall, Faulkner, and Co. He also executed, in colours or in crayons, various portraits, including his own. From 1878 he was almost engrossed by work which he undertook for the town hall of Manchester, and which entailed his living for some few years in that city—twelve large wall paintings, some of them done in a modified form of the Gambier-Parry process, and others in oils on canvas applied to the wall surface. They present a compendium of the history of Manchester and its district, from the building of the Roman camp at Mancunium to the experimental work of Dalton in elaborating the Atomic Theory. This is an extremely fine series, though with some diversity of individual merit in the paintings, and is certainly the chief representative, in the United Kingdom, of any such form of artistic effort—if we leave out of count the works (by various painters) in the Houses of Parliament.

Madox Brown was never a popular or highly-remunerated artist. Up to near middle age he went through trying straits in money matters; afterwards his circumstances improved, but he was not really well off at any time. In youth he followed the usual course as an exhibiting painter, but after some mortifications and heart-burnings he did little in this way after 1852. He held, however, in 1865, an exhibition of his own then numerous paintings and designs. He also delivered a few lectures on fine art from time to time. From 1868 he suffered from gout; and this led to an attack of apoplexy, from which he died (in St Edmund's Terrace, London) on 6th October 1893. He was a man of upright, independent, and honourable character, of warm affections, a steady and self-sacrificing friend; but he took offence rather readily, and viewed various persons and institutions with a degree of suspicion which may be pronounced excessive. He felt interest in many questions outside the range of his art, and, being a good and varied talker, had often something apposite and suggestive to say about them. On more than one occasion he exerted himself very zealously for the benefit of the working classes. In politics he was a consistent Democrat, and on religious questions an Agnostic.

The life of this artist has been well written by his grandson, Ford M. Hueffer, in a handsomely-illustrated volume named *Ford Madox Brown*, London, 1896. This volume contains some extracts from Brown's diary, extending in the whole from 1847 to 1865; and other lengthier extracts appear in two books edited by William M. Rossetti — *Ruskin, Rossetti, Pre-Raphaelitism*, 1899, and *Pre-Raphaelite Diaries and Letters*, 1899. See also the *Preferences in Art, &c.*, by Harry Quilter, 1892. (W. M. R.)

Brown, Thomas Edward (1830-1897), English poet, scholar, and divine, was born on 5th May 1830, at Douglas, Isle of Man, where his father, the Rev. Robert Brown, held the living of St Matthew's—a homely church in a poor district. His mother came of Scottish parentage, though born in the island. Thomas, the sixth of ten children, was but two years old when the family removed to Kirk Braddan Vicarage, a short distance from Douglas, where his father (a scholar of no university, but so fastidious about composition that he would have some sentences of an English classic read to him before answering an invitation) took share with the parish schoolmaster in tutoring the clever boy until, at the age of fifteen, he was entered at King William's College. Here his abilities soon declared themselves, and hence he proceeded to Christ Church, Oxford, where his position (as a servitor) cost him much humiliation, which he remembered to the end of his life. He won a double first, however, and was elected a fellow of Oriel in April 1854, Dean Gaisford having refused to promote him to a senior studentship of his own college, on the ground that no servitor had ever before attained to that honour. Although at that time an Oriel fellowship conferred a deserved distinction, Brown never took kindly to the life, but, after a few terms of private pupils, returned to the Isle of Man as vice-principal of his old school. He had been ordained deacon, but did not proceed to priest's orders for many years. In 1857 he married his cousin, Miss Stowell, daughter of Dr Stowell of Ramsey, and soon afterwards left the island once more to become headmaster of the Crypt School, Gloucester—a position which in no long time he found intolerable. From Gloucester he was summoned by the Rev. John Percival (afterwards Bishop of Hereford), who had recently been appointed to the struggling young foundation of Clifton College, which he soon raised to be one of the great public schools. Percival wanted a master for the modern side, and made an appointment to meet Brown at Oxford; "and there," he writes, "as chance would have it, I met him standing at the corner of St Mary's Entry, in a somewhat Johnsonian attitude, four-square, his hands deep in his pockets to keep himself still, and looking decidedly volcanic. We very soon came to terms, and I left him there under promise to come to Clifton as my colleague at the beginning of the following term." At Clifton Brown remained from September 1863 to July 1892, when he retired—to the great regret of boys and masters alike, who had long since come to regard "T. E. B.'s" genius, and even his eccentricities, with a peculiar pride—to spend the rest of his days upon the island he had worshipped from childhood and often celebrated in song. His poem, "Betsy Lee," appeared in *Macmillan's Magazine* (April and May 1873), and was published separately in the same year. It was included in *Fo'c's'le Yarns* (1881), which reached a second edition in 1889. This volume included at least three other notable poems—"Tommy Big-eyes," "Christmas Rose," and "Captain Tom and Captain Hugh." It was followed by *The Doctor and other Poems* (1887), *The Manx Witch and other Poems* (1889), and *Old John and other Poems* (a volume mainly lyrical) (1893). Since his death all these and a few additional lyrics and fragments have been published in one volume by Messrs Macmillan under the title of *The Collected Poems of T. E. Brown* (1900). His familiar letters (edited in two volumes by an old friend, Mr S. T. Irwin, in 1900) bear witness to the zest he carried back to his native country, although his thoughts often reverted to Clifton. In October 1897 he returned to the school on a visit. He was the guest of one of the house-masters, and on Friday evening, 29th October, he gave an address to the boys of the house. He had spoken for some minutes with his usual vivacity, when his voice grew thick and he was seen to stagger. He died in less than two hours. Brown's more important poems are narrative, and written in the Manx dialect, with a free use of pauses, and sometimes with daring irregularity of rhythm. A rugged tenderness is their most characteristic note; but the emotion, while almost equally explosive in mirth and in tears, remains an educated emotion, disciplined by a scholar's sense of language. They breathe the fervour of an island patriotism (humorously aware of its limits) and of a simple natural piety. In his lyrics he is happiest when yoking one or the other of these emotions to serve a philosophy of life, often audacious, but always genial. (A. T. Q.-C.)

Browne, Hablôt Knight, (1815-1882), English artist, famous chiefly as "Phiz," the illustrator of the best-known books by Charles Dickens, Charles

Lever, and Harrison Ainsworth in their original editions. His talents in other directions of art were of a very ordinary kind. As an interpreter and illustrator of Dickens's characters, "Phiz," as he nearly always signed his drawings, was in some respects the equal of his rivals Cruikshank and Leech, while, in his own way, he excelled them both. Browne was of Huguenot extraction and was born in Lambeth on 11th June 1815. His father dying early, left the family badly off. From the first, Browne showed a disposition towards art, and, after a moderate education, was apprenticed to Finden, the eminent engraver on steel, in whose studio Browne obtained his only artistic education. To engraving, however, he was entirely unsuited, and having in 1833 secured an important prize from the Society of Arts for a drawing of "John Gilpin," he abandoned engraving in the following year and took to other artistic work, with the ultimate object of becoming a painter. In the spring of 1836 the great event in the life of the artist took place, when he met Charles Dickens. It was at the moment when the serial publication of *Pickwick* was in danger from the want of a capable interpreter for the illustrations. Dickens knew Browne slightly as the illustrator of his little pamphlet *Sunday under Three Heads*, and probably this slight knowledge of his work stood the draughtsman in good stead. In the original edition of *Pickwick*, issued in shilling monthly parts from early in 1836 until the end of 1837, the first seven plates were drawn by Robert Seymour, a clever illustrator who committed suicide in April 1836. The next two plates were by R. W. Buss, an otherwise successful portrait-painter and lecturer, but they were so poor that a change was imperative. So thought the publishers, and so also did both H. K. Browne and W. M. Thackeray, who called independently at the publishers' office with specimens of their powers for Dickens's inspection. The novelist preferred Browne. Browne's first two etched plates for *Pickwick* were signed "Nemo," but the third was signed "Phiz," a pseudonym which was retained in future. When asked to explain why he chose this name he answered that the change from "Nemo" to "Phiz" was made "to harmonize better with Dickens's Boz." Possibly Browne adopted it to conceal his identity, hoping one day to become famous as a painter. It is to be noted, however, that "Phiz" is usually attached to his better work and H. K. B. to his less successful drawings. "Phiz" undoubtedly created Sam Weller, so far as his well-known figure is concerned, as Seymour had created Pickwick. Dickens and "Phiz" were personally good friends in early days, and in 1838 travelled together to Yorkshire to see the schools of which Nicholas Nickleby became the hero; afterwards they made several journeys of this nature in company to facilitate the illustrator's work. The other Dickens characters which "Phiz" realized most successfully are perhaps Squeers, Micawber, Guppy, Major Bagstock, Mrs Gamp, Tom Pinch, and, above all, David Copperfield. Of the books by Dickens which "Phiz" illustrated the best are *David Copperfield*, *Pickwick*, *Dombey and Son*, *Martin Chuzzlewit*, and *Bleak House*. Browne made several drawings for *Punch* in early days and also towards the end of his life; his chief work in this direction being the clever design for the wrapper which was used for eighteen months from January 1842. He also contributed to *Punch's Pocket Books*. In addition to his work for Dickens, "Phiz" illustrated over twenty of Lever's novels (the most successful being *Harry Lorrequer*, *Charles O'Malley*, *Jack Hinton*, and the *Knight of Gwynne*). He also illustrated Harrison Ainsworth's and Frank Smedley's novels. *Mervyn Clitheroe* by Ainsworth is one of the most admirable of the artist's works. Browne was in continual employment by publishers until 1867, when a shock of paralysis ruined his artistic career. Although he recovered slightly and made many illustrations on wood, they were by comparison inferior productions, which the draughtsman's admirers would willingly ignore. In 1878 his affairs became so straitened that he was awarded an annuity by the Royal Academy. He gradually became worse in health until he died, 8th July 1882, at the age of sixty-seven. He was buried at Brighton. Browne was a facile draughtsman who readily grasped the intention of the writer he was illustrating. Occasionally he made an error, but it was usually because his pencil went on to delineate what the author may have intended but had not described. His illustrations are full of rollicking good-humour, and having a tendency to caricature they suit Dickens's and Lever's works admirably.

Most of Browne's work was etched on steel plates because these yielded a far larger edition than copper. Browne was annoyed at some of his etchings being transferred to stone by the publishers and printed as lithographic reproductions. Partly with the view to prevent this treatment of his work he employed a machine to rule a series of lines over the plate in order to obtain what appeared to be a tint; when manipulated with acid this tint gave an effect somewhat resembling mezzotint, which at that time it was found practically impossible to transfer to stone. The illustrations executed by Browne are particularly noteworthy because they realized exactly what the reader most desired to see represented. So skilful was he in drawing and composition that no part of the story was avoided by reason of the elaborateness of the subject. Whatever was the best incident for illustration was always the one selected.

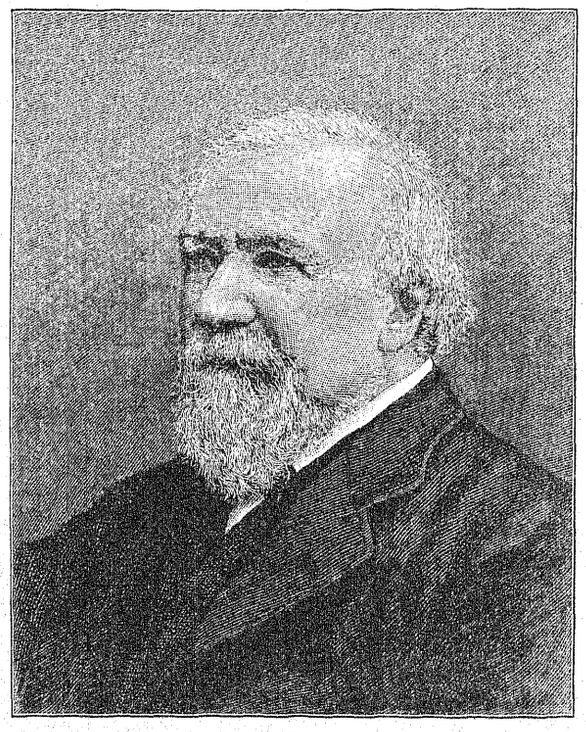
D. Croal Thomson. *Hablôt Knight Browne, "Phiz": Life and Letters*. London, 1884.—John Forster. *Life of Charles Dickens*. London, 1871-74.—F. G. Kitton. *"Phiz": A Memoir*. London, 1882.—*Charles Dickens and his Illustrators*. London, 1899.—M. H. Spielmann. *The History of Punch*. London, 1895.

(D. C. T.)

Brownhills, a village of Staffordshire, England, in the Lichfield division of the county, 6 miles W. of the town of Lichfield, with stations on the North-Western and Midland railways, and near the Essington canal. Since 1894 it has been governed by an urban district council. There are extensive coal-mines in the district. The population of the urban district in 1891 was 11,820; in 1901, 15,252.

Browning, Robert (1812-1889), the great English poet, born at Camberwell, London, on 7th May 1812, was the son of Robert Browning, who for fifty years was employed in the Bank of England. Earlier Brownings had been settled in Wiltshire and Dorsetshire, and there is no ground for the statement that the family was partly of Jewish origin. The poet's mother was a daughter of William Weidemann, a German who had settled in Dundee and married a Scottish wife. His parents had one other child, a daughter, Sarianna, born in 1814. They lived quietly in Camberwell. The elder Browning had a sufficient income and was indifferent to money-making. He had strong literary and artistic tastes. He was an ardent book collector, and so good a draughtsman that paternal authority alone prevented him from adopting an artistic career. He had, like his son, a singular faculty for versifying, and helped the boy's early lessons by twisting the Latin grammar into grotesque rhymes. He lived, as his father had done, to be 84, with unbroken health. The younger Robert inherited, along with other characteristics, much of his father's vigour of constitution. From the mother, who had delicate health, he probably derived his excessive nervous irritability; and from her, too, came his passion for music. The family was united by the strongest mutual affection, and the parents erred, if anything, on the side of indulgence. Browning was sent to a school in the neighbourhood, but left it when fourteen, and had little other teaching. He had a French tutor for the next two years, and in his eighteenth year he attended some Greek lectures at the London University. At school he never won a prize,

though it was more difficult to avoid than to win prizes. He was more conspicuous for the love of birds and beasts, which he always retained, than for any interest in his lessons. He rather despised his companions and made few friends. A precocious poetical capacity, however, showed itself in extra-scholastic ways. He made his schoolfellows act plays, partly written by himself. He had composed verses before he could write, and when twelve years old completed a volume of poems called *Incondita*. His parents tried unsuccessfully to find a publisher; but his verses were admired by Sarah Flower Adams, a well-known hymn-writer of the day, and by W. J. Fox, both of whom became valuable friends. A copy made by Miss Flower was in existence in 1871, but afterwards destroyed by the author. Browning had the run of his father's library, and acquired a very unusual amount of miscellaneous reading. Quarles' *Emblems* was an especial favourite; and besides the Elizabethan dramatists and standard English books, he had read all the works of Voltaire. Byron was his first master in poetry, but about the age of fourteen he fell in accidentally with Shelley and Keats. For Shelley in particular he conceived an enthusiastic admiration which lasted for many years, though it was qualified in his later life.



ROBERT BROWNING.
(From a photograph by Elliott and Fry, London.)

The more aggressive side of Browning's character was as yet the most prominent; and a self-willed lad, conscious of a growing ability, found himself cramped in Camberwell circles. He rejected the ordinary careers. He declined the offer of a clerkship in the Bank of England; and his father, who had found the occupation uncongenial, not only approved the refusal but cordially accepted the son's decision to take poetry for his profession. For good or evil, Browning had been left very much to his own guidance, and if his intellectual training suffered in some directions, the liberty permitted the development of his marked originality. The parental yoke, however, was too light to provoke rebellion. Browning's mental growth led to no violent breach with the creeds of his childhood. His parents became Dissenters in middle life, but often attended Anglican services; and Browning, though he abandoned the dogmas, continued to sympathize with the spirit of their creed. He never took a keen interest in the politics of the day, but cordially accepted the general position of contemporary Liberalism. His worship of Shelley did not mean an acceptance of his master's hostile attitude towards Christianity, still less did he revolt against the moral discipline under which he had been educated. He frequented literary and artistic circles, and was passionately fond of the theatre; but he was entirely free from a coarse Bohemianism, and never went to bed, we are told, without kissing his mother. He lived with his parents until his marriage. His mother lived till 1849, and his father till 1866, and his affectionate relations to both remained unaltered. Browning's first published poem, *Pauline*, appeared anonymously in 1833. He always regarded it as crude, and only consented with reluctance to republishing it in the collected works of 1868. The indication of genius was recognized by W. J. Fox, who hailed it in the *Monthly Repository* as marking the advent of a true poet. *Pauline* contains an enthusiastic invocation of Shelley, whose influence upon its style and conception is strongly marked. It is the only one of his works which can be regarded as imitative; and Browning's personality was fully revealed in his next considerable poems, *Paracelsus* (1835) and *Sordello* (1840). The three, however, form a group. In an essay (prefixed to the spurious Shelley letters of 1851), Browning describes Shelley's poetry "as a sublime fragmentary essay towards a presentment of the correspondency of the universe to Deity." The phrase describes his own view of the true functions of a poet, and Browning, having accepted the vocation, was meditating the qualifications which should fit him for his task. The hero of *Pauline* is in a morbid state of mind which endangers his fidelity to his duty. *Paracelsus* and *Sordello* are studies in the psychology of genius, illustrating its besetting temptations. *Paracelsus* fails from intellectual pride, not balanced by love of his kind, and from excessive ambition, which leads him to seek success by unworthy means. *Sordello* is a poet distracted between the demands of a dreamy imagination and the desire to utter the thoughts of mankind. He finally gives up poetry for practical politics, and gets into perplexities only to be solved by his death. *Pauline* might in some indefinite degree reflect Browning's own feelings, but in the later poems he adopts his characteristic method of speaking in a quasi-dramatic mood. They are, as he gave notice, "poems, not dramas." The interest is not in the external events, but in the "development of a soul"; but they are observations of other men's souls, not direct revelations of his own. *Paracelsus* was based upon a study of the original narrative, and *Sordello* was a historical, though a very indefinite person. The background of history is intentionally vague in both cases. There is one remarkable difference between them. The *Paracelsus*, though full of noble passages, is certainly diffuse. Browning heard that John Sterling had complained of its "verbosity," and tried to remedy this failing by the surgical expedient of cutting out the usual connecting words. Relative pronouns henceforth become scarce in his poetry, and the grammatical construction often a matter of conjecture. Words are forcibly jammed together instead of being articulately combined. To the ordinary reader many passages in his later work are both crabbed and obscure, but the "obscurity" never afterwards reached the pitch of *Sordello*. It is due to the vagueness with which the story is rather hinted than told, as well as to the subtlety and intricacy of the psychological

expositions. The subtlety and vigour of the thought are indeed surprising, and may justify the frequent comparisons to Shakespeare; and it abounds in descriptive passages of genuine poetry.

Still, Browning seems to have been misled by a fallacy. It was quite legitimate to subordinate the external incidents to the psychological development in which he was really interested, but to secure the subordination by making the incidents barely intelligible was not a logical consequence. We should not understand Hamlet's psychological peculiarities the better if we had to infer his family troubles from indirect hints. Browning gave more time to *Sordello* than to any other work, and perhaps had become so familiar with the story which he professed to tell that he failed to make allowance for his readers' difficulties. In any case it was not surprising that the ordinary reader should be puzzled and repelled, and the general recognition of his genius long delayed, by his reputation for obscurity. It might, however, be expected that he would make a more successful appeal to the public by purely dramatic work, in which he would have to limit his psychological speculation and to place his characters in plain situations. *Paracelsus* and *Sordello* show so great a power of reading character and appreciating subtler springs of conduct that its author clearly had one, at least, of the most essential qualifications of a dramatist.

Before *Sordello* appeared Browning had tried his hand in this direction. He was encouraged by outward circumstances as well as by his natural bent. He was making friends and gaining some real appreciative admirers. John Forster had been greatly impressed by *Paracelsus*. Browning's love of the theatre had led to an introduction to Macready in the winter of 1835-36; and Macready, who had been also impressed by *Paracelsus*, asked him for a play. Browning consented and wrote *Strafford*, which was produced at Covent Garden on 11th May 1837, Macready taking the principal part. Later dramas were *King Victor and King Charles*, published in 1842, *The Return of the Druses* and *A Blot on the 'Scutcheon* (both in 1843), *Colombe's Birthday* (1844), *Luria* and *A Soul's Tragedy* (both in 1846), and the fragmentary *In a Balcony* (1853). *Strafford* succeeded fairly, though the defection of one of the actors stopped its run after the fifth performance. The *Blot on the 'Scutcheon*, produced by Macready as manager of Drury Lane on 11th February 1843, led to an unfortunate quarrel. Browning thought that Macready had felt unworthy jealousy of another actor, and had gratified his spite by an inadequate presentation of the play. He remonstrated indignantly and the friendship was broken off for years. Browning was disgusted by his experience of the annoyances of practical play-writing, though he was not altogether discouraged. The play had apparently such a moderate success as was possible under the conditions, and a similar modest result was attained by *Colombe's Birthday*, produced at Covent Garden on 25th April 1853. Browning, like other eminent writers of the day, failed to achieve the feat of attracting the British public by dramas of high literary aims, and soon gave up the attempt. It has been said by competent critics that some of the plays could be fitted for the stage by judicious adaptation. The *Blot on the 'Scutcheon* has a very clear and forcibly treated situation; and all the plays abound in passages of high poetic power. Like the poems, they deal with situations involving a moral probation of the characters and often suggesting the ethical problems which always interested him. The speeches tend to become elaborate analyses of motive by the persons concerned, and would try the patience of an average audience, though interesting to an intelligent reader in the closet. For whatever reason, Browning, though he had given sufficient proofs of genius, had not found in these works the most appropriate mode of utterance.

The dramas, after *Strafford*, formed the greatest part of a series of pamphlets called *Bells and Pomegranates*, eight of which were issued from 1841 to 1846. The name, he explained, was intended to indicate an "alternation of poetry and thought." The first number contained the fanciful and characteristic *Pippa Passes*. The seventh, significantly named *Dramatic Romances and Lyrics*, contained some of his most striking shorter poems. In 1844 he contributed some similar poems to *Hood's Magazine* in order to help Hood, then in his last illness. These poems take the special form in which Browning is unrivalled. He wrote very few lyrical poems of the ordinary kind purporting to give a direct expression of his own personal emotions. But, in the lyric which gives the essential sentiment of some impressive dramatic situation, he has rarely been approached. There is scarcely one of the poems published at this time which can be read without fixing itself at once in the memory as a forcible and pungent presentation of a characteristic mood. Their vigour and originality failed to overcome at once the presumption against the author of *Sordello*. Yet Browning was already known to and appreciated by such literary celebrities of the day as Talfourd, Leigh Hunt, Procter, Monckton Milnes, Carlyle, and Landor. His fame began to spread among sympathetic readers. The *Bells and Pomegranates* attracted the rising school of "pre-Raphaelites," especially D. G. Rossetti, who guessed the authorship of the anonymous *Pauline* and made a transcript from the copy in the British Museum. But his audience was still select.

Another recognition of his genius was of incomparably more personal importance and vitally affected his history. In 1844, Miss Barrett published a volume of poems containing "Lady Geraldine's Courtship," with a striking phrase about Browning's poems. He was naturally gratified, and her special friend and cousin, John Kenyon, encouraged him to write to her. She admitted him to a personal interview after a little diffidence, and a hearty appreciation of literary genius on both sides was speedily ripened into genuine and most devoted love. Miss Barrett was three years older than Browning and a confirmed invalid with shaken nerves. She was tenderly attached to an autocratic father who objected on principle to the marriage of his children. The correspondence of the lovers (published in 1899) shows not only their mutual devotion, but the chivalrous delicacy with which Browning behaved in a most trying situation. Miss Barrett was gradually encouraged to disobey the utterly unreasonable despotism. They made a clandestine marriage on 12th September 1846. The state of Miss Barrett's health suggested misgivings which made Browning's parents as well as his bride's disapprove of the match. She, however, appears to have become stronger for some time, though always fragile and incapable of much active exertion. She had already been recommended to pass a winter in Italy. Browning had made two previous tours there, and his impressions had been turned to account in *Sordello* and *Pippa Passes*. For the next fifteen years the Brownings lived mainly in Italy, making their headquarters at Florence. A couple of winters were passed in Rome. In the summer of 1849 they were at Siena, where Browning was helpful to Landor, then in his last domestic troubles. They also visited England and twice spent some months in Paris. Their only child, Robert Weidemann Browning, was born at Florence in 1849. Browning's literary activity during his marriage seems to have been comparatively small; though the two volumes called *Men and Women* (1855) contained

some of his best work and showed that his power was still growing. His position involved some sacrifice and imposed limitations upon his energies. Mrs Browning's health required a secluded life; and Browning, it is said, never dined out during his marriage, though he enjoyed society and made many and very warm friendships. The only breach of complete sympathy with his wife was due to his contempt for "spiritualists" and "mediums," in whom she fully believed. His portrait of the notorious Home as "Sludge" only appeared after her death. This domestic happiness, however, remained essentially unbroken until she died on 29th June 1861. The whole love-story had revealed the singular nobility of his character, and, though crushed for a time by the blow, he bore it manfully. Browning determined to return to England and superintend his boy's education at home. He took a house in Warwick Crescent, Bayswater, and became gradually acclimatized in London. He resumed his work and published the *Dramatis Personæ* in 1864. The publication was well enough received to mark the growing recognition of his genius, which was confirmed by *The Ring and the Book*, published in four volumes in the winter of 1868-69. In 1867 the University of Oxford gave him the degree of M.A. "by diploma," and Balliol College elected him as an honorary fellow. In 1868 he declined a virtual offer of the rectorship of St Andrews. He repeated the refusal on a later occasion (1884) from a dislike to the delivery of a public address. The rising generation was now beginning to buy his books; and he shared the homage of thoughtful readers with Tennyson, though in general popularity he could not approach his friendly rival. *The Ring and the Book* has been generally accepted as Browning's masterpiece. It is certainly most characteristic. The audacity of the scheme is surprising. To tell the story of a hideous murder twelve times over, to versify the arguments of counsel and the gossip of quidnuncs, and to insist upon every detail with the minuteness of a law report, could have occurred to no one else. The poem is so far at the opposite pole from *Sordello*. Vagueness of environment is replaced by a photographic distinctness, though the psychological interest is dominant in both. Particular phrases may be crabbed, but nothing can be more distinct and vivid in thought and conception. If some of those "dramatic monologues" of which the book is formed fail to be poetry at all, some of them—that of Pompilia the victim, her champion Caponsacchi, and the Pope who gives judgment—are in Browning's highest mood, and are as impressive from the ethical as from the poetical point of view. Pompilia was no doubt in some respects an idealized portrait of Mrs Browning. Other pieces may be accepted as a background of commonplace to throw the heroic into the stronger relief. *The Ring and the Book* is as powerful as its method is unique.

Browning became gentler and more urbane as he grew older. His growing fame made him welcome in all cultivated circles, and he accepted the homage of his admirers with dignity and simplicity. He exerted himself to be agreeable in private society, though his nervousness made him invariably decline ever to make public speeches. He was an admirable talker, and took pains to talk his best. A strong memory supplied him with abundant anecdotes; and though occasionally pugnacious, he allowed a fair share of the conversation to his companions. Superficial observers sometimes fancied that the poet was too much sunk in the man of the world; but the appearance was due to his characteristic reluctance to lay bare his deeper feelings. When due occasion offered, the underlying tenderness of his affections was abundantly manifest. No one could show more delicate sympathy. He made many warm personal friendships in his later years, especially with women, to whom he could most easily confide his feelings. In the early years of this period he paid visits to country houses, but afterwards preferred to retire farther from the London atmosphere into secluded regions. He passed some holidays in remote French villages, Pornic, Croisic, and St Aubyn, which have left traces in his poetry. At St Aubyn he had the society of J. Milsand, a French writer who had shown his warm appreciation of Browning's poetry by an article in the *Revue des Deux Mondes*, which in 1852 had led to a personal friendship lasting till Milsand's death in 1886. Browning sent to him the proof-sheets of all his later works for revision. In 1877 Browning was at La Saisiaz on the Salève, near Geneva, where an old friend, Miss Egerton Smith, was staying. She died suddenly almost in his presence. She had constantly accompanied him to concerts during his London life. After her death he almost ceased to care for music. The shock of her loss produced the singular poem called *La Saisiaz*, in which he argues the problem of personal immortality with a rather indefinite conclusion. In later years Browning returned to Italy and passed several autumns at Venice. He never visited Florence after his wife's death there.

Browning's literary activity continued till almost the end of his life. He wrote constantly, though he composed more slowly. He considered twenty-five or thirty lines to be a good day's work. His later writings covered a very great variety of subjects, and were cast in many different forms. They show the old characteristics and often the old genius. Browning's marked peculiarity, the union of great speculative acuteness with intense poetical insight, involved difficulties which he did not always surmount. He does not seem to know whether he is writing poetry or when he is versifying logic; and when the speculative impulse gets the upper hand, his work suggests the doubt whether an imaginary dialogue in prose would not have been a more effective medium. He is analysing at length when he ought to be presenting a concrete type, while the necessities of verse complicate and obscure the reasoning. A curious example is the *Prince Hohenstiel-Schwangau* (1871), an *alias* for Louis Napoleon. This attempt to show how a questionable hero apologizes to himself recalls the very powerful "Bishop Blougram," and "Sludge, the medium," of earlier works, but becomes prolix and obscure. *Fifine at the Fair* (1872) is another curious speculation containing a defence of versatility in love-making by an imaginary Don Juan. Its occasionally cynical tone rather scandalized admirers, who scarcely made due allowance for its dramatic character. Browning's profound appreciation of high moral qualities is, however, always one main source of his power. In later years he became especially interested in stories of real life, which show character passing through some sharp ordeal. The *Red Cotton Nightcap Country* (1873), describing a strange tragedy which had recently taken place in France, and especially *The Inn Album* (1875), founded on an event in modern English society, are powerful applications of the methods already exemplified in *The Ring and the Book*. The *Dramatic Idyls* (1879 and 1880) are a collection of direct narratives, with less analytical disquisition, which surprised his readers by their sustained vigour. In the last volumes, *Jocoseria* (1883), *Ferishtah's Fancies* (1884), *Parleyings with Certain People* (1887), and *Asolando* (1889), the old power is still apparent, but the hand is beginning to fail. They contain discussions of metaphysical problems, such as the origin of evil, which are interesting as indications of his creed, but can scarcely be regarded as successful either poetically or philosophically.

Another group of poems showed Browning's interest in Greek literature. *Balaustion's Adventure* (1871) includes a "transcript from Euripides," a translation, that is, of part of the *Alcestis*. *Aristophanes' Apology* (1875) included another translation from the *Heraklès*, and in 1877 he published a very literal translation of the *Agamemnon*. This, it seems, was meant to disprove the doctrine that Æschylus was a model of literary style. Browning shared his wife's admiration for Euripides, and takes a phrase from one of her poems as a motto for *Balaustion's Adventure*. In the *Aristophanes' Apology* this leads characteristically to a long exposition by Aristophanes of his unsatisfactory reasons for ridiculing Euripides. It recalls the apologies of "Blougram" and Louis Napoleon, and contains some interesting indications of his poetical theory. Browning was to many readers as much prophet as poet. His religious position is most explicitly, though still not very clearly, set forth in the *Christmas Eve and Easter Day* (1850). Like many eminent contemporaries, he combined a disbelief in orthodox dogma with a profound conviction of the importance to the religious instincts of the symbols incorporated in accepted creeds. *Saul* (1845), *A Death in the Desert* (1864), and similar poems, show his strong sympathy with the spirit of the old belief, though his argumentative works have a more or less sceptical turn. It was scarcely possible, if desirable, to be original on such topics. His admirers hold that he shows an affinity to German metaphysicians, though he had never read their works nor made any express study of metaphysical questions. His distinctive tendency is to be found rather in the doctrine of life and conduct which both suggests and is illustrated by his psychological analyses. A very characteristic thought emphatically set forth in the *Rabbi Ben Ezra* (1864) and the *Grammarian's Funeral* (1855) is that a man's value is to be measured, not by the work done, but by the character which has been moulded. He delights in exhibiting the high moral instinct which dares to override ordinary convictions, or which is content with discharge of obscure duties, or superior to vulgar ambition and capable of self-sacrifice, because founded upon pure love and sympathy for human suffering. Browning's limitations are characteristic of the poetry of strong ethical preoccupations. His strong idiosyncrasy, his sympathy with the heroic and hatred of the base, was hardly to be combined with the Shakespearian capacity for sympathizing with the most varied types of character. Though he deals with a great variety of motive with singularly keen analysis, he takes almost exclusively the moral point of view. That point of view, however, has its importance, and his morality is often embodied in poetry of surpassing force. Browning's love of the grotesque, sometimes even of the horrible, creates many most graphic and indelible portraits. The absence of an exquisite sense for the right word is compensated by the singular power of striking the most brilliant flashes out of obviously wrong words, and forcing comic rhymes to express the deepest and most serious thoughts. Though he professed to care little for motive as apart from human interest, his incidental touches of description are unsurpassably vivid.

The appreciation of Browning's genius became general in his later years, and zeal was perhaps a little heightened by the complacency of disciples able to penetrate a supposed mist of obscurity. The Browning Society, founded in 1881 by Mr Furnivall and Miss Hickey, was a product of this appreciation, and helped to extend the study of the poems. Browning accepted the homage in a simple and friendly way, though he avoided any action which would make him responsible for the publications. He received various honours: the LL.D. degree from Cambridge in 1879, the D.C.L. from Oxford in 1882, and LL.D. from Edinburgh in 1884. He became foreign correspondent to the Royal Academy in 1886. His son, who had settled at Venice, married in 1887, and Browning moved to De Vere Gardens. In the autumn of 1889 he went with his sister to visit his son, and stayed on the way at Asolo, which he had first seen in 1838, when it supplied the scenery of *Pippa Passes*. He was charmed with the place, and proposed to buy a piece of ground and to build upon it a house to be called "Pippa's Tower"—in memory of his early heroine. While his proposal was under consideration he went to his son at Venice. His health had been breaking for some time, and a cold, aggravated by weakness of the heart, brought on a fatal attack. He died on 12th December 1889. He was buried in Westminster Abbey on 31st December. It was suggested that his wife's body should be removed from Florence to be placed beside him; but their son rightly decided that her grave should not be disturbed.

Browning's personal characteristics are so strongly stamped upon all his works that it is difficult to assign his place in contemporary thought. He is unique and outside of all schools. His style is so peculiar that he is the easiest of all poets to parody and the most dangerous to imitate. In spite of his early Shelley worship he is in certain respects more closely related to Wordsworth. Both of them started by accepting the poet's mission as quasi-prophetical or ethical. In other respects they are diametrically contrasted. Wordsworth expounded his philosophy by writing a poetical autobiography. Browning adheres to the dramatic method, of which Wordsworth was utterly incapable. He often protested against the supposition that he put himself into his books. Yet there is no writer whose books seem to readers to be clearer revelations of himself. Nothing, in fact, is more characteristic of a man than his judgments of other men, and Browning's are keen and unequivocal. The revolutionary impulse had died out, and Browning has little to say either of the political questions which had moved Shelley and Byron or of the social problems which have lately become more prominent. He represents the thought of a quieter epoch. He was little interested, too, in the historical or "romantic" aspect of life. He takes his subjects from a great variety of scenes and places—from ancient Greece, mediæval Italy, and modern France and England; but the interest for him is not in the picturesque surroundings, but in the human being who is to be found in all periods. Like Balzac, whom he always greatly admired, he is interested in the eternal tragedy and comedy of life. His problem is always to show what are the really noble elements which are eternally valuable in spite of failure to achieve tangible results. He gives, so far, another version of Wordsworth's doctrine of the cultivation of the "moral being." The psychological acuteness and the subtle analysis of character are, indeed, peculiar to himself. Like Carlyle, with whom he had certain points of affinity, he protests, though rather by implication than direct denunciation, against the utilitarian or materialistic view of life, and finds the divine element in the instincts which guide and animate every noble character. When he is really inspired by sympathy for such emotions he can make his most grotesque fancies and his most far-fetched analyses subservient to poetry of the highest order. It can hardly be denied that his intellectual ingenuity often tempts him to deviate from his true function, and that his observations are not to be excused because they result from an excess, instead of a deficiency, of intellectual acuteness. But the variety of his interests—aesthetic, philosophical, and ethical—is astonishing, and his successes

are poems which stand out as unique and unsurpassable in the literature of his time.

Browning's *Life*, by Mrs. Orr (1891), one of his most intimate friends in later years, and the correspondence with his wife before their marriage, published by his son in 1899, are the main authorities. A collection of Browning's poems in 2 vols. appeared in 1849, another in 3 vols. in 1863, another in 6 vols. in 1868, and a definite edition in 16 vols. in 1888-89. (L. S.)

Brown-Séquard, Charles Edward (1817-1894), the eminent physiologist, was born at Port Louis, Mauritius, on 8th April 1817. His father was an American and his mother a Frenchwoman, but he himself always desired to be looked upon as a British subject, though in the restlessness of his life and the enthusiasm of his disposition characteristics of his mother's nation were plainly visible. After graduating in medicine at Paris in 1840, he returned to Mauritius with the intention of practising there, but he soon went to America, subsequently returning to Paris. In 1859 he migrated to London, and became physician to the National Hospital for the Paralysed and Epileptic. There he stayed for about five years, expounding his views on the pathology of the nervous system in numerous lectures which attracted considerable attention. In 1864 he again crossed the Atlantic, and was appointed professor of Physiology and Nervous Diseases at Harvard. This position he relinquished five years later, to become professor at the École de Médecine in Paris, but in 1873 he again returned to America, and began to practise in New York. Finally, he came back to Paris to succeed Claude Bernard in 1878 as professor of Experimental Medicine in the Collège de France, and he remained there till his death, which occurred on 2nd April 1894. Brown-Séquard was a bold investigator who did not shrink from trying daring experiments even on his own person, and in drawing inferences from his results he seemed to be gifted with a sort of prophetic instinct which enabled him to reach correct conclusions before they were warranted by actually ascertained facts. His researches, which are contained in about 500 essays and papers, some written in French and some in English, cover a wide range, but are especially concerned with the physiology and pathology of the nervous system. Towards the end of his life he gained a certain notoriety among people who would otherwise have taken no interest in his work, by his advocacy of the subcutaneous injection of orchitic substance for the treatment of nervous disorders. In this particular case the beneficial effects of the method are open to question, but in other applications, *e.g.*, the administration of thyroid in myxœdema, good results have been obtained by the system of organotherapy, which is founded on the doctrines he held respecting the importance of the internal secretions of certain organs and their reabsorption into the circulation.

Brownson, Orestes Augustus (1803-1876), American theological, philosophical, and sociological writer, was born in Stockbridge, Vermont, 16th September 1803. Having spent some time in active religious, reformatory, and political (Democratic) work in the interior of New York State, Brownson removed to Chelsea, near Boston, Massachusetts, and at once made himself felt in the movements then agitating New England, which, between 1830 and 1850, was stirred by discussions pertaining to unitarianism, transcendentalism, spiritualism, abolitionism, and various schemes for communistic living. In several of these movements Brownson took an active but independent part, establishing the *Boston Quarterly Review*, mainly written by himself, in 1838. In his religious views he was successively a Presbyterian, a Universalist, and a Unitarian, finally becoming a Roman Catholic in 1844, and so remaining, though the question of the orthodoxy of his writings was at one time submitted to a cardinal by the Pope. In his philosophy Brownson was a more or less independent follower of Comte for a time, and of Cousin, who praised him; he may be said to have taught a modified intuitionalism. In his schemes for social reform he was at first a student of Robert Owen, until his later views led him to accept Roman Catholicism. His first quarterly was followed, in 1844, by *Brownson's Quarterly Review*, in which he expressed his opinions on many themes until its suspension in 1864, and after its revival for a brief period in 1873. Of his numerous publications in book form, the chief during his lifetime were *Charles Elwood, or The Infidel Converted* (1840, autobiographical), and *The American Republic: its Constitution, Tendencies, and Destiny* (1865), in which he based government on ethics, declaring the national existence to be a moral and even a theocratic entity, not depending for validity upon the sovereignty of the people. After his death his son, Henry F. Brownson, collected and published his various political, religious, philosophical, scientific and literary writings, in no less than twenty octavo volumes (Detroit, 1883-87), of which a condensed summary appeared in a single volume, also prepared by his son, entitled *Literary and Political Views* (New York, 1893). Brownson died in Detroit, Michigan, 17th April 1876.

Brownsville, capital of Cameron county, Texas, U.S.A., situated near the southern point of the state, on the Rio Grande, a few miles above its mouth, and opposite Matamoras in Mexico. It is on the Rio Grande railway, by which it is connected with Isabel on the coast. It has some river traffic, and a large trade with Mexico. Population (1880), 4938; (1890), 6134; (1900), 6305.

Broxburn, a mining and manufacturing town and railway station of Linlithgowshire, Scotland, on the Union Canal, $11\frac{5}{8}$ miles W. of Edinburgh by road. It is the centre of the Scottish shale oil trade. There is a public hall, with reading-room. Population (1881), 3066; (1901) 6270.

Bruay, a town in the arrondissement of Béthune, department of Pas-de-Calais, France, on the Lawe, an affluent of the Lys, 16 miles in direct line N.W. of Arras, with station on the railway from Lens to St. Pol. It is situated in a rich coal-mining district. Population (1886), 5052; (1901), 7095.

Bruch, Max (1838-——), German musical composer, son of a city official and grandson of the famous Evangelical cleric, Dr Christian Bruch, was born at Cologne, 6th January 1838. From his mother (*née* Almenräder), a well-known musician of her time, he learnt the elements of music, but under Breidenstein he made his first serious effort at composition at the age of fourteen by the production of a symphony. In 1853 Bruch gained the Mozart Stipendium of 400 gulden per annum for four years at Frankfort-on-Main, and for the following few years studied under Hiller, Reinecke, and Breunung. Subsequently he lived from 1858 to 1861 as pianoforte teacher at Cologne, in which city his first opera (in one act), *Scherz, List und Rache*, was produced in 1858. On his father's death, in 1861, Bruch began a tour of study at Berlin, Leipzig, Vienna, Munich, Dresden, and Mannheim, where his opera *Lorelei* was brought out in 1863. At Mannheim he lived till 1864, and there he wrote some of his best-known works, including the beautiful *Frithjof*. After a further period of travel he became musical-director at Coblenz (1865-67), Hof-kapellmeister at Sondershausen (1867-70), and lived in Berlin (1871-73), where he wrote his *Odysseus*; his first violin

concerto and two symphonies being composed at Sondershausen. After five years at Bonn (1873-78), during which he made two visits to England, Bruch, in 1878, succeeded Stockhausen as conductor of the Stern Choral Union; in 1880 Benedict at the Liverpool Philharmonic; in 1892 von Herzogenberg at the Berlin Hochschule. In 1893 he was given the honorary degree of Mus. Doc. by Cambridge University. Max Bruch has written in almost every conceivable musical form, invariably with straightforward honest simplicity of design. He has a gift of refined melody beyond the common, his melodies being broad and suave and often exceptionally beautiful.

Bruchsal, a town of Germany, grand-duchy of Baden, 20 miles by rail S. of Heidelberg. It has a technical school, a prison constructed on the single-cell system, a gaol for female prisoners, and manufactures of machinery, paper, soap, beer, &c. Population (1885), 11,662; (1895), 12,614; (1900), 13,567.

Bruges (Flemish, *Brugge*), capital of the Belgian province of W. Flanders, 14 miles by rail E. of Ostend, at the junction of the Ghent, Ostend, and Sluys Canals. This delightful town is largely visited for the sake of its old buildings and its art treasures. Its ancient rampart is levelled and turned into a promenade, and its moat is in large part filled up. The manufacture of lace of various kinds employs about 12,000 women, from 4000 to 5000 of whom live in the city. There are also works for the construction of railway material and steam trawlers, brush factories, establishments for smoking herring and other fish, and many nurseries. The canal to Ostend offers an indifferent sea-road, because of its shallowness, sluices, and bridges. The new maritime way, intended to be completed in 1902, includes a port of call on the North Sea at Heyst, and a canal, 26 ft. deep, running in a straight line, 7 miles long, to Bruges, which will then be an inland port (see CANALS). The population, 47,961 in 1875, had fallen to 44,501 in 1880, but since then it has gradually increased to 55,641 in 1900.

See WEALE, *Bruges et ses environs*, 1865; *Stad Brugge, Verslag over het bestuur en den toestand van stads zaken*, 1897; *Compagnie des installations maritimes de Bruges: le port d'escale et le port intérieur de Bruges*, 1898; *Bulletin de la société royale belge de géographie*, 1898.—J. DU FIEF. *Bruges et le nouveau canal maritime.* (J. DU F.)

Brugsch, Heinrich Karl (1827-1894), German Egyptologist, was the son of a Prussian cavalry officer, and was born in the barracks at Berlin, 18th February 1827. He early manifested a great inclination to Egyptian studies, in which, though encouraged by Humboldt, he was almost entirely self-taught. After completing his university course and visiting foreign museums he was sent to Egypt by the Prussian Government in 1853, and contracted an intimate friendship with Mariette. On his return he received an appointment in the Berlin Museum. In 1860 he was sent to Persia on a special mission under Baron Minutoli, travelled over the country, and after Minutoli's death discharged the functions of ambassador. In 1864 he was consul at Cairo, in 1868 professor at Göttingen, and in 1870 director of the school of Egyptology, founded at Cairo by the Khedive. From this post he was unceremoniously dismissed in 1879 by the European controllers of the public revenues, determined to economize at all hazards; and French jealousy prevented his succeeding his friend Mariette at the Boulak Museum in 1883. He afterwards resided principally in Germany until his death on 9th September 1894, but frequently visited Egypt, took part in another official mission to Persia, and organized an Egyptian expedition in the United States. He had been made a pasha by the Khedive in 1881. He published his autobiography in 1894, concluding with a warm panegyric upon British rule in Egypt. Brugsch's services to Egyptology are most important, including the standard ancient Egyptian History (1877), a geographical Dictionary of Ancient Egypt (1877-80); a hieroglyphic-demotic Dictionary (1877-82), and numerous works on the monuments. He also published accounts of his travels in Persia and northern Africa. (R. G.)

Brunei, a state situated in the north-west of Borneo. It has been so diminished in area since the beginning of the 19th century as to have become in comparison with the other states of Borneo territorially insignificant. It formerly included the whole of Northern Borneo, Southern Palawan, and stretched down the west coast as far as Sambas. What remains of this once powerful sultanate is a triangular-shaped territory, the base of the triangle being represented by eighty miles of coast-line, and the two sides by the frontiers of Sarawak. The area, as calculated by one method, is 1686 square miles; by another, 1701 square miles. In 1888 the state was placed under British protection. The country is ruled by a sultan, with absolute powers, whose usually good intentions are thwarted by ministers. The interior people have for centuries been subject to petty oppression, and there is too much of the old spirit left among the Malays to avoid acrimonious dispute and rebellion.

The bulk of its inhabitants, who consist of Malays, Kadayans, Orang Bukits, and a few Muruts, are to be found in and about the capital—also called Brunei—the population of the city being estimated at about 15,000, and the population of the whole territory being about 25,000. The city is prettily situated on the river, with cleared hills in the distance, and a background of heights clothed with magnificent forest. The dwelling-houses are built over the river, on slender piles obtained from the Nibong palm which resists the action of the water for several years. Though there are practically no exports and imports, there is a certain amount of inland commerce, the Brunei Malay usually earning a living as a trader with the interior tribes of Sarawak and British North Borneo. Some of them are skilled workers of brass, and the Brunei women make very beautiful cloth, interwoven and embroidered with gold thread. Sago is worked in Tutong and Balait, the two most important rivers in Brunei territory, but only a small quantity of rice is cultivated.

The history of this ancient and decaying sultanate is of great interest. Brunei or, as it is called by the natives, Brunei or Darul-Salam (city of peace), possesses a historic tablet of stone upon which, in A.H. 1221 (1804), was engraved in Malay characters the genealogy of the sovereigns who have ruled over the country. The engraving was the work of Datu Imaum Yakub, the high priest at the time, who received the genealogy from the lips of Merhoum Bongsu, otherwise the Sultan Muadin, and Sultan Kemal-Udin, who ordered this record of their forefathers to be written. This stone tablet now stands on the tomb of Sultan Mahommed Jemal-ul-Alam at the foot of Panggal hill, in the city of Brunei. The Selesilah, or Book of Descent, is kept in the palace by the present sultan. The other heirlooms which are also kept in the sultan's palace, and which descend to each sultan in turn, are the "Nobab Nagara" (two royal drums) from Johore and Menang-Kabau, and the "Gunta Alamat" (bells), the gift of Sultan Bahkei of Johore or Malacca. The first sultan of Brunei was Alak-ber-Tata, who was probably of Bisaya stock, and who governed the country before the introduction of Islam, in the 15th century. He assumed the name of Mahommed on his conversion to Islam, which was brought about during a visit to the Malay peninsula. Brunei, at this time, was a dependency of Menjapahit (Java), and paid a yearly tribute of a jar of areca juice obtained from the young green nuts of the areca palm, and of no monetary value. The Hindu kingdom of Menjapahit was destroyed by the Mahommedans in 1478, and Brunei is mentioned in the history of Java as one of the countries conquered by Adaya Mingrat, the general of Angka Wijaya. Sultan Mahommed's only child was a daughter. His brother Akhmed married the daughter of Ong Chum Ping, a Chinese officer said to have been sent by his emperor to obtain a

jewel from mount Kina Balu in North Borneo, and was the successor of Sultan Mahommed in the sovereignty of Brunei. He was succeeded by Sultan Berkat, an Arab Serif of high rank, from the country of Taif in Arabia, who had married Sultan Akhmed's only child. Sultan Berkat built a mosque and enforced Mahommedan law, and with the assistance of the Chinese built the stone wall, by sinking forty junks filled with rock across the mouth of the Brunei river, between the islands of Kaya Orang and Chermin, which is still in existence. This work was completed before the arrival of Pigafetta in 1521. In the reign of Sultan Bulkeiah Magellan's squadron anchored off the mouth of Brunei river in August 1521, and Pigafetta makes mention of the splendid court and the imperial magnificence of the Borneo capital. Sultan Bulkeiah was otherwise known as Nakoda Ragam, and was the great warrior of Brunei who voyaged to Java, Malacca, Luzon, and all round the coast of Borneo. His tomb, which is handsomely built of stone, is still to be seen in Brunei, and is constantly visited by Malays, who leave money and various articles on the tomb as offerings to his memory. Others, again, come and take away anything they can find, which they keep as charms and mementos. The Spaniards captured Brunei in 1580, the reigning sultan and his court retiring to Suai in the Baram district. The invaders were compelled to evacuate the place, however, in consequence of the heavy losses they sustained in the numerous attempts made for its recovery. The golden age of Brunei was nevertheless at an end, and there is little more of striking importance to record. Disputed successions and civil war, maladministration and the untrustworthiness of the Malay character, caused a steady decline in prosperity. The East India Company started a factory in the town in the 18th century, but commerce had already decayed and the establishment was abandoned. In the early part of the 19th century Brunei was but a resort for pirates and a market for the slave trade. During the 'forties Admiral (then Captain) Keppel and other officers of the British navy suppressed piracy in the neighbourhood. Sarawak was handed over to Raja Brooke, and, after the capture and temporary occupation of Brunei by Sir Thomas Cochrane, Labuan was ceded to the British empire. From this island it has always been possible to check the designs of the townspeople, and of late years a consul has been stationed there to watch affairs. Nowadays the political consequence of Brunei largely arises from the existence there of valuable seams of coal, leased to the Sarawak Government, which may in the future prove of great commercial importance.

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Brünnow, Franz Friedrich Ernst (1821-1891), German astronomer, was born in Berlin on 18th November 1821. Between the ages of eight and eighteen he attended the Friedrich-Wilhelm Gymnasium. In 1839 he entered Berlin University, where he attended lectures in mathematics, astronomy, and physics; chemistry, philosophy, and philology also occupying his attention.

After graduating as Ph.D. in 1843 he took an active part in astronomical work at the Berlin Observatory, under the direction of the celebrated Encke, contributing numerous important papers on the orbits of comets and minor planets to the *Astronomische Nachrichten*. In 1847 he was appointed director of the Düsseldorf Observatory. During his tenure of this post he published his well-known *Mémoire sur la comète elliptique de De Vico*, for which he received the gold medal of the Amsterdam Academy. In 1851 he succeeded Galle as first assistant at the Berlin Observatory. While occupying this position he computed his tables of the minor planet Flora, which were followed in 1859 and 1869 by tables of two other minor planets, Victoria and Iris. In 1854 he accepted the post of director of the new observatory of Ann Arbor, Michigan, U.S.A. Here he published for several years a journal entitled *Astronomical Notices*. In 1860 he went, as associate director of the observatory, to Albany, N.Y., whence he continued to issue his *Astronomical Notices;* but in 1861 he returned to Michigan, and threw himself with vigour into the work of studying the astronomical and physical constants of the observatory and the instruments it possessed. In 1863 he resigned the directorship of the Ann Arbor Observatory and returned to Germany, but three years later, on the death of Sir W. R. Hamilton, he accepted the post of Andrews professor of astronomy in the University of Dublin and Astronomer Royal of Ireland. The first task he undertook at the Dublin Observatory was the erection of an equatorial telescope to carry the fine object-glass which had been presented to the university by Sir James South. On the completion of this instrument he commenced his important researches on stellar parallax. The first, second, and third parts of the *Astronomical Observations and Researches made at Dunsink* contain the results of these labours, and include discussions of the distances of the stars α Lyræ, σ Draconis, Groombridge 1830, 85 Pegasi, and Bradley 3077, and of the planetary nebula H. iv. 37. In 1873 the observatory, on Dr Brünnow's recommendation, was provided with a first-class transit-circle which, with his usual thoroughness, he proceeded to test as a preliminary to commencing an extended programme of work with it, but in the following year, in consequence of failing health and eyesight, he resigned the post and retired to Basel. In 1880 he removed to Vevey, and in 1889 to Heidelberg, where he died on 20th August 1891. It was during his residence at Düsseldorf that he composed his *Lehrbuch der Sphärischen Astronomie*, on which, more perhaps than on any of his other works, his reputation will rest. Its importance was immediately recognized in Germany and other countries. In 1860 Part I. was translated into English by Main, the Radcliffe Observer at Oxford; in 1865 an English translation of the whole work by Brünnow himself appeared; while the fact that it reached a fourth edition, and has also been translated into French, Russian, Italian, and Spanish, proves how widely its value has been appreciated. (A. A. R.*)

Brunsbüttel, a seaport town of Prussia, province of Schleswig-Holstein, on the N. bank of the Elbe, 60 miles N.W. from Hamburg. It is the W. extremity of the North-Sea–Baltic Canal, which is closed at that end by double locks, estimated to have cost £771,750. Here also are an inner harbour, 1640 feet long and 656 feet wide, a coaling station, and a small harbour for the tugs and other vessels belonging to the canal company. Population (1900), 2151.

Brunswick (German, *Braunschweig*), a duchy of Germany; area, 1424 sq. miles; population (1885) 372,452, (1895) 434,213, of whom 215,772 were males and 218,441 females; density, 304·9 to the sq. mile. Except for 19,508 Roman Catholics, the people belong almost entirely to the Lutheran church. The emigrants decreased from 333 in 1892 to 112 in 1899. Of the births annually 10 to 11 per cent. are illegitimate. The total number of farms in 1895 was 58,091, of which 38,901, or 67 per cent., were each less than 2½ acres, 13,929 were between 2½ and 25 acres, 5080 between 25 and 250 acres, and 181 exceeded 250 acres. In 1897 the live stock embraced 157,931 pigs, 149,149 sheep, 120,798 cattle, and 33,170 horses. The mines produced in the same year 1,057,192 tons of lignite, valued at £158,550; 108,502 tons of iron, valued at £10,800; 21,580 tons of potassium salts, valued at £148,850; or, in all, 1,187,274 tons of the value of £318,200 (£442,550 in 1898). There were also mined 44,262 tons of asphalt, valued at £12,650. The produce of the furnaces consisted of 26,285 tons of iron, valued at £71,200, and 16,499 tons of sulphuric acid. In 1898-99 the sugar factories and refineries produced 91,942 tons of sugar; the breweries, 13,530,000 gallons of beer; and the distilleries (1897) 375,850 gallons of pure alcohol. The duchy had 303 miles of railway in 1898. As reformed by laws of 1888 and 1899, the legislative assembly now consists of 48 members, thus elected by indirect voting—15 by the large towns, 15 by the country communes, and 18 by the learned professions, the clergy, landowners, manufacturers, and those who are assessed highest for income-tax. The assembly meets every two years, and the representatives sit for four years. The public revenue for the year 1900-01 was estimated at £787,500, and the public expenditure at £808,150. In addition to this the duke had a civil list of £180,630, derivable from domains, forests, &c.; and there was a special budget of £70,460, devoted to religion and education. The public debt, of which 80 per cent. was incurred for the construction of railways, amounted in 1899 to £913,317. The contribution to the imperial exchequer was fixed at £218,675 in 1900.

Brunswick, a town of Germany, capital of the duchy, 53 miles W. by N. from Magdeburg by the railway to Hanover. Most of the principal churches have been restored since 1895—the cathedral in 1891-92, St Peter's in 1888-92, St Martin's in 1897-99, St Catherine's in 1887-90, St Magnus in 1877, and St Andreas in 1899 onwards. Amongst the new secular buildings the first place is claimed by the ducal museum, built in 1883-87, in which are preserved the pictures collected by Duke Anthony Ulrich of Brunswick-Wolfenbüttel, a collection especially valuable for its Dutch canvases; it also contains collections of jewellery and Italian majolica. Other edifices are the post office (1878-81); synagogue (1875); the new town house, an Early Gothic sandstone structure (1896-99); and the technical high school, an Italian Renaissance building of 1877, furnishing quarters for the Caroline College, and for various scientific collections. Brunswick also possesses the Dankwarderode, a two-storeyed Romanesque building put up in 1884 on the site of part of the ancient citadel of the same name, which was destroyed by fire in 1873; two town halls, one containing a picture gallery, the other the municipal archives and municipal library; the municipal museum, in the old town house since 1899; the national museum; an anatomical museum; botanical gardens; and several parks; teachers' seminaries, deaf and dumb and blind asylums; and a national school of arboriculture. Nor should the many fine old houses be overlooked. There are also several monuments, the principal being those erected to Henry the Lion, a bronze fountain (1874); to the mathematician Gauss (1880), who was born here in 1777 (died 1855); to Lessing, by Rietschel (1853), Lessing having died here in

jewel from mount Kina Balu in North Borneo, and was the successor of Sultan Mahommed in the sovereignty of Brunei. He was succeeded by Sultan Berkat, an Arab Serif of high rank, from the country of Taif in Arabia, who had married Sultan Akhmed's only child. Sultan Berkat built a mosque and enforced Mahommedan law, and with the assistance of the Chinese built the stone wall, by sinking forty junks filled with rock across the mouth of the Brunei river, between the islands of Kaya Orang and Chermin, which is still in existence. This work was completed before the arrival of Pigafetta in 1521. In the reign of Sultan Bulkeiah Magellan's squadron anchored off the mouth of Brunei river in August 1521, and Pigafetta makes mention of the splendid court and the imperial magnificence of the Borneo capital. Sultan Bulkeiah was otherwise known as Nakoda Ragam, and was the great warrior of Brunei who voyaged to Java, Malacca, Luzon, and all round the coast of Borneo. His tomb, which is handsomely built of stone, is still to be seen in Brunei, and is constantly visited by Malays, who leave money and various articles on the tomb as offerings to his memory. Others, again, come and take away anything they can find, which they keep as charms and mementos. The Spaniards captured Brunei in 1580, the reigning sultan and his court retiring to Suai in the Baram district. The invaders were compelled to evacuate the place, however, in consequence of the heavy losses they sustained in the numerous attempts made for its recovery. The golden age of Brunei was nevertheless at an end, and there is little more of striking importance to record. Disputed successions and civil war, maladministration and the untrustworthiness of the Malay character, caused a steady decline in prosperity. The East India Company started a factory in the town in the 18th century, but commerce had already decayed and the establishment was abandoned. In the early part of the 19th century Brunei was but a resort for pirates and a market for the slave trade. During the 'forties Admiral (then Captain) Keppel and other officers of the British navy suppressed piracy in the neighbourhood. Sarawak was handed over to Raja Brooke, and, after the capture and temporary occupation of Brunei by Sir Thomas Cochrane, Labuan was ceded to the British empire. From this island it has always been possible to check the designs of the townspeople, and of late years a consul has been stationed there to watch affairs. Nowadays the political consequence of Brunei largely arises from the existence there of valuable seams of coal, leased to the Sarawak Government, which may in the future prove of great commercial importance.

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See HANAK, *Die Königliche Landes-Hauptstadt Brünn und die Umgebung* (Brünn, 1880), and works in German by D'ELVERT, *Neu-Brünn, wie es entstanden ist* (Brünn, 1889), DEUTSCH, and TRAUTENBERGER. (*A.* O'N.)

Brünnow, Franz Friedrich Ernst (1821-1891), German astronomer, was born in Berlin on 18th November 1821. Between the ages of eight and eighteen he attended the Friedrich-Wilhelm Gymnasium. In 1839 he entered Berlin University, where he attended lectures in mathematics, astronomy, and physics; chemistry, philosophy, and philology also occupying his attention.

After graduating as Ph.D. in 1843 he took an active part in astronomical work at the Berlin Observatory, under the direction of the celebrated Encke, contributing numerous important papers on the orbits of comets and minor planets to the *Astronomische Nachrichten*. In 1847 he was appointed director of the Düsseldorf Observatory. During his tenure of this post he published his well-known *Mémoire sur la comète elliptique de De Vico*, for which he received the gold medal of the Amsterdam Academy. In 1851 he succeeded Galle as first assistant at the Berlin Observatory. While occupying this position he computed his tables of the minor planet Flora, which were followed in 1859 and 1869 by tables of two other minor planets, Victoria and Iris. In 1854 he accepted the post of director of the new observatory of Ann Arbor, Michigan, U.S.A. Here he published for several years a journal entitled *Astronomical Notices*. In 1860 he went, as associate director of the observatory, to Albany, N.Y., whence he continued to issue his *Astronomical Notices;* but in 1861 he returned to Michigan, and threw himself with vigour into the work of studying the astronomical and physical constants of the observatory and the instruments it possessed. In 1863 he resigned the directorship of the Ann Arbor Observatory and returned to Germany, but three years later, on the death of Sir W. R. Hamilton, he accepted the post of Andrews professor of astronomy in the University of Dublin and Astronomer Royal of Ireland. The first task he undertook at the Dublin Observatory was the erection of an equatorial telescope to carry the fine object-glass which had been presented to the university by Sir James South. On the completion of this instrument he commenced his important researches on stellar parallax. The first, second, and third parts of the *Astronomical Observations and Researches made at Dunsink* contain the results of these labours, and include discussions of the distances of the stars α Lyræ, σ Draconis, Groombridge 1830, 85 Pegasi, and Bradley 3077, and of the planetary nebula H. iv. 37. In 1873 the observatory, on Dr Brünnow's recommendation, was provided with a first-class transit-circle which, with his usual thoroughness, he proceeded to test as a preliminary to commencing an extended programme of work with it, but in the following year, in consequence of failing health and eyesight, he resigned the post and retired to Basel. In 1880 he removed to Vevey, and in 1889 to Heidelberg, where he died on 20th August 1891. It was during his residence at Düsseldorf that he composed his *Lehrbuch der Sphärischen Astronomie*, on which, more perhaps than on any of his other works, his reputation will rest. Its importance was immediately recognized in Germany and other countries. In 1860 Part I. was translated into English by Main, the Radcliffe Observer at Oxford; in 1865 an English translation of the whole work by Brünnow himself appeared; while the fact that it reached a fourth edition, and has also been translated into French, Russian, Italian, and Spanish, proves how widely its value has been appreciated. (A. A. R.*)

Brunsbüttel, a seaport town of Prussia, province of Schleswig-Holstein, on the N. bank of the Elbe, 60 miles N.W. from Hamburg. It is the W. extremity of the North-Sea–Baltic Canal, which is closed at that end by double locks, estimated to have cost £771,750. Here also are an inner harbour, 1640 feet long and 656 feet wide, a coaling station, and a small harbour for the tugs and other vessels belonging to the canal company. Population (1900), 2151.

Brunswick (German, *Braunschweig*), a duchy of Germany; area, 1424 sq. miles; population (1885) 372,452, (1895) 434,213, of whom 215,772 were males and 218,441 females; density, 304·9 to the sq. mile. Except for 19,508 Roman Catholics, the people belong almost entirely to the Lutheran church. The emigrants decreased from 333 in 1892 to 112 in 1899. Of the births annually 10 to 11 per cent. are illegitimate. The total number of farms in 1895 was 58,091, of which 38,901, or 67 per cent., were each less than 2½ acres, 13,929 were between 2½ and 25 acres, 5080 between 25 and 250 acres, and 181 exceeded 250 acres. In 1897 the live stock embraced 157,931 pigs, 149,149 sheep, 120,798 cattle, and 33,170 horses. The mines produced in the same year 1,057,192 tons of lignite, valued at £158,550; 108,502 tons of iron, valued at £10,800; 21,580 tons of potassium salts, valued at £148,850; or, in all, 1,187,274 tons of the value of £318,200 (£442,550 in 1898). There were also mined 44,262 tons of asphalt, valued at £12,650. The produce of the furnaces consisted of 26,285 tons of iron, valued at £71,200, and 16,499 tons of sulphuric acid. In 1898-99 the sugar factories and refineries produced 91,942 tons of sugar; the breweries, 13,530,000 gallons of beer; and the distilleries (1897) 375,850 gallons of pure alcohol. The duchy had 303 miles of railway in 1898. As reformed by laws of 1888 and 1899, the legislative assembly now consists of 48 members, thus elected by indirect voting—15 by the large towns, 15 by the country communes, and 18 by the learned professions, the clergy, landowners, manufacturers, and those who are assessed highest for income-tax. The assembly meets every two years, and the representatives sit for four years. The public revenue for the year 1900-01 was estimated at £787,500, and the public expenditure at £808,150. In addition to this the duke had a civil list of £180,630, derivable from domains, forests, &c.; and there was a special budget of £70,460, devoted to religion and education. The public debt, of which 80 per cent. was incurred for the construction of railways, amounted in 1899 to £913,317. The contribution to the imperial exchequer was fixed at £218,675 in 1900.

Brunswick, a town of Germany, capital of the duchy, 53 miles W. by N. from Magdeburg by the railway to Hanover. Most of the principal churches have been restored since 1895—the cathedral in 1891-92, St Peter's in 1888-92, St Martin's in 1897-99, St Catherine's in 1887-90, St Magnus in 1877, and St Andreas in 1899 onwards. Amongst the new secular buildings the first place is claimed by the ducal museum, built in 1883-87, in which are preserved the pictures collected by Duke Anthony Ulrich of Brunswick-Wolfenbüttel, a collection especially valuable for its Dutch canvases; it also contains collections of jewellery and Italian majolica. Other edifices are the post office (1878-81); synagogue (1875); the new town house, an Early Gothic sandstone structure (1896-99); and the technical high school, an Italian Renaissance building of 1877, furnishing quarters for the Caroline College, and for various scientific collections. Brunswick also possesses the Dankwarderode, a two-storeyed Romanesque building put up in 1884 on the site of part of the ancient citadel of the same name, which was destroyed by fire in 1873; two town halls, one containing a picture gallery, the other the municipal archives and municipal library; the municipal museum, in the old town house since 1899; the national museum; an anatomical museum; botanical gardens; and several parks; teachers' seminaries, deaf and dumb and blind asylums; and a national school of arboriculture. Nor should the many fine old houses be overlooked. There are also several monuments, the principal being those erected to Henry the Lion, a bronze fountain (1874); to the mathematician Gauss (1880), who was born here in 1777 (died 1855); to Lessing, by Rietschel (1853), Lessing having died here in

1781; two bronze equestrian statues (1894) of Dukes Charles William and Frederick William; a bronze monument to Franz Abt (1891); and a monument of the war of 1870-71. Brunswick is the seat of varied industries, the most noteworthy of which are sugar-refining, jute-spinning, manufacture of sewing and other machines, hardware, tobacco, beer, musical instruments, colours, lacquered wares, gloves, &c., printing and publishing, distilling, and gardening. Brunswick is famous for its sausages, honey cakes, asparagus, and Mumme beer. Owing to its central situation, at the intersection of the great route between the middle Rhine (Frankfort) and the middle Elbe (Magdeburg), and that between Hamburg and Leipzig, it is also the seat of a very active trade. The musician Spohr was born here in 1784 (died 1859). Population (1885), 85,174; (1890), 101,047; (1895), 115,138; (1900), 128,177.

See *Braunschweig, einst und jetzt* (Brunsw., 1897). (J. T. Be.)

Brunswick, capital of Glynn county, Georgia, U.S.A., situated on St Simon Sound, 8 miles from the sea. It is a seaport of some importance, particularly in the export of cotton, has two railways, the Southern and the Plant System, and has considerable manufactures of yellow-pine lumber. Population (1880), 2891: (1890), 8459; (1900), 9081.

Brunswick, a city of Cumberland county, Maine, U.S.A., on the south bank of Androscoggin river, near its mouth. It is the terminus of several branches of the Maine Central railway. Bowdoin College, situated here, had in 1900 (including the Medical School of Maine), 34 professors and instructors and 356 students. Population (1880), 5384; (1890), 6012; (1900), 5210.

Brúsa, or Broussa, the capital of the Khudavendikiar viláyet of Asia Minor, which includes parts of ancient Mysia, Bithynia, and Phrygia, and extends in a south-easterly direction from Mudánia, on the Sea of Marmora, to Afiún Kara-hissar on the Smyrna-Konia railway. The viláyet is one of the most important in Asiatic Turkey, has great mineral and agricultural wealth, many mineral springs, large forests, and valuable industries. It exports cereals, silk, cotton, opium, tobacco, olive oil, meerschaum, boracite, &c. The Ismid-Angora and Eskishehr-Konia railways pass through the province. Population of the province, 1,600,000 (Moslems, 1,280,000; Christians, 317,000; Jews, 3000).

The city stretches along the lower slopes of the Mysian Olympus or Keshish Dagh, occupying a position above the valley of the Nilúfer (*Odrysses*) not unlike that of Great Malvern above the vale of the Severn. It is divided by ravines into three quarters, and in the centre, on a bold terrace of rock, stood *Prusa*, built by Prusias and long the capital of the Bithynian kings. The prosperity of Prusa, under Rome, is clear from the letters of Pliny the younger. The modern town has clean streets and good roads made by Ahmed Vefyk Pasha when Vali, and it contains mosques and tombs of great historic and architectural interest; the more important are those of Sultans Murad I., Bayezid I., Muhammad I., and Murad II., 1360-1451, and the Ulu Jami'. The mosques show traces of Byzantine, Persian, and Arab influence in their plan, architecture, and decorative details. The circular church of St Elias, in which the first two sultans, Osman and Orkhan, were buried, was destroyed by fire and earthquake, and rebuilt by Ahmed Vefyk Pasha. There are in the town an American mission and school, and a British orphanage. Silk stuffs, towels, burnús, carpets, felt prayer-carpets embroidered in silk and gold, are manufactured, and there are several factories in which silk is spun for export and home consumption. The hot iron and sulphur springs near Brúsa, varying in temperature from 112° to 178° F., are still much used. The town is connected with its port, Mudánia, by a railway and a road. There is a British Vice-Consul. Population, 75,000 (Moslems, 40,000; Christians, 33,000; Jews, 2000). (C. W. W.)

Brushes.—(1) *Wire.*—Brushes with tufts formed of steel wire are used for cleaning tubes and flues of steam boilers, for the purpose of removing the scale formed by the products of combustion. Steel wire brushes are also used for cleaning scale from the interior surface of a boiler, or for removing the sand from the surface of a casting. Occasionally such brushes are revolved in a machine, for more convenient use on the article to be cleaned or polished.

A novel and effective use is made of a steel wire brush in utilizing it to form the active principle of what is known as Snyer's patent elastic clutch or coupling. The apparatus is for the purpose of coupling up or disconnecting a steam engine from a line of shafting used for transmitting power to machinery; or it may be used for coupling an engine and dynamo together, or other similar purpose. The clutch consists essentially of two discs, the adjacent faces of which are provided, one with a ring of brushes made of flat steel wire, the other with a number of finely serrated teeth. One of the discs is movable longitudinally on its shaft, and with the brushes clear of the serrations, the clutch is free. On closing together, which may be done with the engine running at speed, the elasticity of the brush permits the motion to be imparted gradually and without shock to the standing part, until both rotate and are locked together. These clutches are very powerful, and are capable of transmitting as much as 3000 horse-power.

(2) *Electric.*—An apparatus for conducting the electric current from the stationary portion, the field magnets, to the revolving part, the armature, of an electric dynamo or motor, is termed a "brush." There are usually two brushes to each dynamo or motor, and they are placed diametrically opposite, lightly touching the commutator of the armature.

It is important that there should be good metallic contact between the brushes and the commutator in order to avoid sparking, and at the same time the frictional resistance resulting from the contact must be at a minimum. To effect this result brushes are variously made. The kind of brush frequently used consists of a number of copper wires laid side by side and soldered together at one end, where the brush is held. Brushes are also made of strips of spongy copper cut like a comb, which give a number of bearing points on the commutator. Very good results are obtained from brushes made of copper gauze wound closely until it takes the exterior form of a rectangular block, which is held radially in a spring holder, and bears at the end on the commutator. In place of the gauze block, hard carbon blocks are frequently used and form the "brushes." (G. H. Ba.)

Brussels (French, *Bruxelles;* Flemish, *Brussel*), capital of Belgium and of the province of Brabant, in 50° 51′ N. lat., 4° 22′ E. long., partly in the low-lying plain traversed from S. to N. by the Senne, partly on hills rising to the E. The ancient contour of the city is indicated by a line of fine boulevards occupying the place of its old fortifications. Beyond that circuit it has absorbed the neighbouring communes, by the laying out on the E. of the Avenue Louise, leading to the Bois de la Cambre; and also of the Park, with the Palace du Cinquantenaire, in which were held the Exhibitions of 1880, 1888, and 1897. In 1900 the city was extended on the N.W., where the lands near by the canal of Willebroeck were annexed for the accommodation of shipping establishments. The eight communes that immediately surround the city are those of St Josse-ten-Noode, Schaerbeek, and Laeken on the N.; Etterbeek and Ixelles on the E.; St Gilles on the S.; Anderlecht and Molenbeek-St-Jean on the W. These communes form, with Brussels, practically one vast town, without visible sign of their several boundaries. Since 1875 they have experienced a considerable development from the overflow of the population of Brussels, and enjoy, in fact, all the advantages of the capital without sharing its burdens. Thus Brussels is a spacious and handsome city, clean, healthy, and attractive to visitors, more especially since several of the old quarters, insanitary and crowded, have given way to well-aired streets and squares. This process of transformation dates from 1868, when, to remedy the constant exhalations and frequent inundations of the Senne, the course of that river in its passage through the city was enclosed by a great

arch, on each side of which were laid two large main sewers, into which the whole sewage system empties itself. Upon these subterranean buildings has been constructed a series of magnificent boulevards, which connect the Gare du Midi with the Gare du Nord, and along which a constant stream of tram and passenger traffic flows all day long and far into the night. Beginning in front of the Place de la Constitution, where is situated the Station du Midi, this broadway bears the names successively of the Boulevard du Hainaut, Boulevard Anspach, Place de Brouckère, where the way divides into the Boulevard de la Senne (at the end of which the river issues out again into the open), and the Boulevard du Nord ending in front of the Place Rogier, where stands the Station du Nord. These thoroughfares are all distinguished by their elegant and varied architecture. Running parallel to this central way, there has been opened the Avenue du Midi, which, continued by the Rue du Midi, the Rue des Fripiers, the Place de la Monnaie, and the Rue Neuve, forms a second grand thoroughfare, leading also from the Gare du Midi to the Gare du Nord. Other grand thoroughfares and new quarters have been opened up in different parts of the city. Among the more remarkable squares and parks are the Public Park with its fine trees, situated between the Palais du Roi and the Palais de la Nation; the Square Frère-Orban (the old Place de la Société Civile), on which has been erected a statue of M. Frère-Orban; the Square du Petit Sablon, remarkable for the group in bronze of Counts Egmont and Hoorn, surrounded by eight statues of personages of the 16th century, and by the artistic iron railing; the Park Leopold, formerly the Zoological Gardens, whither has been transferred the Museum of Natural History, and in which, by private subscription, have been erected the Biological Institutes; the Parc du Cinquantenaire, a very beautiful avenue, leads to the Parc de Tervueren, in which is a museum of the Congo; the Bois de la Cambre, two miles from the Place Royale, at the extremity of the Avenue Louise; the squares Marie-Louise and Ambiorix; the Park of St Gilles, and the Parc de Laeken, adjoining the royal residence. The cathedral has been restored, and the famous Hotel de Ville (15th century) has also been completely repaired, both outside and inside. On the Grande Place, the Maison du Roi (16th century), its old foundations showing signs of giving way, was rebuilt in 1877 on its original plan. The old Guild-houses have likewise experienced a restoration of their façades according to their original aspect, and now form a curious and magnificent *ensemble*. Since the opening of the Central Boulevard numerous buildings of diverse styles have been erected on both sides. In the lower town the New Exchange (1874) has been erected in rich ornamental Renaissance, at a cost of four million francs. Other buildings are the Central Post Office (1892), a fine edifice in Renaissance, erected on the site of the ancient Hotel des Monnaies, opposite the Théâtre de la Monnaie; the Communal Theatre, intended specially for the representation of Belgian pieces; the Fish Halls (1883); the Halles Centrales (1874); the Marché Couvert for fruit, &c., in the Place St Géry; the Palais du Midi, a vast structure, comprising shops, markets, and an industrial school. On the slope and in the upper part of the city are the Hotel Central des Téléphones (1900), on the site of the former Palais de Justice; the new Palais de Justice, constructed in 1868-83, from designs by Polaert, and costing about fifty million francs, quadrangular in form, covering 270,000 square feet, surmounted by a dome, the cupola of which is about 330 feet above the pavement of the Salle des Pas Perdus. Opening into Place Polaert is the broad Rue de la Régence, in which are a synagogue (1878) in the Romanesque, the Royal Conservatorium of Music (1876) in Renaissance, the Palace of the Count of Flanders, the Palace of the Fine Arts (1880), in which are placed the gallery of old pictures and the gallery of sculptures, while the modern pictures, as also the general archives of the kingdom, are alongside of the royal library in the old building of the picture gallery (Musée de Peinture), and the Museum of Natural History. In the Quartier-Léopold is the Musée Wiertz, where the paintings attract innumerable visitors. Beyond the Park, behind the Palais de la Nation and the Ministries, there are groups of fine buildings of recent construction, in which are the offices of the administration of railways and of that of the marine. In the commune of St Gilles a vast mint (Hotel des Monnaies) has been erected, and a prison of solitary confinement (1884) in Anglo-Gothic, able to accommodate 600 prisoners. The observatory, formerly placed at the north-east angle of the line of boulevards, was transferred in 1891 to Uccle. In the way of military quarters, all that is now left are a barrack for the grenadiers, and a barrack for the infantry of the line. At Etterbeek, about 1½ miles from Brussels, handsome barracks have been built for the cavalry and artillery, with a large field for manœuvres; and close by, on the Ixelles ground, is a military hospital. There are new buildings, to serve as a military school, near the Parc du Cinquantenaire. In the Schaerbeek quarter is the barrack of Baudoin, occupied by the carabiniers, and, a little farther off, the national shooting-ground (1888), where, with the latest improvements, are about forty targets.

Among the industries of Brussels are its noted lace manufactures, cabinetmaking, the making of furniture, coachbuilding, jewellery, goldsmith's work, leather-glove and boot manufactures, the making of organs and pianos, wall-paper, soaps, &c.; important breweries, &c. Railway lines radiate in all directions: to Ostend, and thence by packet-boats to Dover and London; to Antwerp, and thence by steamer to Harwich and London; to Amsterdam; to Berlin and St Petersburg; to Vienna and Constantinople; to Basel, Rome, and Brindisi; to Paris and Marseilles; to Lille and Calais. Two canals, one from Charleroi, the other from Willebroeck, meet in Brussels on their way to the Rupel and the Escaut (see CANALS). The population of the commune of Brussels alone was 183,000 in 1875 and 183,686 in 1900. But the total population of the combined communes increased from 385,000 in 1875 and 465,317 in 1890 to 571,000 in 1899.

HENNE and WAUTERS. *Hist. politique, civile, et monumentale de la ville de Bruxelles*, 1843-45.—L. HYMANS. *Bruxelles à travers les âges*, 1881. (J. DU F.)

Brux, chief town of district of the same name in Bohemia, on the railway from Prague to Pilsen. Population (1890), 14,894; (1900), 21,525, mostly Catholic. There are important sugar, iron and hardware, distilling, brewing, and milling industries. Valuable lignite deposits are found in the neighbourhood, and the bitter waters at Püllna, Seidlitz, and Seidschütz are celebrated.

Bryan, William Jennings, (1860-——) American politician and presidential candidate, was born in Salem, Illinois, 19th March 1860. His parents, well-to-do but not wealthy, were highly respected, his father serving twelve years as a circuit judge. After graduating from the classical course in Illinois College at Jacksonville in 1881, young Bryan took a full course in the Union College of Law, Chicago, supplementing his studies with work in the office of ex-Senator Trumbull. From 1883 to 1887 Mr Bryan practised law in Jacksonville. In 1887 he removed to Lincoln, Nebraska, which has since been his home. His success at the bar was much greater than usually comes to so young an attorney, but public

questions and his bent of mind turned his attention to politics. In 1890 the first Congressional district of Nebraska, a Republican stronghold, elected Mr Bryan as its representative in the fifty-second Congress, and in 1892 re-elected him to the fifty-third. He was placed on the Ways and Means Committee, an unusual honour to a new member, and was known as a worker. He also won high reputation as a debater. Two of his speeches in particular attracted wide attention, those against protection on the 16th March 1892, and against the repeal of the silver purchase clause of the Sherman Act, 16th August 1893. His zeal for bimetallism in the fifty-third Congress was the main cause of his failure to be re-elected to the next. As editor of the *Omaha World-Herald*, Mr Bryan championed bimetallism in the press as vigorously as he had advocated it in Congress, his articles being widely quoted and discussed. The Democratic party was radically divided on the monetary policy. To secure the repeal of the silver purchase clause of the Sherman Act, President Cleveland had used all the power he possessed. In spite of this, however, the sentiment in favour of opening the mints to the free coinage of silver rapidly gained in party favour, so that in the Democratic Convention of July 1896 at Chicago, nearly two-thirds of the delegates were against the administration and its gold régime. Mr Bryan was a delegate-at-large from Nebraska in this Convention. It was here, in the course of a heated debate on the proper Democratic attitude to the currency question, that he made his memorable declaration, "You shall not crucify mankind on a cross of gold." With the silver majority of the Convention he at once became an idol, and next day he was nominated as candidate for the Presidency. Mr Bryan spent the entire autumn of 1896 upon the hustings. He opened the campaign in the centre of the "gold" country, at Madison Square Garden, New York, with an address of remarkable ability. He visited more than half the States of the Union and delivered more than six hundred speeches. But the opposition both without and within the Democratic party was too strong to be overcome. At the election in November the popular vote was 7,107,822 for McKinley and 6,511,073 for Bryan. Of the electoral votes McKinley received 271 and Bryan 176. Though defeated Mr Bryan not only remained the undisputed leader of the Democrats, but his power and the respect accorded to him rapidly increased. Between 1896 and 1900, except the six months of the Spanish war, in which he served as colonel of the Third Nebraska Volunteers, Mr Bryan devoted his entire time to study, speaking and writing in the interest of his party. His ability, his sincerity of character, his wide information, and his quick and accurate grasp of the new issues arising from the Spanish war, of which "imperialism" was the most momentous, drew to him the support of many who had opposed him in 1896. As the time for the Democratic Convention of 1900 drew on, it was seen that he was the only possible candidate. He was again nominated for the Presidency, and again he spent his whole time through the campaign upon the hustings. He was, however, once more defeated by the Republican candidate, the popular vote standing 7,206,677 for Mr McKinley, and 6,374,397 for Mr Bryan, and the electoral vote 292 to 155. This result appears to have been mainly due to the fact that the platform again demanded the free coinage of silver.

Bryansk, a district town of middle Russia, in the government and 90 miles by rail W.N.W. of Orel, picturesquely situated at the confluence of the Desna with the Bolva, which brings it in connexion with Kieff, *viâ* the navigable Desna. Since it has been connected by rail with Riga, *viâ* Vitebsk, and the south-western railways *viâ* Gomel, it has rapidly grown in importance, both as a depot for the export of grain, and chiefly hemp, and as an industrial centre. The exports *viâ* the Desna alone (grain, timber, oils, tar and pitch, metallic goods) are valued at £110,000 per annum, while nearly 50,000 cwts. of hemp and £10,000 worth of hempseed oil are sent to St Petersburg every year. It contains large gun works of the Crown, several hemp-spinning mills, rope works, &c. The Bryansk Byezhitsk works close by, at the junction of the Desna with the Dnieper, have grown to be one of the most considerable centres in Russia for the manufacture of railway rails and bridges, employing 5000 workers. Population, 23,520.

Bryant, William Cullen (1794-1878), American poet and journalist, was born at Cummington, a farming village in the Hampshire hills of Western Massachusetts, 3rd November 1794. He was the second son of Peter Bryant, a physician and surgeon of no mean scholarship, refined in all his tastes, and a public-spirited citizen. Peter Bryant was the great-grandson of Stephen Bryant, an English Puritan emigrant to Massachusetts Bay about the year 1632. The poet's mother, Sarah Snell, was a descendant of "Mayflower" pilgrims. He was born in the log farmhouse built by his father two years before, at the edge of the pioneer settlement among those boundless forests, the deep stamp of whose beauty and majesty he carried on his own mind and reprinted upon the emotions of others throughout a long life spent mainly amid the activities of his country's growing metropolis. By parentage, by religious and political faith, and by hardness of fortune, the earliest of American poets was appointed to a life severely typical of the first century of American national existence, and of the strongest single racial element by which that nation's social order has been moulded and promoted. Rated by the amount of time given to school books and college classes, Bryant's early education was limited. After the village school he received a year of exceptionally good training in Latin under his mother's brother, the Rev. Dr Thomas Snell, of Brookfield, followed by a year of Greek under the Rev. Moses Hallock, of Plainfield, and at sixteen entered the sophomore class of Williams College. Here he was an apt and diligent student through two sessions, and then, owing to the straitness of his father's means, he withdrew without graduating, and studied classics and mathematics for a year, in the vain hope that his father might yet be able to send him to Yale College. But the length of his school and college days would be a very misleading measure of his training. He was endowed by nature with many of those traits which it is often only the final triumph of books and institutional regimen to establish in character, and a

William Cullen Bryant.
(From a photo by Sarony, New York.)

double impulse toward scholarship and citizenship showed its ruling influence with a precocity and an ardour which gave every day of systematic schooling many times its ordinary value. It is his own word that, two months after beginning with the Greek alphabet, he had read the New Testament through. On abandoning his hope to enter Yale, the poet turned to and pursued, under private guidance at Worthington and at Bridgewater, the study of law. At twenty-one he was admitted to the bar, opened an office in Plainfield, presently withdrew from there, and at Great Barrington settled for nine years in the attorney's calling, with an aversion for it which he never lost. His first book of verse, *Thanatopsis*, appeared in 1817.

At the age of twenty-six Bryant married, at Great Barrington, Miss Frances Fairchild, with whom he enjoyed a happy union until her death nearly half a century later. In the year of his marriage he suffered the bereavement of his father's death. In 1825 he ventured to lay aside the practice of law, and removed to New York city to assume a literary editorship. Here for some months his fortunes were precarious, until in the next year he became one of the editors of the *Evening Post*. In the third year following, 1829, he came into undivided editorial control, and became also chief owner. He enjoyed his occupation, fulfilling its duties with an unflagging devotion to every worthy public interest till the end of his life, which came in 1878, in the month of his choice, as indicated in his beautiful poem entitled "June."

Though Bryant's retiring and contemplative nature could not overpower his warm human sympathies, it yet dominated them to an extent that made him always, even in his journalistic capacity and in the strenuous prose of daily debate, a councillor rather than a leader. It was after the manner of the poet, the seer, that he was a patriot, standing for principles much more than for measures, and, with an exquisite correctness which belonged to every phase of his being, never prevailing by the accommodation of himself to inferiors in foresight, insight, or rectitude. His vigorous and stately mind found voice in one of the most admirable models of journalistic style known in America. He was founder of a distinct school of American journalism, characterized by an equal fidelity and temperance, energy and dignity. Though it is as a poet that he most emphatically belongs to history, his verse was the expression of only the gentler motions of his mind; and it gathers influence, if not lustre, when behind it is seen a life intrepid, upright, glad, and ever potent for the nobler choice in all the largest affairs of his time. His renown as a poet antedated the appearance of his first volume by some four or five years. "American poetry," says Richard Henry Stoddard, "may be said to have commenced in 1817 with . . . (Bryant's) 'Thanatopsis' and 'Inscription for the entrance of a wood.'" The solemn chords of "Thanatopsis," revealing a voice at once as new and as old as the wilderness out of which they reverberated, had been written at Cummington in the poet's eighteenth year, the "Inscription" in his nineteenth, and in his twenty-first, while a student of law at Bridgewater, he had composed his lines "To a Waterfowl," whose exquisite beauty and exalted faith his own pen rarely, if ever surpassed. The poet's gift for language made him a frequent translator, and among his works of this sort his rendering of Homer is the most noted and most valuable. But the muse of Bryant, at her very best, is always brief-spoken and an interpreter initially of his own spirit. Much of the charm of his poems lies in the equal purity of their artistic and their moral beauty. On the ethical side they are more than pure, they are—it may be said without derogation—Puritan. He never commerces with unloveliness for any loveliness that may be plucked out of it, and rarely or never discovers moral beauty under any sort of mask. As free from effeminacy as from indelicacy, his highest and his deepest emotions are so dominated by a perfect self-restraint that they never rise (or stoop) to transports. There is scarcely a distempered utterance in the whole body of his poetical works, scarcely one passionate exaggeration. He faces life with an invincible courage, an inextinguishable hope and heavenward trust, and the dignity of a benevolent will which no compulsion can break or bend. The billows of his soul are not waves, but hills which tempests ruffle but can never heave. Even when he essays to speak for spirits unlike his own—characters of history or conceptions of his own imagination—he never with signal success portrays them in the bonds, however transient, of any overmastering passion. For merriment he has a generous smile, for sorrow a royal one; but the nearest he ever comes to mirth is in his dainty rhyme, "Robert of Lincoln," and the nearest to a wail in those exquisite notes of grief for the loss of his young sister, "The Death of the Flowers," which only draw the tear to fill it with the light of a perfect resignation. As a seer of large and noble contemplation, in whose pictures of earth and sky the presence and care of the Divine mind, and every tender and beautiful relation of man to his Creator and to his fellow, are melodiously celebrated, his rank is among the master poets of America, of whom he is historically the first. (G. W. CA.)

Brynmawr, a market town of South Wales, in the county of Brecknock, 14½ miles S.E. of Brecknock, with a station on the London and North-Western railway. Since 1894 it has been governed by an urban district council. Population of the urban district (1891), 6413; (1901), 6833.

Bryophyta.—This great subdivision of the vegetable kingdom was treated so fully in the article MUSCINEÆ (see *Ency. Brit.* vol. xvii.), that only a brief supplementary note is necessary to indicate the nature of the extension of our knowledge of the Mosses and Liverworts since the date of its publication. The more recent work has shown that in the Bryophyta we have a group of plants, the evolution of which has proceeded on somewhat similar lines to that of the higher plants as regards the adaptation of the organism to the conditions under which it lives. The important distinction for morphological purposes, that in the Bryophyta the leafy plant is the sexual generation, while the corresponding modifications are found in the sporophyte of the higher plants, only gives a special value to the comparison of the two groups, since the adaptations can be seen to have arisen independently. It will be sufficient here to point out some of the characters of Liverworts and Mosses which receive their explanation in this way, and to refer for details to the works cited at the end of this article. Starting from the structure found in the simpler thalloid forms, the development of more or less specialized leaves to meet the requirements of assimilation can be seen. A series illustrating the passage from the frondose to the foliose condition is afforded by the anacrogynous *Jungermanniaceæ*, several interesting new forms of which have been discovered. In some of the acrogynous *Jungermanniaceæ* also the main assimilating surface is a flat thallus, only the branches which bear the reproductive organs being leafy. On the other hand, a specialization of the upper surface of a thallus for this purpose can be traced in a series of forms from the *Ricciaceæ* to the *Marchantiaceæ*, culminating in the structure found in such a liverwort as *Marchantia*. The leafy shoot of the sexual generation of the Mosses may be cited

lastly. In one moss (*Buxbaumia aphylla*), this is so simple that the well-developed protonema bears either solitary scale leaves, or a simple stem with several leaves around the sexual organs. This has been regarded by Goebel as the simplest form of moss, but the complexity of the capsule, combined with the fact that the plant is probably a saprophyte, makes the validity of this inference questionable. The view that in *Buxbaumia* we have a reduced rather than a primitive form, is supported by the presence of a well-developed leafy shoot in the mosses which appear to be most closely allied to it. In connexion with the partial saprophytism of many of the Bryophyta, the occurrence of fungal hyphæ in their rhizoids, forming a mycorhiza, may be noted. The *Splachnaceæ*, a group of mosses growing on dung and decomposing animal substances, exhibit in their conspicuousness, and in their coherent and sticky spores, characters which may be regarded as adaptive; the spores of these mosses are probably carried to the localized droppings, on which the plants are found, by the agency of flies. Another group of adaptive characters is related to the protection of the organism against drought. Many Bryophyta are capable of withstanding prolonged desiccation, recovering on being moistened, and show no special arrangements for their preservation through a dry period. Others, however, do show special adaptations to this end, such as the rolling up of the thallus in certain *Marchantiaceæ*, the presence of the auricles on the leaves of some *Jungermanniaceæ* (which serve for water-storage, and are most common in epiphytic or epiphyllous forms), and the rolling up of the leaf in the *Polytrichaceæ*. In connexion with this the not infrequent occurrence of underground tubers may be mentioned; these start the growth of the plant after the dry season is over, and thus serve as a means of vegetative multiplication. Special arrangements have also been shown to exist in the structures adjoining the sexual organs, the function of which is to increase the chance of the spermatozoids being brought within the range of the attractive power of the archegonium; the attraction appears to be due to the irritability of the spermatozoids to certain chemical substances. With regard to the sporophyte, evidence has accumulated, from a study of its structure and from experimental work, that the larger sporogonia of some Mosses and the *Anthocerotæ* are to a considerable extent independent of the gametophyte. Their assimilating tissue may be well developed, especially in the apophysis, which bears true stomata, and in the arrangement of its cells recalls the mesophyll of some foliage leaves. Various types of spore-dispersal have also been recognized in the moss sporogonium. It will be evident that, until a considerable insight into the origin of such characters is obtained, the value of their application to the determination of relationship cannot be estimated; but it may be pointed out that their bearing on the classification of the Bryophyta, which is to some extent founded on differences in leaf-form, &c., along with more trustworthy characters, is an important one.

As to the relationship of the Bryophyta, on the one hand, to the *Algæ*, and on the other to the Vascular Cryptogams, little can be added to what is said in the original article. In connexion with the hypothesis advanced by Bower to explain the origin of the latter group, in which the strobilus of a Vascular Cryptogam, such as *Equisetum*, is regarded as the equivalent of the sporogonial head, the article on PTERIDOPHYTA may be referred to. The significance of the Bryophyta as affording an insight into the possible mode of origin of the independent, leafy sporophyte of the Pteridophyta is obvious, whether we regard the two groups as nearly related or not. The alternation found in the two is a strictly similar one: investigations into the nuclear changes have shown that in Bryophytes the reduction in number of the chromosomes takes place in the spore-mother-cells, and that thus the same cytological difference exists between gametophyte and sporophyte. While apogamy is not known, some mosses have been shown to be aposporous; in *Funaria* the protonemal filaments may arise from a sporogonium while still attached to the moss plant. Thus the one generation may arise vegetatively from the other in Mosses as in Ferns. This brief account will serve to show that, while our knowledge of the details of morphology and natural history has increased, the general point of view in the original article needs no amendment, while the systematic works cited below will show to what extent the classification of the Bryophyta has been modified by the additional facts brought to light.

For further information the reader may consult:—CAMPBELL. *Mosses and Ferns.* London, 1895.—ENGLER and PRANTL. *Die natürlichen Pflanzenfamilien*, Theil i. Abth. 3. Leipzig, 1893-1900.—GOEBEL. *Organographie der Pflanzen.* Jena, 1898. Full references to the recent literature of the subject will be found in all these works. (W. H. L.)

Brzezany, a town in Galicia (Austria). Population of town and commune (1890), 11,221; (1900), 11,244; besides a garrison of 832 men. It has leather manufactures and trade in corn, spirits, and agricultural produce.

Bucaramanga, capital of the department of Santander, Colombia, South America, 185 miles N.N.E. of Bogota. It is a town of considerable commercial activity, connected with the Magdalena river by a railway, and is well built and prosperous, the streets being lighted by electricity. There are gold, copper, and iron mines in the neighbourhood. Population, 18,000

Buchanan, Robert Williams (1841-1901), British poet, novelist, and dramatist, son of Robert Buchanan (1813-1866), Owenite lecturer and journalist, was born at Caverswall, Staffordshire, on 18th August 1841. His father, a native of Ayr, after living for some years in Manchester, removed to Glasgow, where Buchanan was educated, at the High School and the University, one of his fellow-students being the poet David Gray. His essay on Gray, originally contributed to the *Cornhill Magazine*, tells the story of their close friendship, and of their journey to London in 1860 in search of fame. After a period of struggle and disappointment Buchanan published *Undertones* in 1863. This "tentative" volume was followed by *Idyls and Legends of Inverburn* (1865), *London Poems* (1866), and *North Coast and other Poems* (1868), wherein he displayed a faculty for poetic narrative and a sympathetic insight into the humbler conditions of life. On the whole, Buchanan is at his best in these narrative poems, though he essayed a more ambitious flight in *The Book of Orm: A Prelude to the Epic*, a study in mysticism, which appeared in 1870. He also became a frequent contributor to periodical literature, and obtained notoriety by an article which, under the *nom de plume* of Thomas Maitland, he contributed to the *Contemporary Review* for October 1871, entitled "The Fleshly School of Poetry." This article was expanded into a pamphlet (1872), but he subsequently withdrew from the criticisms it contained, and it is chiefly remembered by the replies it evoked from D. G. Rossetti in a letter to the *Athenæum* (16th December 1871), entitled "The Stealthy School of Criticism," and from Mr Swinburne. In 1876 appeared *The Shadow of the Sword*, the first and one of the best of a long series of novels. Buchanan was also the author of many successful plays, among which may be mentioned *Lady Clare*, produced in 1883; *Sophia* (1886), an adaptation of *Tom Jones*; *A Man's Shadow* (1890); and *The Charlatan*

(1894). In 1896 he became, so far as some of his work was concerned, his own publisher. In the autumn of 1900 he had a paralytic seizure, from which he never recovered. He died at Streatham on 10th June 1901.

Buchanan's poems were collected into three volumes in 1874, and again, more completely, into one volume in 1884. This volume contains, besides the poems mentioned above and many others, "The Drama of Kings" (1871); "St Abe and his Seven Wives," a lively tale of Salt Lake City, published anonymously in 1872; and "Balder the Beautiful" (1877). He afterwards published (among others) "The City of Dream" (1888); "The Outcast: a Rhyme for the Time" (1891); and "The Wandering Jew" (1893). His earlier novels, *The Shadow of the Sword* and *God and the Man* (1881), a striking tale of a family feud, are distinguished by a certain breadth and simplicity of treatment which is not so noticeable in their successors, among which may be mentioned *The Martyrdom of Madeline* (1882); *Foxglove Manor* (1885); *Effie Hetherington* (1896); and *Father Anthony* (1898). *David Gray and other Essays, chiefly on Poetry* (1868); *Master Spirits* (1873); *A Poet's Sketch Book* (1883), in which the interesting essay on Gray is reprinted; and *A Look round Literature* (1887), contain Buchanan's chief contributions to periodical literature. More valuable is *The Land of Lorne* (two vols. 1871), a vivid record of yachting experiences on the west coast of Scotland.

Bucharest, or BUCAREST (Rumanian, *Bucuresci*), the capital of Rumania, in the province of Ilfov, on the Dimbovitza, 30 miles from the Danube. It is the residence of the king and court, the seat of government and of the metropolitan primate, and has increased in an extraordinary degree in general importance, more especially since the foundation of the kingdom and of the present dynasty. It now occupies an area of more than 20 square miles, and is surrounded by a girdle of fortifications, planned by the celebrated Belgian engineer General Brialmont, extending over a circuit of 45 miles, and comprising 18 forts mounted with the latest inventions in movable cupolas and siege cannon. Many imposing public buildings and private mansions have been erected during recent years, and new streets and boulevards constructed. The paving throughout with granite blocks, and even in parts of the central street, the Calea Victoriei, with wood, and the use of the electric light in its main arteries have given to this so-called Paris of the East an entirely novel aspect, and completely removed all trace of the Oriental character it once possessed. The river Dimbovitza has been provided with handsome quays, and the broad boulevard Elizabeth, which meets it at right angles, extends from the palace of the crown prince and princess at Cotroceni to the barrier of the cattle market, west to east, a distance of some 4½ miles. Another new boulevard meets the Chaussée Kisseleff. This latter, the Bois de Boulogne of Rumania's capital, terminates in the prettily situated racecourse of Băneasa, where spring and autumn meetings are held. The new public buildings are to be found chiefly on the quays of the Dimbovitza, the Calea Victoriei, and the main boulevards. They comprise the remodelled royal palace, the ministries of state (with the exception of the ministry of the interior, all of recent construction), the national bank, the deposit bank, the post office, the law courts, the prefecture, the athenæum (used for literary conferences and for concerts), the court of public accounts, the state printing-office, &c. To these must be added the arsenal, on the outskirts of the town, the cavalry barracks on the plateau of Cotroceni, the infantry barracks at Dealu Spirei, and those for the regiments of the Chasseurs (Vĕnatorĭ) of the Calarasi and Dorobanti at Malmaison, affording in all accommodation for about 30,000 troops.

As to population Bucharest has increased considerably. It amounted in 1890 to about 250,000, and though more or less stationary until 1895, it has since that date, according to the census of 1900, increased to 282,071, of whom 53,056 are foreigners (mostly Austro-Hungarian subjects) and 43,274 are Jews. The great bulk of the population are Rumanians of the Greek orthodox religion. There are at least 350 churches of this creed in the capital, the most noticeable being the Metropol or Cathedral, the church of Doamna Balaşă, and that of St Spiridion. The Roman Catholic community is a large one, numbering as many as 30,000, but there are only three Roman Catholic places of worship, including the cathedral of St Joseph. Educational institutions have also made great progress, for besides the university there are now no less than fifty public schools, not to mention numerous Catholic and Lutheran foundations.

The general sanitary and other improvements are certainly noteworthy, and include, besides the gas and electric lighting and well-paved streets, an almost universally applied system of canalization and water-supply, and electric and horse tramways in all the principal thoroughfares. Manufactories have also sprung up in the neighbourhood of the town, and of these the chief are the gunpowder factory at Dudesci, some 7 miles distant; the sugar factory at Chitila; brick, tile, pipe, and terra-cotta works at Cotroceni; three large breweries, linseed-oil mills, and a rope and waterproof cloth factory. With this increase in importance and general welfare, the railway system of Rumania has been so far extended that her capital is now in communication with the rest of the continent by six lines.

1. By that of Bucharest, Verciorova with Austria-Hungary.
2. By that *viâ* Predeal with Transylvania.
3. By that *viâ* Burdujeni with Austria and Germany.
4. By that *viâ* Jassy-Ungheni with Russia.
5. By the Giurgevo line with Bulgaria; and
6. By the Constantza line over the New Danube Bridge with the Black Sea, and so by the Rumanian Maritime Service (Servicird Maritim) with Constantinople and the east.

Besides a complete external and internal telegraphic service, Bucharest is also in telephonic communication with Sinaia, the summer residence of the court in the Carpathians, and with the ports of Galatz and Braila, and with Jassy.

Among the most important philanthropic institutions may be mentioned the Coltei Hospital, the Asile Elena Doamna, and the Brancovan, Maternitate, Philantropia, Pantelimon hospitals, and the Marcutza lunatic asylum. Good hotels and restaurants are also plentiful. There are, however, only two theatres properly so called, the National Theatre, restored in 1895-96, and the Lyric Theatre, chiefly patronized by foreign artistes. There are besides two large concert halls. There is also a large increase in the number of clubs, political, social, and sporting. Socially, indeed, the progress of Bucharest is remarkable, its political, literary, and scientific *coteries* being of a character to place it on a level with most European capitals. The local colouring of the town is rapidly disappearing with the speedy march of Western civilization; and with the increasing number of houses of several storeys, the room available for the small gardens which once formed so marked a feature is yearly becoming less, although the few public squares and gardens, such as the Cismegiu, Place St Georges, the gardens of the Episcopei and Icoanei, remain for the present intact. The excellent cabs, however, driven by Russian coachmen of the peculiar Lipovan sect, the itinerant retail vendors, with their doleful street-cries and often picturesque country dresses, and the native gypsies, whether musicians or employed in building houses, still strike the eye of the foreigner as a last vestige of the Oriental past.

Bucher, Lothar (1817-1892), German publicist, was born on 25th October 1817, at Neu Stettin, in Pomerania, his father being master at a gymnasium. After studying at the University of Berlin he adopted the legal profession. Elected a member of the National Assembly in Berlin in 1848, he was an active leader of the extreme democratic party. With others of his colleagues he was in 1850 brought to trial for having taken part in organizing a movement for refusal to pay taxes; he was condemned to fifteen months' imprisonment in a fortress, but left the country before the sentence was executed. For ten years he lived in exile, chiefly in London; he acted as special correspondent of the *National Zeitung*, and gained a great knowledge of English life; and he published a work, *Der Parliamentarismus wie er ist*, a criticism of parliamentary government, which shows a marked change in his political opinions. In 1860 he returned to Germany, and became intimate with Lassalle,

who made him his literary executor. In 1864 he was offered by Bismarck, and accepted, a high position in the Prussian Foreign Office. The reasons that led him to a step which involved so complete a break with his earlier friends and associations are not clearly known. From this time till his death he acted as Bismarck's secretary, and was the man who probably enjoyed the greatest amount of his confidence. It was he who drew up the text of the constitution of the North German Confederation; in 1870 he was sent on a very confidential mission to Spain in connexion with the Hohenzollern candidature for the Spanish crown; he assisted Bismarck at the final negotiations for the treaty of Frankfort, and was one of the secretaries to the Berlin Congress; he also assisted Bismarck in the composition of his memoirs. Bucher, who was a man of great ability, had considerable influence, which was especially directed against the economic doctrines of the Liberals; in 1881 he published a pamphlet criticizing the influence and principles of the Cobden Club. He identified himself completely with Bismarck's later commercial and colonial policy, and probably had much to do with introducing it, and he did much to encourage anti-British feeling in Germany. He died at Glion, in Switzerland, on 12th October 1892.

HEINRICH V. POSCHINGER. *Ein Æser: Lothar Buchers Leben und Werke*, 3 vols. Berlin, 1890.—BUSCH. *Bismarck: some Secret Pages of his History*. London, 1898. (J. W. HE.)

Buchholz, a town of Germany, on the Sehma, 18 miles S. by E. of Chemnitz by rail, in the circle of Zwickau, kingdom of Saxony. There is a school for instruction in lace-making, an industry dating from 1589, and now counting over 80 factories. Population (1890), 7808; (1900), 8402.

Buckie, a fishing town and police burgh and railway station of Banffshire, Scotland, on the Moray Firth, at the mouth of the Buckie burn, about 21 miles W. of Banff. It attracts one of the largest Scottish fleets in the herring season, and is also the chief seat of line fishing in Scotland. The value of the fish landed in 1899 was £34,247, and the port had 232 boats of 6106 tons. There are two harbours, one of 9 acres, with half a mile of quayage. There are engineering works and distilleries. A literary institute contains library and recreation rooms. Population (1891), 5849; (1901), 6541. (See BANFFSHIRE for statistics of fishing district.)

Buckingham, a municipal borough and market town of Buckinghamshire, England, 61 miles N.W. of London by rail, on the Ouse, in (since 1885) the Northern parliamentary division of the county. Milk-condensing and the preparation of artificial manure are recently introduced industries. Area, 5007 acres; population (1881), 3585; (1891), 3364; (1901), 3151.

Buckinghamshire, a south midland county of England, bounded on the N. by Northampton, on the W. by Oxford, on the S. by the Thames, and on the E. by Middlesex, Hertford, and Bedford.

Area and Population.—The area of the ancient and administrative county, as given in the census returns, is 475,694 acres, or 743 square miles. Population (1881), 176,155; (1891), 185,284 (of whom 91,195 were males, and 94,089 females, the number of persons per square mile being 249, and of acres to a person 2·57); (1901), 195,534. In 1895 the area of the administrative county was slightly altered, part of the parish of Ibstone, and the parish of Stokenchurch in Oxford being transferred to Buckingham, while part of the parish of Kingsey in Buckingham was transferred to Oxford. The area of the registration county is 410,242 acres, with a population in 1891 of 164,442, of whom 43,190 were urban, and 121,252 rural; and in 1901 of 173,060. Within this area the increase of population between 1881 and 1891 was 5·57 per cent. The excess of births over deaths between 1881 and 1891 was 21,762, but the increase of the resident population was only 8669. The following table gives the numbers of marriages, births, and deaths, with the number of illegitimate births, for 1880, 1890, and 1898:—

Year.	Marriages.	Births.	Deaths.	Illegitimate Births.	
				Male.	Female.
1880	906	4875	2801	142	106
1890	1038	4529	2645	108	112
1898	1174	4348	2464	104	75

The number of marriages in 1899 was 1203, of births 4385, and of deaths 2649.

The following table gives the marriage-, birth-, and death-rates with the percentage of illegitimate births for a series of years:—

	1870-79.	1880.	1880-89.	1890.	1888-97.	1898.
Marriage-rate .	12·8	11·6	12·3	12·7	12·7	13·8
Birth-rate . .	33·2	31·2	30·8	27·7	28·1	25·5
Death-rate . .	19·0	17·9	17·0	16·2	15·4	14·5
Percentage of illegitimacy	5·4	5·1	5·0	4·9	4·5	4·1

Both the birth-rate and the death-rate were below the average for England. In 1891 there were in the county 626 natives of Scotland, 496 natives of Ireland, and 273 foreigners.

Constitution and Government.—The ancient county is divided into three parliamentary divisions, and it also includes part of the parliamentary borough of Windsor. The administrative county contains two municipal boroughs, Buckingham and Chipping Wycombe. The following are urban districts: Aylesbury, Beaconsfield, Chesham, Eton, Fenny Stratford, Linslade, Marlow, Newport Pagnell, and Slough. The county is in the midland circuit, and spring and summer sessions are held at Aylesbury. The boroughs of Buckingham and Chipping Wycombe have separate commissions of the peace. The ancient county, which is in the diocese of Oxford, contains 207 entire ecclesiastical parishes or districts with parts of others.

Education.—Eton college is within the county, and there is a board school for deaf children at Chipping Wycombe. The number of elementary schools on 31st August 1899 was 257, of which 67 were board schools, and 190 voluntary, the latter including 173 Church of England schools, 2 Wesleyan, 3 Roman Catholic, and 12 "British and other." The average attendance at board schools was 11,727, and at voluntary schools 20,006. The total school board receipts for the year ending 29th September 1899 were £38,315. The income under the Agricultural Rates Act was over £1468.

Agriculture.—There are considerable varieties of soil. On the lower grounds, especially in the vale of Aylesbury, it is remarkably fertile, but on the hills it is usually poor and thin. The district round Aylesbury is still famous for its ducks, large numbers being fattened for the London market. About eleven-twelfths of the total area of the county is under cultivation, and of this more than three-fifths is in permanent pasture, which is gradually increasing. Over 3500 acres are under orchards, and about 32,000 acres under woods. The acreage under corn crops, and especially that under wheat, has within recent years greatly decreased. While wheat in 1880 occupied 50,391 acres, its average acreage is now only about 35,000. Turnips and swedes are the principal green crops, cattle being chiefly kept both for feeding and for dairy purposes. The following table gives the larger main divisions of the cultivated area at intervals of five years from 1880:—

Year.	Total Acreage under Cultivation.	Corn Crops.	Green Crops.	Clover.	Permanent Pasture.	Fallow.
1880	405,899	125,035	32,536	31,040	200,774	16,514
1885	408,361	115,953	34,740	32,070	216,461	9,137
1890	405,364	107,476	29,661	30,491	228,456	9,012
1895	401,232	95,437	26,819	31,901	235,850	10,486
1900	400,276	92,855	25,598	31,470	243,887	5,872

The following table gives particulars regarding the principal live stock for the same years:—

Year.	Total Horses.	Total Cattle.	Cows or Heifers in Milk or in Calf.	Sheep.	Pigs.
1880	17,794	68,180	28,208	195,764	31,170
1885	17,753	76,912	31,734	230,152	37,429
1890	17,503	69,913	30,500	213,533	38,952
1895	18,483	66,153	28,645	192,609	40,047
1900	18,182	75,183	31,308	195,567	28,098

Industries and Trade.—According to the annual report of the inspector of factories for 1898 (1900), the total number of persons employed in textile and non-textile factories and workshops in 1897 was 13,286, as compared with 12,568 in 1896. The number of persons employed in non-textile factories in 1897 was 10,313, between 1895 and 1896 there was an increase of 10·6 per cent., and between 1896 and 1897 an increase of 6·2 per cent.; as many as 3795 were employed in the manufacture of machines, conveyances, tools, &c., and 2095 in the manufacture of paper. In workshops 2962 persons were employed, of whom 1537 were employed in the furniture industry. The clothing, lace, and straw-plait manufactures continue to prosper, and there is a thriving trade, especially at High Wycombe, in various articles of turnery, such as chairs, spades, and bowls, from beech and other hard woods. Of clay 8680 tons were raised in 1899.

AUTHORITIES.—The original standard history is the laborious and sumptuous work of LIPSCOMB, 4 vols., London, 1847. A later work is GIBB, *Buckingham*, Aylesbury, 1878-82. Mention may also be made of the same author's *Worthies of Buckingham*, Aylesbury, 1886; and his *Buckingham Miscellany*, Aylesbury, 1891. Other works are SHEAHAN, *History and Topography of Buckinghamshire*, London, 1862; KENNEDY, *Birds of Berkshire and Buckinghamshire*, Eton, 1868; and G. S. ROSCOE, *Buckingham Sketches*, London, 1891.

Buckner, Samuel Bolivar (1823——), American soldier, was born in Hart county, Kentucky, on 1st April 1823, and graduated at West Point in 1844. He resigned from the army in March 1855 to practise law and politics. He was adjutant-general and commander of the state guard of Kentucky, in the Southern interest, May-July 1861. Presently, under a commission, he invaded his native state. As brigadier in command he surrendered Fort Donelson to General Grant on 16th February 1862, with 16,000 troops and vast stores, his superiors Floyd and Pillow escaping. After his exchange as a prisoner of war, he fought under General Bragg at Murfreesboro' and Chickamauga. After the war he served as governor of Kentucky (1887-91), and in 1896 was candidate of the gold Democrats for vice-president of the United States.

Bucyrus, capital of Crawford county, Ohio, U.S.A. It is situated in the northern part of the state, 62 miles north of Columbus, on Sandusky river and on the Pennsylvania and the Ohio Central railways, at an altitude of 991 feet. Its manufactures consist largely of agricultural tools and machines. Population (1880), 3835; (1890), 5974; (1900), 6560.

Buczacz, a district-town in Eastern Galicia, Austria, on the Strypa, a tributary of the Dniester. It is memorable in the Turkish wars of the latter half of the 17th century and for the Treaty of Buczacz in 1672 (*Ency. Brit.* xix. 295). It possesses the ruins of an old castle and a château belonging to the Potocki family. Population (1890), 11,096; (1900), 11,504 (Polish).

Buda (German, *Ofen*), formerly a royal free town of Hungary, on the right bank of the Danube, opposite Pest (on the left bank). It was incorporated with Pest in 1873. Since then the two towns, together with O-Buda (Alt-Ofen, the Aquincum of the Romans) and Steinbruch, form one municipality under the official name of Budapest.

Budapest, the capital of Hungary and residence of the king, situated on both banks of the Danube, 140 miles S.E. of Vienna. It is the seat of the government, parliament, and the supreme courts, and the headquarters of the commander of the Hungarian Landwehr or Houveds. The area, which is now 77½ square miles, has been but slightly increased since the incorporation of the two towns in 1873. Population (1880), including the garrison, 370,767; (1890), 506,384; (1900), 733,358, an increase in the decade of 44·82 per cent. as compared with 36·57 in the preceding ten years. Of this total, 427,112 were Roman Catholics and 5386 Catholics of the Greek rite; 166,198 Jews (in 1869, 42,000); 62,837 Protestants of the Helvetic and 37,170 of the Augsburg Confessions, and 3201 of the Greek orthodox faith. Between 1870 and 1900 the proportion of Roman Catholics declined from 72·3 to 60·7 per cent., of Jews rose from 16·6 to 23·6 per cent., and of Protestants from 10·1 per cent to 14·2. Hungarian was given as the mother tongue of 559,965; 98,515 being returned as German and 24,091 as Slovaks, a branch of the same race as the Czechs of Austria. The remainder (20,877) was composed of Croatians, Servians, Rumanians, Russians, Greeks, Armenians, Gypsies, &c. The great increase of the Magyar element must not be regarded as of purely ethnographic significance. The adoption of a Hungarian name or of the Hungarian language as the mother-tongue is often a political confession of faith, sometimes due to the persuasive influence of official superiors. The Jewish contribution amounted to 35·4 per cent., which was still higher in previous years. Of the 733,358 inhabitants of Budapest in 1900, including the garrison of 16,000 men, 79·6 per cent. were Magyars, 14 per cent. Germans, and 3·4 per cent. Slovaks, the balance being made up of other nationalities. The proportion of Roman Catholics was 60·7 per cent. (in 1890, 64·7 per cent.), of Protestants of the Helvetic and Augsburg Confessions, 14·8 per cent. (in 1890, 13 per cent.), of Jews, 23·6 per cent. (in 1890, 21 per cent.), and of other creeds 1·5 per cent. Of the nationalities the Magyars have the largest increase, and of the creeds the Helvetic Confession. The Roman Catholics show the smallest proportional increase. The Germans and Slovaks have actually declined in number, the former by 17,058 and the latter by 3035 souls.

The marriage-rate, which averaged 7·2 per thousand in the 'seventies, rose to 8·6 in the 'eighties, and to 9·5 in the period 1891-96. In 1897 and 1898 it was 9·6 per thousand. Between 1874 and 1898 the mixed marriages increased from 15·8 per cent. to 24·7 per cent. of the total number. During the same period the birth-rate diminished from 44·5 to 32·6 per thousand. Of these 29 to 30 per cent. were illegitimate. The decline in the death-rate is one of the most striking features in the progress of Budapest, sinking from 43·4 per thousand in 1874 to 20·6 per thousand in 1900. In addition to the increased influx of persons in the prime of life, this is due largely to the improved water-supply and better sanitary conditions generally, including increased hospital accommodation.

The progress of education, the direction and development of which have been governed by the desire to promote Magyar national sentiment, has kept pace with that made in other departments of public life. An important achievement in this respect is the retention in Hungarian military academies of the young officers who were previously educated in Austria. In 1898 the Budapest University was attended by 5382 students (about 2000 in the 'eighties), and the Polytechnic by 1569 (about 1000 in the 'eighties). A further large increase of the attendance is to be anticipated from special measures latterly adopted with the object of keeping Hungarian students at home. The number who attend the Austrian universities, and especially that of Vienna, is already diminishing. A new addition to the educational institutions is the Oriental Academy, organized in 1899. Between 1870 and 1891 the proportion of children attending school more than doubled. The number of elementary schools has increased from 35 in 1861 to 157 in 1899, and that of intermediate schools from *one* in 1870 to 16 in 1899. The illiterates over six years of age, who formed 27·8 per cent. of the population in 1870, fell to 23·1 in 1881 and to 16·6 per cent. in 1891. This percentage is lowest among the Magyar and highest among the Slav inhabitants; lowest among the Jews and Protestants and highest among the Roman Catholics.

There are 18 political daily papers, of which 5 are in the German language. Out of a total (in 1898) of 413 periodicals, 327 were in Hungarian, 36 in German, the remainder consisting of polyglot and Slav publications, &c.

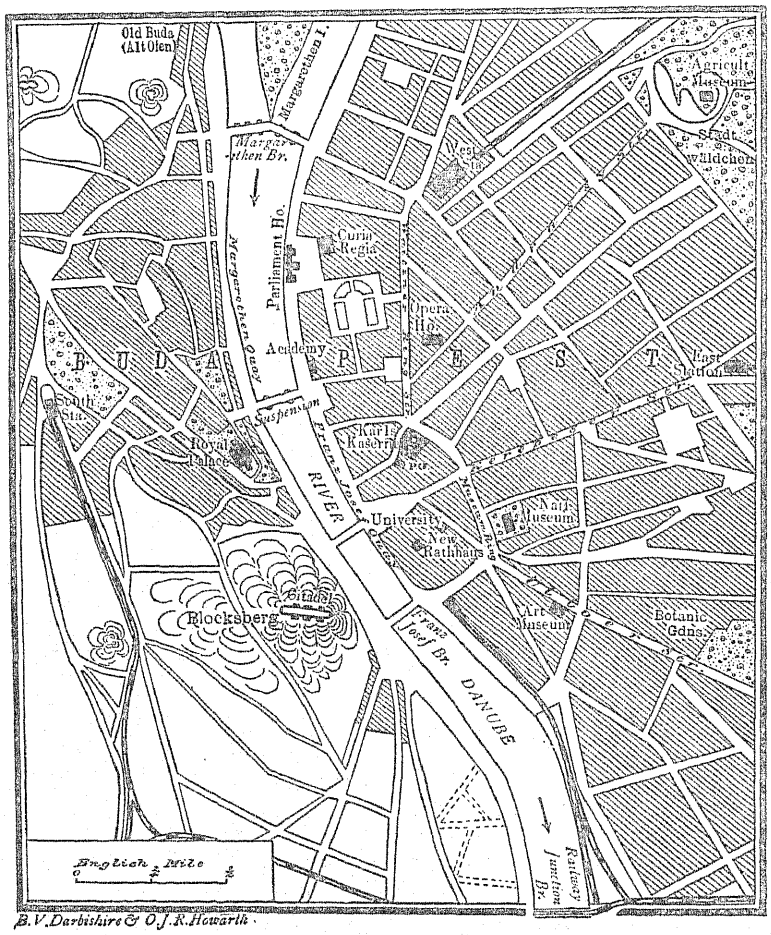
Of the eight theatres, two are subsidized by the State and one by the municipality. The performances are almost exclusively in Hungarian, the exceptions being the occasional appearance of French, Italian, and other foreign artists. Performances in German are under a popular taboo, which effectually excludes them from the theatres, although sometimes given in a music-hall, where they have more than once led to hostile demonstrations. Among the other institutions should be mentioned fourteen lodges of Freemasons. These are forbidden to associate or hold meetings in Austria.

The municipal administration, although on the whole fairly satisfactory, appears to be somewhat expensive. The communal debt is increasing. The total revenue, ordinary and extraordinary, rose from £686,699 in 1887 to £1,220,787 in 1896, and £1,447,460 in 1900. The estimated value of the estate and effects of the corporation, which includes a large and increasing amount of house and real property, rose from £6,183,000 in 1887 to £11,582,000 in 1898. The municipality owns a great deal of the vacant land in and about the town.

The trade of Budapest is mainly in corn, wool, wine, spirits, cattle, pigs, horses, hides, wood, coal, &c. The principal industries are steam flour-milling, distilling, and the manufacture of machinery, waggons, bricks, jute, &c. Comprehensive statistics of the trade and industry of Budapest alone are not available; but, as the leading industrial centre and chief market of Hungary, there is a constant ratio between its progress and that of the whole country.

As an indication of that progress in both respects may be mentioned the increase in the period 1887-98 of the amount paid in direct and indirect taxation from, in round numbers, £1,200,000 to £2,187,666, with a corresponding increase in the communal surtax. The increase in the number of joint-stock companies and of the capital thus invested (an increase which greatly exceeds that of Vienna) is also a valuable indication. In 1873 there were 28 such companies, with a total capital of £2,224,900; in 1890, 75 (capital, £9,352,000); and in 1899 no less than 242, with a total capital of £31,378,655. In the latter year the average net profits of these companies was 8·5 per cent. One of the earliest material causes of the progress of Budapest—at first chiefly commercial—was the introduction of steam navigation on the Danube, which gave an immense impetus to its corn trade. This still continues to operate, having been promoted by the growth of the flour-milling industry, which was revolutionized by certain Budapest inventions. According to Mr A. Shaw, Minneapolis and Budapest are now the two great milling centres of the world. The latter possesses a number of magnificent establishments, fitted with automatic machinery invented and manufactured in the city; fifteen large steam-mills employ 3200 hands. A significant example of the progress of Budapest in another direction, the manufacture of electrical plant, is the fact that a Budapest firm was entrusted by the Russian Government (November 1899) with the erection of a great central station for the transmission of electric power at Port Arthur, and also contracted to furnish large and important plant for the Paris electrical underground railway, and an electric-lighting company in the French capital on the eve of the great exhibition of 1900.

Of the later improvements in Budapest perhaps the most important is the regulation of the older part of the town in connexion with the construction of the two new bridges across the Danube (there are now six in all), and the rapid development of Buda, where entirely new quarters have sprung up. The following figures will give an idea of the building activity: in 1881 the number of houses was 10,748; in 1891, 13,066; in 1896, 14,628; in 1901, 16,254. This growth, which was accompanied by a progressive increase in the proportion of the larger houses, is insufficient for the requirements of the population, of whom 13 per cent. still occupy overcrowded dwellings. The rapid development of a quarter, consisting largely of palatial buildings, which has grown up in the vicinity of the new central railway station has won for it the popular appellation of "Chicago." In the period 1885-95 there were erected 221 new public buildings, including the Palace of Justice and the Royal Opera House, 11 other places of public amusement, 12 barracks, 10 bathing establishments, 9 larger educational institutions, 9 hospitals, 7 charitable institutions, 6 churches, 3 museums, 3 permanent exhibition buildings, 2 orphan asylums, and a central railway station. Within the same period there was a considerable addition to the number of public monuments by native artists. Rents bear nearly the same burden of taxation in Budapest as in Vienna, and in both towns the remission of taxes for a period of years is the chief means of promoting building and reconstruction by private persons. There has been a great extension of the tramway service (formerly horse traction, now electrical), and the new electric underground railway is one of the best-constructed lines of the kind in existence.



B. V. Darbishire & O. J. R. Howarth.

PLAN OF BUDAPEST.

The extraordinarily rapid growth of Budapest during the 19th century, and more particularly since 1867, together with its remarkable progress in every department of municipal and public life, renders it one of the most interesting of modern cities. In the matter of the increase of its population alone it has only been slightly surpassed by one European town, namely, Berlin. Both capitals multiplied their population by nine in the first nine decades of the century. According to an interesting and instructive comparison of the growth of twenty-eight European cities made by Dr Joseph de Körösy, director of the Budapest Communal Bureau of Statistics, Berlin in 1890 showed an increase, as compared with the beginning of the century, of 818 per cent., and Budapest of 809 per cent. Within the same period the increase of Paris was 343 per cent., and of London 340 per cent. This phenomenon, which has excited the admiration of an exceptionally competent American observer, Mr Albert Shaw (see "Budapest: the Rise of a New Metropolis," in his *Municipal Government in Continental Europe*), is worthy of special attention. In Mr Shaw's opinion no other important European city falls so far short of the appreciation it merits. There can be no doubt that its progress is mainly due to the revival of Hungarian national spirit in the first half of the century, and to the energetic and systematic efforts of the Government and people of Hungary since the restoration of the constitution. So far as Hungary was concerned, Pesth in 1867 at once became the favoured rival of Vienna, with the important additional advantage that it had no such competitors within its own sphere as Vienna had in the Austrian provincial capitals. The political, intellectual, and social life of Hungary was centred

in Pesth, and had largely been so since 1848, when it became the seat of the legislature, as it was that of the Austrian central administration which followed the Revolution. The ideal of a prosperous, brilliant, and attractive Magyar capital, which would keep the nobles and the intellectual flower of the country at home, uniting them in the service of the Fatherland, had received a powerful impetus from Count Stephen Széchényi, the great Hungarian reformer of the pre-Revolutionary period. His work, continued by patriotic and able successors, was now taken up as the common task of the Government and the nation, under the guidance of a Liberal aristocracy and gentry distinguished by exceptional political insight. The eminent Hungarian statesman, Count Julius Andrassy, bore a prominent part in this work.

From that time to the present day the record of the Hungarian capital has been one of uninterrupted advance, not merely in externals, such as the removal of slums, the reconstruction of the town, the development of communications, industry, and trade, and the erection of important public buildings, but also in the mental, moral, and physical elevation of the inhabitants; besides another important gain from the point of view of the Hungarian statesman, namely, the progressive increase and improvement of status of the Magyar element of the population. The promotion of the interests of the capital and the centralization of the public and commercial life of the country have—apart from the special acts devoted to that end—formed an integral part of the policy of the State since the restoration of the constitution. Budapest has profited largely by the encouragement of agriculture, trade, and industry, by the nationalization of the railways, which all radiate from Pesth, by the special rates and the zone system, by the development of inland navigation, and also by the neglect of similar measures in favour of Vienna in consequence of the discord prevailing in Austria. It would be difficult to over-estimate the beneficial effect of such direct Government action as the founding of the large State establishment at Budapest for the manufacture of locomotives and agricultural and other machinery, and of the encouragement given to native and foreign enterprise, to undertake the production of all articles consumed in the country. When it is remembered that the ideal both of the authorities and the people is the ultimate monopoly of the home market by Hungarian industry and trade, and the strengthening of the Magyar influence by centralization, it is easy to understand the progress of Budapest.

Politically, this ambitious and progressive capital is the creation of the Magyar upper classes. Commercially and industrially, it may be said to be the work of the Jews. The sound judgment of the former led them to welcome and appreciate the co-operation of the latter, who furnish an ingredient necessary in the composition of a modern State in which they themselves were lacking. Indeed, a readiness to assimilate foreign elements is characteristic of Magyar patriotism, which has, particularly within the last generation, made numerous and ardent converts among the other nationalities of Hungary, and—for national purposes—may be considered to have quite absorbed the Hungarian Jews. It has thus come to pass that there is no anti-Semitism in Budapest, although the Hebrew element is proportionately much larger (21 per cent. as compared with 9 per cent.) than it is in Vienna, the Mecca of the Jew-baiter.

A far larger number of Jews and Protestants are engaged in industry, commerce, and intellectual pursuits than the more numerous Catholics. Out of every 10,000 Jews, 3274 come under those three categories. The remainder are divided as follows: of no occupation, including women and children, 5498 (a far higher proportion than the Catholics and Protestants); engaged in unskilled physical labour, 993 (about a third of the proportion of Catholics and Protestants); in transports and communications, 164 (between a third and half the proportion of Catholics and Protestants); soldiers, policemen, barbers, &c., 55 (about a fourth of the Catholic and an eighth of the Protestant proportion); and, finally, 16 Jews per 10,000 are engaged in some form of agricultural, horticultural, and vineyard labour, which is less than a third of the Catholic and about a ninth of the Protestant proportion. The money-lending institutions, as well as commerce of the town, particularly in corn, manufactures, jewellery, furniture, and clothing, are mainly in the hands of the Jews. The Protestants are to a great extent agriculturists, while they are also largely represented among the teachers, officials, and artisans.

A comparison of the statistics of 1870 with those of 1891 shows a steady increase in the proportion of Hungarians in all occupations, and a corresponding diminution in the proportion of Austrians and other foreigners. In 1891 the percentage of natives engaged in industry was 85·7 per cent. (+9·7 per cent.); in communications, 91·5 per cent. (+24·6 per cent.); in trade, 91·1 per cent. (+7·2 per cent.); in the professions and intellectual occupations, 91·3 per cent. (+8·5 per cent.). Even in unskilled physical labour the same change is visible, there being within the same period an increase of 16 per cent. in the number of natives employed (in 1891, 85·4 per cent.).

Among the most important events in the recent history of the city are the National Hungarian Exhibition, held there in 1885; its elevation to an equality with Vienna as a royal residence and capital on the occasion of the 25th anniversary of the sovereign's coronation as king of Hungary in June 1892, followed by the royal ordinance of November 1893, superseding Austrian court functionaries by Hungarians during the king's stay in Hungary; the imposing national demonstration of respect and the public funeral accorded to the Revolutionary hero Louis Kossuth in March and April 1894; and the Millennial Exhibition in 1896 in celebration of the thousandth anniversary of the foundation of the kingdom of Hungary.

The official publications of the Budapest Communal Bureau of Statistics have acquired a European repute for their completeness, and their fearless exposure of shortcomings has been an element in the progress of the town. Reference should also be made to separate works of the director of that institution, Dr Joseph de Körösy, known in England for his discovery of the law of marital fertility, published by the Royal Society, and by his labours in the development of comparative international statistics. His *Statistique Internationale des grandes villes*, and *Bulletin annuel des finances des grandes villes*, give valuable comparative data. See also *Budapest, hygiène publique et culture*, by Dr Gustave Thirring, assistant director of the Communal Bureau of Statistics, and the *Statistisches Jahrbuch von Budapest*, by the same author; Kahn's *Illustrated Guide to Budapest*; Krücken's *Budapest in Wort und Bild*; the *Technischer Führer von Budapest*, published by the Hungarian Association of Engineers and Architects; and Mr A. Shaw's work, cited above. (Æ. O'N.)

Budaun, a town and district of British India, in the Rohilkhand division of the North-West Provinces. The town is near the left bank of the river Sot. The population in 1891 was 35,372; the municipal income in 1897-98 was Rs.32,871. There are ruins of an immense fort and a very handsome mosque, formerly a Hindu temple. The American Methodist mission maintains several girls' schools, and there is a high school for boys.

The district of Budaun has an area of 2017 square miles. The population in 1891 was 925,598, being 418

persons per square mile. Classified according to religion, Hindus numbered 774,779; Mahommedans, 148,393; Christians, 2581, of whom 19 were Europeans; "others," 229. In 1901 the population was 1,024,888, showing an increase of 11 per cent. The land revenue and rates were Rs.13,03,767, the incidence of assessment being Rs.0:13:13 per acre; the number of police was 2680. Out of a total cultivated area in 1896-97 of 840,827 acres, 104,800 were irrigated, mainly from wells. There are 51 indigo factories, employing 3000 persons, with an out-turn valued at Rs.1,20,400. The district is crossed by two lines of the Oudh and Rohilkhand railway, with five stations. The chief centre of trade is Bilsi.

Buddhism.—Since the article on BUDDHISM in the ninth edition of this work was written (vol. iv. pp. 424-438) nearly the whole of the works composed in the earliest period of Buddhism have been edited in the original Pali, chiefly through the Pali Text Society. A few works of the second period have been edited in the original Pali or Sanskrit, and a number of books of later Buddhism have appeared in the various languages of Eastern Asia. To appreciate the additions thus made to our knowledge it is necessary to remember that the Buddha, like other Indian teachers of his period, taught by conversation only. A highly-educated man (according to the education current at the time), speaking constantly to men of similar education, he followed the literary habit of his day by embodying his doctrines in set phrases (*sûtras*), on which he enlarged, on different occasions, in different ways. Writing was then widely known. But the lack of suitable writing materials made any lengthy books impossible. Such sûtras were therefore the recognized form of preserving and communicating opinion. They were catch-words, as it were, *memoria technica*, which could be easily remembered, and would recall the fuller expositions that had been based upon them. In the Buddha's time the Brahmins had their sûtras in Sanskrit, already a dead language. He purposely put his into the ordinary conversational idiom of the day, that is to say, into Pali. When the Buddha died these sayings were collected together by his disciples into what they call the Four Nikâyas, or "collections." These cannot have reached their final form till about fifty or sixty years afterwards. Other sayings and verses, most of them ascribed, not to the Buddha, but to the disciples themselves, were put into a supplementary Nikâya. We know of slight additions made to this Nikâya as late as the time of Asoka, 3rd century B.C. And the developed doctrine, found in certain portions of it, shows that these are later than the four old Nikâyas. For a generation or two the books so put together were handed down by memory, though probably written memoranda were also used. And they were doubtless accompanied from the first, as they were being taught, by a running commentary. About one hundred years after the Buddha's death there was a schism in the community. Each of the two schools kept an arrangement of the canon —still in Pali, or some allied dialect. Sanskrit was not used for any Buddhist works till long afterwards, and never used at all, so far as is known, for the canonical books. Each of these two schools broke up, in the following centuries, into others. Several of them had their different arrangements of the canonical books, differing also in minor details. These books remained the only authorities for about five centuries, but they all, except only our extant Pali Nikâyas, have been lost in India. These then are our authorities for the earliest period of Buddhism. Now what are these books?

We talk necessarily of Pali *books*. They are not books in the modern sense. They are memorial sentences or verses intended to be learnt by heart. And the whole style and method of arrangement is entirely subordinated to this primary necessity. Each sûtra (Pali, *sutta*) is very short; usually occupying only a page, or perhaps two, and containing a single proposition. When several of these, almost always those that contain propositions of a similar kind, are collected together in the framework of one dialogue, it is called a *suttanta*. The usual length of such a suttanta is about a dozen pages; only a few of them are longer. And a collection of such suttantas might be called a book. But it is as yet neither narrative nor essay. It is at most a string of passages, drawn up in similar form to assist the memory, and intended, not to be read, but to be learnt by heart. The first of the four Nikâyas is a collection of the longest of these suttantas, and it is called accordingly the *Dîgha Nikâya*, that is "the Collection of Long Ones" (scil. Suttantas). The next is the *Majjhima Nikâya*, the "Collection of the suttantas of Medium Length"—medium, that is, as being shorter than the suttantas in the Dîgha, and longer than the ordinary suttas preserved in the two following collections. Between them these first two collections contain 186 dialogues, in which the Buddha, or in a few cases one of his leading disciples, is represented as engaged in conversation on some one of the religious, or philosophic, or ethical points in that system which we now call Buddhism. In depth of philosophic insight, in the method of Socratic questioning often adopted, in the earnest and elevated tone of the whole, in the evidence they afford of the most cultured thought of the day, these dialogues constantly remind the reader of the dialogues of Plato. But not in style. They have indeed a style of their own; always dignified, and occasionally rising into eloquence. But for the reasons already given, it is entirely different from the style of Western writings which are always intended to be read. Historical scholars will, however, revere this collection of dialogues as one of the most priceless of the treasures of antiquity still preserved to us. It is to it, above all, that we shall always have to go for our knowledge of the most ancient Buddhism. Of the 186, 144 have now been edited for the Pali Text Society, and the remainder are either in the press or in preparation. The present writer has commenced a translation of them into English, entitled "The Dialogues of the Buddha," of which one volume has appeared. And Dr K. E. Neumann has published the first volume of a translation of the shorter collection into German, under the title "Reden des Gotamo." A disadvantage of the arrangement in dialogues, more especially as they follow one another according to length and not according to subject, is that it is not easy to find the statement of doctrine on any particular point which is interesting one at the moment. It is very likely just this consideration which led to the compilation of the two following Nikâyas. In the first of these, called the *Anguttara Nikâya*, all those points of Buddhist doctrine capable of expression in classes are set out in order. This practically includes most of the psychology and ethics of Buddhism. For it is a distinguishing mark of the dialogues themselves that the results arrived at are arranged in carefully systematized groups. We are familiar enough in the West with similar classifications, summed up in such expressions as the Seven Deadly Sins, the Ten Commandments, the Thirty-nine Articles, the Four Cardinal Virtues, the Seven Sacraments, and a host of others. These numbered lists (it is true) are going out of fashion. The aid which they afford to memory is no longer required in an age in which books of reference abound. It was precisely as a help to memory that they were found so useful in the early Buddhist times, when the books were all learnt by heart, and had never as yet

been written. And in the Anguttara we find set out in order first of all the ones, then all the pairs, then all the trios, and so on up to the thirty-four constituent parts of the human organism, or the thirty-seven constituent elements of Arahatship. It is the longest book in the Buddhist Bible, and fills 1840 pages 8vo. The whole of the Pali text has been published by the Pali Text Society, but only a few fragments of it have as yet been translated into English. The next, and last, of these four collections contains again the whole, or nearly the whole, of the Buddhist doctrine; but arranged this time in order of subjects. It consists of 55 *Samyuttas* or groups. In each of these the suttas on the same subject, or in one or two cases the suttas addressed to the same sort of people, are grouped together. The whole of it has been published in five volumes by the Pali Text Society. Only a few fragments have been translated.

Many hundreds of the short suttas and verses in these two collections are found, word for word, in the dialogues. And there are numerous instances of the introductory story stating how, and when, and to whom the sutta was enunciated—a sort of narrative framework in which the sutta is set—recurring also. This is very suggestive as to the way in which the earliest Buddhist records were gradually built up. The suttas came first embodying, in set phrases, the doctrine that had to be handed down. Those episodes, found in two or three different places, and always embodying several suttas, came next. Then several of these were woven together to form a suttanta. And finally the suttantas were grouped together into the two Nikâyas, and the suttas and episodes separately into the two others. Parallel with this evolution, so to say, of the suttas, the short statements of doctrine, in prose, ran the treatment of the verses. There was a great love of poetry in the communities in which Buddhism arose. Verses were helpful to the memory. And they were adopted not only for this reason. The adherents of the new view of life found pleasure in putting into appropriate verse the feelings of enthusiasm and of ecstasy which the reforming doctrines inspired. When particularly happy in literary finish, or peculiarly rich in religious feeling, such verses were not lost. These were handed on, from mouth to mouth, in the small companies of the brethren or sisters. The oldest verses are all lyrics, expressions either of emotion, or of some deep saying, some pregnant thought. Very few of them have been preserved alone. And even then they are so difficult to understand, so much like puzzles, that they were probably accompanied from the first by a sort of comment in prose, stating when, and why, and by whom they were supposed to have been uttered. As a general rule such a framework in prose is actually preserved in the old Buddhist literature. It is only in the very latest books included in the canon that the narrative part is also regularly in verse, so that a whole work consists of a collection of ballads. The last step, that of combining such ballads into one long epic poem, was not taken till after the canon was closed. The whole process, from the simple anecdote in mixed prose and verse, the so-called *akhyâna*, to the complete epic, comes out with striking clearness in the history of the Buddhist canon. It is typical, one may notice in passing, of the evolution of the epic elsewhere; in Iceland, for instance, in Persia, and in Greece. And we may safely draw the conclusion that if the great Indian epics, the Mahâ-bhârata and the Râmâyana, had been in existence when the formation of the Buddhist canon began, the course of its development would have been very different from what it was.

As will easily be understood, the same reasons which led to literary activity of this kind, in the earliest period, continued to hold good afterwards. A number of such efforts, after the Nikâyas had been closed, were included in a supplementary Nikâya called the *Khuddaka Nikâya*. It will throw very useful light upon the intellectual level in the Buddhist community just after the earliest period, and upon literary life in the valley of the Ganges in the 4th or 5th century B.C., if we briefly explain what the tractates in this collection contain. The first, the *Khuddaka Pâtha*, is a little tract of only a few pages. After a profession of faith in the Buddha, the doctrine and the order, there follows a paragraph setting out the thirty-four constituents of the human body—bones, blood, nerves, and so on—strangely incongruous with what follows. For that is simply a few of the most beautiful poems to be found in the Buddhist scriptures. There is no apparent reason, except their exquisite versification, why these particular pieces should have been here brought together. It is most probable that this tiny volume was simply a sort of first lesson book for young neophytes when they joined the order. In any case that is one of the uses to which it is put at present. The next book is the *Dhammapada*. Here are brought together from ten to twenty stanzas on each of twenty-six selected points of Buddhist self-training or ethics. There are here altogether 423 verses, gathered from various older sources, and strung together without any other internal connexion than that they relate more or less to the same subject. And the collector has not thought it necessary to choose stanzas written in the same metre, or in the same number of lines. We know that the early Christians were accustomed to sing hymns, both in their homes and on the occasions of their meeting together. These hymns are now irretrievably lost. Had some one made a collection of about twenty isolated stanzas, chosen from these hymns, on each of about twenty subjects—such as Faith, Hope, Love, the Converted Man, Times of Trouble, Quiet Days, the Saviour, the Tree of Life, the Sweet Name, the Dove, the King, the Land of Peace, the Joy Unspeakable—we should have a Christian Dhammapada; and very precious such a collection would be. The Buddhist Dhammapada has been edited by Professor Fausböll (2nd edition, 1900), and has been frequently translated. Where the verses deal with those ideas that are common to Christians and Buddhists, the versions are easily intelligible, and some of the stanzas appeal very strongly to the Western sense of religious beauty. Where the stanzas are full of the technical terms of the Buddhist system of self-culture and self-control, it is often impossible, without expansions that spoil the poetry, or learned notes that distract the attention, to convey the full sense of the original. In all these distinctively Buddhist verses the existing translations (of which Professor Max Müller's is the best known, and Dr Karl Neumann's the best) are inadequate and sometimes quite erroneous. The connexion in which they were spoken is often apparent in the more ancient books from which these verses have been taken, and has been preserved in the commentary on the work itself.

In the next little work the framework, the whole paraphernalia of the ancient akhyâna, is included in the work itself, which is called *Udâna*, or "ecstatic utterances." The Buddha is represented, on various occasions during his long career, to have been so much moved by some event, or speech, or action, that he gave vent, as it were, to his pent-up feelings in a short, ecstatic utterance, couched, for the most part, in one or two lines of poetry. These outbursts, very terse and enigmatic, are charged with religious emotion, and turn often on some subtle point of Arahatship, that is, of the Buddhist ideal of life. The original text has been published by the Pali Text Society. But the little book, a garland of fifty of these

gems, has not yet been translated. The next work is called the *Iti Vuttaka*. This contains 120 short passages, each of them leading up to a terse deep saying of the Buddha's, and introduced, in each case, with the words *Iti vuttam Bhagavatâ*—"thus was it spoken by the Exalted One." These anecdotes may or may not be historically accurate. It is quite possible that the memory of the early disciples, highly trained as it was, enabled them to preserve a substantially true record of some of these speeches, and of the circumstances in which they were uttered. Some or all of them may also have been invented. In either case they are excellent evidence of the sort of questions on which discussions among the earliest Buddhists must have turned. These ecstatic utterances and deep sayings are attributed to the Buddha himself, and accompanied by the prose framework. There has also been preserved a collection of stanzas ascribed to his leading followers. Of these 107 are brethren, and 73 sisters, in the order. The prose framework is in this case preserved only in the commentary, which also gives biographies of the authors. This work is called the *Thera-therî-gâthâ*.

Another interesting collection is the *Jâtaka* book, a set of verses supposed to have been uttered by the Buddha in some of his previous births. These are really 550 of the folk-tales current in India when the canon was being formed, the only thing Buddhist about them being that the Buddha, in a previous birth, is identified in each case with the hero in the little story. Here again the prose is preserved only in the commentary. And it is a most fortunate chance that this—the oldest, the most complete, and the most authentic collection of folk-lore extant—has thus been preserved intact to the present day. Many of these stories and fables have wandered to Europe, and are found in mediæval homilies, poems, and story-books. A full account of this curious migration will be found in the introduction to the present writer's *Buddhist Birth Stories*, the first volume of a contemplated translation of the whole book, now being completed under the editorship of Professor Cowell at the Cambridge University Press. The last of these poetical works which it is necessary to mention is the *Sutta Nipâta*, containing fifty-five poems, all except the last merely short lyrics, many of great beauty. A very ancient commentary on the bulk of these poems has been included in the canon as a separate work. The poems themselves have been translated by Professor Fausböll in the *Sacred Books of the East*. The above works are our authority for the philosophy and ethics of the earliest Buddhists. We have also a complete statement of the rules of the order in the *Vinaya*, edited, in five volumes, by Professor Oldenberg. Three volumes of translations of these rules, by him and by the present writer, have also appeared in the *Sacred Books of the East*.

There have also been added to the canonical books seven works on *Abhidhamma*, a more elaborate and more classified exposition of the Dhamma or doctrine as set out in the *Nikâyas*. All these works are later. Only one of them has been translated as yet, the so-called Dhamma Sangani. The introduction to this translation, published under the title of *Buddhist Psychology*, contains the fullest account that has yet appeared of the psychological conceptions on which Buddhist ethics are throughout based. The translator, Mrs Caroline Rhys Davids, estimates the date of this ancient manual for Buddhist students as the 4th century B.C.

So far the canon, almost all of which is now accessible to readers of Pali. But only seven volumes have so far been translated, and a good deal of work is still required before the harvest of historical data contained in these texts shall have been made acceptable to students of philosophy and sociology. These works of the oldest period, the two centuries and a half, between the Buddha's time and that of Asoka, were followed by a voluminous literature in the following periods—from Asoka to Kanishka, and from Kanishka to Buddhaghosa,—each of about three centuries. Many of these works are extant in MS.; but only five or six of the more important have so far been published. Of these the most interesting is the Milinda, one of the earliest historical novels preserved to us. It is mainly religious and philosophical, and purports to give the discussion, extending over several days, in which a Buddhist elder named Nâgasena succeeds in converting Milinda, that is Menander, the famous Greek king of Bactria, to Buddhism. The Pali text has been edited and the work translated into English. More important historically, though greatly inferior in style and ability, is the Mahâvastu or *Sublime Story*, in Sanskrit. The story is the one of chief importance to the Buddhists—the story, namely, of how the Buddha won, under the Bo Tree, the victory over ignorance, and attained to the Sambodhi, "the higher wisdom," of Nirvâna. The story begins with his previous births, in which also he was accumulating the Buddha qualities. And as the Mahâvastu was a standard work of a particular sect, or rather school, called the Mahâ-sanghikas, it has thus preserved for us the theory of the Buddha as held outside the followers of the canon, by those whose views developed, in after centuries, into the Mahâyâna or modern form of Buddhism in India. But this book, like all the ancient books, was composed, not in the north, in Nepal, but in the valley of the Ganges, and it is partly in prose, partly in verse. Two other works, the *Lalita Vistara* and the *Buddha Carita*, give us—but this, of course, is later—Sanskrit poems, epics, on the same subject. Of these, the former may be as old as the century before Christ; the latter belongs to the century after Christ. Both of them have been edited and translated. The older one contains still a good deal of prose, the gist of it being often repeated in the verses. The later one is entirely in verse, and shows off the author's mastery of the artificial rules of prosody and poetics, according to which a poem, a mahâ-kâvya, ought, according to the later writers on the *Ars poetica*, to be composed.

These three works deal only quite briefly and incidentally with any point of Buddhism outside of the Buddha legend. Of greater importance for the history of Buddhism are two later works, the *Netti Pakarana* and the *Sad-dharma Pundarika*. The former, in Pali, discusses a number of questions then of importance in the Buddhist community; and it relies throughout, as does the Milinda, on the canonical works, which it quotes largely. The latter, in Sanskrit, is the earliest exposition we have of the later Mahâyâna doctrine. Both these books may be dated in the 2nd or 3rd century of our era. The latter has been translated into English. We have now also the text of the *Prajnâ Pâramitâ*, a later treatise on the Mahâyâna system, which in time entirely replaced in India the original doctrines. To about the same age belongs also the *Divyâvadâna*, a collection of legends about the leading disciples of the Buddha, and important members of the order, through the subsequent three centuries. These legends are, however, of different dates, and in spite of the comparatively late period at which it was put into its present form, it contains some very ancient fragments.

The whole of the above works were composed in the north of India; that is to say, either north or a few miles south of the Ganges. The record is at present full of gaps. But we can even now obtain a full and accurate idea of the earliest Buddhism, and are able to trace the main

lines of its development through the first eight or nine centuries of its career. The Pali Text Society is still publishing two volumes a year; and the Russian Academy has inaugurated a series to contain the most important of the Sanskrit works still buried in MS. We have also now accessible in Pali fourteen volumes of the commentaries of the great 5th-century scholars in south India and Ceylon, most of them the works either of Buddhaghosa of Budh Gaya, or of Dhammapâla of Kâncipura (the ancient name of Conjevaram). These are full of important historical data on the social, as well as the religious, life of India during the periods of which they treat.

The striking archæological discoveries of the last few years have both confirmed and added to our knowledge of the earliest period. Pre-eminent among these is the discovery, by Mr William Peppé, on the Birdpur estate, adjoining the boundary between English and Nepalese territory, of the stûpa, or cairn, erected by the Sakya clan over their share of the ashes from the cremation pyre of the Buddha. About twelve miles to the north-east of this spot has been found an inscribed pillar, put up by Asoka as a record of his visit to the Lumbini Garden, as the place where the future Buddha had been born. Although more than two centuries later than the event to which it refers, this inscription is good evidence of the site of the garden. There had been no interruption of the tradition; and it is probable that the place was then still occupied by the descendants of the possessors in the Buddha's time. North-west of this another Asoka pillar has been discovered, recording his visit to the cairn erected by the Sakyas over the remains of Konâgamana, one of the previous Buddhas or teachers, whose follower Gotama the Buddha had claimed to be. These discoveries definitely determine the district occupied by the Sakya republic in the 6th and 7th centuries B.C. The boundaries, of course, are not known; but the clan must have spread thirty miles or more along the lower slopes of the Himalayas, and thirty miles or more southwards over the plains. It has been abandoned jungle since the 3rd century A.D., or perhaps earlier, so that the ruined sites, numerous through the whole district, have remained undisturbed, and further discoveries may be confidently expected.

The principal points on which this large number of older and better authorities has modified our knowledge are as follows:—1. We have learnt that the division of Buddhism, originating with Burnouf, into northern and southern, is misleading. He found that the Buddhism in his Pali MSS., which came from Ceylon, differed from that in his Sanskrit MSS. which came from Nepal. Now that the works he used have been made accessible in printed editions, we find that, wherever the existing MSS. came from, the original works themselves were all composed in the same stretch of country, that is, in the valley of the Ganges. The difference of the opinions expressed in the MSS. is due, not to the place where they are now found, but to the difference of time at which they were originally composed. Not one of the books mentioned above is either northern or southern. They all claim, and rightly claim, to belong, so far as their place of origin is concerned, to the Majjhima Desa, the middle country. It is undesirable to base the main division of our subject on an adventitious circumstance, and especially so when the nomenclature thus introduced (it is not found in the books themselves) cuts right across the true line of division. The use of the terms northern and southern as applied, not to the existing MSS., but to the original books, or to the Buddhism they teach, not only does not help us, it is the source of serious misunderstanding. It inevitably leads careless writers to take for granted that we have, historically, two Buddhisms—one manufactured in Ceylon, the other in Nepal. Now this is admittedly wrong. What we have to consider is Buddhism varying through slight degrees, as the centuries pass by, in almost every book. We may call it one, or we may call it many. What is quite certain is that it is not two. And the most useful distinction to emphasize is, not the ambiguous and misleading geographical one—derived from the places where the modern copies of the MSS. are found; nor even, though that would be better, the linguistic one—but the chronological one. The use, therefore, of the inaccurate and misleading terms northern and southern ought no longer to be followed in scholarly works on Buddhism.

2. Our ideas as to the social conditions that prevailed, during the Buddha's lifetime, in the eastern valley of the Ganges have been modified. The people were divided into clans, many of them governed as republics, more or less aristocratic. In a few cases several of such republics had formed confederations, and in four cases such confederations had already become hereditary monarchies. The right historical analogy is not the state of Germany in the Middle Ages, but the state of Greece in the time of Socrates. The Sakyas were still a republic. They had republics for their neighbours on the east and south, but on the western boundary was the kingdom of Kosala, the modern Oudh, which they acknowledged as a suzerain power. Gotama, the Buddha's father, was not a king. There were râjas in the clan, but the word meant at most something like consul or archon. All the four real kings were called Mahâ-râja. And Suddhodana, the teacher's father, was not even râja. One of his cousins, named Bhaddiya, is styled a râja; but Suddhodana is spoken of, like other citizens, as Suddhodana the Sakyan. As the ancient books are very particular on this question of titles, this is decisive.

3. There was no caste—no caste, that is, in the modern sense of the term. We have long known that the connubium was the cause of a long and determined struggle between the patricians and the plebeians in Rome. Evidence has been yearly accumulating on the existence of restrictions as to intermarriage, and as to the right of eating together (commensality) among other Aryan tribes, Greeks, Germans, Russians, and so on. Even without the fact of the existence now of such restrictions among the modern successors of the ancient Aryans in India, it would have been probable that they also were addicted to similar customs. It is certain that the notion of such usages was familiar enough to some at least of the tribes that preceded the Aryans in India. Rules of endogamy and exogamy; privileges, restricted to certain classes, of eating together, are not only Indian or Aryan, but world-wide phenomena. Both the spirit, and to a large degree the actual details, of modern Indian caste-usages are identical with these ancient, and no doubt universal, customs. It is in them that we have the key to the origin of caste.

At any moment in the history of a nation such customs seem, to a superficial observer, to be fixed and immutable. As a matter of fact they are never quite the same in successive centuries, or even generations. The numerous and complicated details which we sum up under the convenient, but often misleading, single name of caste are solely dependent for their sanction on public opinion. That opinion seems stable. But it is always tending to vary as to the degree of importance attached to some particular one of the details, as to the size and complexity of the particular groups in which each detail ought to be observed.

Owing to the fact that the particular group that in India worked its way to the top, based its claims on religious grounds, not on political power, nor on wealth, the system has, no doubt, lasted longer in India than in Europe. But public opinion still insists, in considerable

circles, even in Europe, on restrictions of a more or less defined kind, both as to marriage and as to eating together. And in India the problem still remains to trace, in the literature, the gradual growth of the system—the gradual formation of new sections among the people, the gradual extension of the institution to the families of people engaged in certain trades, belonging to the same group, or sect, or tribe, tracing their ancestry, whether rightly or wrongly, to the same source. All these factors, and others besides, are real factors. But they are phases of the extension and growth, not explanations of the origin of the system.

There is no evidence to show that at the time of the rise of Buddhism there was any substantial difference, as regards the barriers in question, between the peoples dwelling in the valley of the Ganges and their contemporaries, Greek or Roman, dwelling on the shores of the Mediterranean Sea. The point of greatest weight in the establishment of the subsequent development, the supremacy in India of the priests, was still being hotly debated. All the new evidence tends to show that the struggle was being decided rather against than for the Brahmins. What we find in the Buddha's time is caste in the making. The great mass of the people were distinguished quite roughly into four classes, social strata, of which the boundary lines were vague and uncertain. At one end of the scale were certain outlying tribes and certain hereditary crafts of a dirty or despised kind. At the other end the nobles claimed the superiority. But Brahmins by birth (not necessarily sacrificial priests, for they followed all sorts of occupations) were trying to oust the nobles from the highest grade. They only succeeded, long afterwards, when the power of Buddhism had declined.

4. It had been supposed on the authority of late priestly texts, where boasts of persecution are put forth, that the cause of the decline of Buddhism in India had been Brahmin persecution. The now accessible older authorities, with one doubtful exception,[1] make no mention of persecution. On the other hand, the comparison we are now able to make between the canonical books of the older Buddhism and the later texts of the following centuries, shows a continual decline from the old standpoint, a continual approximation of the Buddhist views to those of the other philosophies and religions of India. We can see now that the very event which seemed, in the eyes of the world, to be the most striking proof of the success of the new movement, the conversion and strenuous support, in the 3rd century B.C., of Asoka, the most powerful ruler India had had, only hastened the decline. The adhesion of large numbers of nominal converts, more especially from the newly incorporated and less advanced provinces, produced weakness rather than strength in the movement for reform. The day of compromise had come. Every relaxation of the old thoroughgoing position was welcomed and supported by converts only half converted. And so the margin of difference between the Buddhists and their opponents gradually faded almost entirely away. The soul theory, step by step, gained again the upper hand. The popular gods and the popular superstitions are once more favoured by Buddhists themselves. The philosophical basis of the old ethics is overshadowed by new speculations. And even the old ideal of life, the salvation of the Arahat to be won in this world and in this world only, by self-culture and self-mastery, is forgotten, or mentioned only to be condemned. The end was inevitable. The need of a separate organization became less and less apparent. The whole pantheon of the Vedic gods, with the ceremonies and the sacrifices associated with them, passed indeed away. But the ancient Buddhism, the party of reform, was overwhelmed also in its fall; and modern Hinduism arose on the ruins of both.

[1] See *Journal of the Pali Text Society*, 1896, pp. 87-92.

The attention of the few scholars at work on the subject being directed to the necessary first step of publishing the ancient authorities, the work of exploring them, of analysing and classifying the data they contain, has as yet been very imperfectly done. But the following works have appeared, and are to be preferred to those given at the end of the article in the ninth edition. Only the most important are here mentioned.

Texts.—*Pali Text Society*, 50 vols.—*Jâtaka*, 7 vols., ed. Fausböll, 1877-97.—*Vinaya*, 5 vols., ed. Oldenberg, 1879-83.—*Dhammapada*, ed. Fausböll, 2nd ed. 1900.—*Divyâvadâna*, ed. Cowell and Neil, 1882.—*Mahâvastu*, ed. Senart, 3 vols. 1882-97.—*Buddha Carita*, ed. Cowell, 1892.—*Milinda-pañho*, ed. Trenckner, 1880.

Translations.—*Vinaya Texts*, by Rhys Davids and Oldenberg, 3 vols., 1881-85.—*Dhammapada*, by Max Müller, and *Sutta Nipata*, by Fausböll, 1881.—*Questions of King Milinda*, by Rhys Davids, 2 vols., 1890-94.—*Buddhist Suttas*, by Rhys Davids, 1881.—*Saddharma Pundarika*, by Kern, 1884.—*Buddhist Mahâyâna Texts*, by Cowell and Max Müller, 1894—all the above in the "Sacred Books of the East."—*Jâtaka*, vol. i., by Rhys Davids, under the title *Buddhist Birth Stories*, 1880; vols. i.-iv., by Chalmers, Neil, Francis, and Rouse, 1895-97. *Buddhism in Translations*, by Warren, 1896.—*Buddhistische Anthologie*, by Neumann, 1892. *Lieder der Mönche und Nonnen*, 1899, by the same.—*Dialogues of the Buddha*, by Rhys Davids, 1899.—*Die Reden Gotamo Buddho's*, by Neumann, 2 vols., 1899-1900.—*Buddhist Psychology*, by Mrs. Rhys Davids, 1900.

Manuals, Monographs, &c.—*Buddhism*, by Rhys Davids, 12mo, 18th thousand, 1899.—*Buddha, seine Leben seine Lehre und seine Gemeinde*, by Oldenberg, 3rd ed., 1898.—*Der Buddhismus und seine Geschichte in Indien*, by Kern, 1882.—*Der Buddhismus*, by Edmund Hardy, 1890.—*American Lectures, Buddhism*, by Rhys Davids, 1896.—*Inscriptions de Piyadasi*, by Senart, 2 vols., 1881-86.—*Mara und Buddha*, by Windisch, 1895.

(T. W. R. D.)

Budweis (Czech, *Budějovice*), the chief town of a government-district in Bohemia, Austria. Population (1890), 28,491; (1900), 39,328 (estimated to have 59 per cent. Czech, 41 per cent. German, 95·5 per cent. Catholic, 4 per cent. Jewish, and ½ per cent. Protestant). It has a garrison of 2155 men. It is the principal commercial centre of South Bohemia, and has a large, varied, and growing industry, which now comprises the manufacture of chemicals, matches, paper, machinery, bricks and tiles, boat-building, bell-founding, corn and sawmills, &c. The trade is chiefly in corn, timber, coal, lignite, and salt, as well as in industrial products, including beer exported to America. Budweis is the centre of a German enclave in Czech Bohemia, the rural population for a considerable distance round the town being German-speaking.

Buell, Don Carlos (1818-1898), American soldier, was born near Marietta, Ohio, on 23rd March 1818. He graduated at West Point in 1841, and during the Mexican war won brevet promotion, being severely wounded at Cherubusco. From 1848 to 1861 he performed various staff duties, chiefly as assistant-adjutant-general. Appointed lieutenant-colonel of staff on 11th May 1861, and brigadier-general of volunteers on 17th May 1861, he aided efficiently in organizing the army of the Potomac, and, at the instance of General McClellan, was sent in November to Kentucky to succeed General William T. Sherman in the reorganized department of the Ohio. Aided by Grant's famous river operations, he occupied Bowling Green in February 1862, and thence marched to Nashville. He was promoted major-general of volunteers on 21st March 1862, and placed at once under the orders of General Halleck, then at the zenith of his fame. Near the critical close of Grant's first day's battle at Shiloh he arrived with reinforcements, and co-operated in driving back the foe on the following day. Detached with his army by Halleck after the capture of Corinth, he met the rapid advance of the Confederate General Bragg into Kentucky, rescued Louisville, and, on 8th October, fought at Perryville, compelling Bragg to retreat. Complaints

against him having been made at Washington, which were later investigated but not published, Buell was now superseded by General Rosecrans. He was mustered out of the volunteer service in May 1864, and on 1st June resigned from the regular army. He was president of Kentucky ironworks (1865-70), and subsequently engaged in various mining enterprises; he served (1885-90) as pension agent at Louisville. He died near Rockport, Kentucky, on 19th November 1898. Buell was a good organizer of troops and disciplinarian, but somewhat tardy of movement and indisposed to take risks, and his haughty bearing often caused offence. As McClellan's friend, holding similar views, adverse politically to the administration, he suffered by McClellan's displacement.

Buenos Aires, a maritime province of the Argentine Republic. The official area at the census of 1895 was 117,777 square miles: the population in 1869 (exclusive of that of the Federal District) was 307,761; in 1895 it was 921,168. The capital is La Plata. In 1895 there were 36,777 farms, 2,774,875 acres planted in cereals, 7,745,896 head of cattle, 1,685,658 horses, and 11,545,018 sheep in the province.

Buenos Aires, capital of the Argentine Republic, situated in 34° 36′ 29″ S. lat. and 58° 22′ 14″ W. long.; its mean altitude above sea-level, 10 feet. It now forms part of the Federal District (area, 72 square miles; greatest breadth from N. to S., 11 miles; greatest length from E. to W., 16 miles), which was separated from the rest of the province in 1880, and constituted an administrative entity, when the city was made the federal capital and its duties as provincial capital were transferred to La Plata. All the most characteristic features of the old city have changed completely. The ancient one-storeyed buildings have been replaced by handsome structures of modern design; the streets have been paved with asphalt and wood; electric light has been introduced; water and drainage works have been constructed. In short, European civilization is now firmly implanted. The once outlying parts of the capital either have already become real suburbs or will shortly do so. Amongst later important public buildings and institutions are the Congress House, the Archbishop's Palace, the National Library (60,000 volumes), the National Museum of Fine Arts (1895), the Natural History Museum, the National Historical Museum, the Zoological Gardens, and the Municipal Botanical Gardens. The population in 1880 was estimated to be under 400,000; in 1895 it was 663,854, and in 1899, 795,323. The number of foreigners in 1895 was 345,493, as against 63,115 in 1869. The proportion of males to females per thousand at the same date was 537 males to 463 females. The number of marriages in 1895 was 5492, or 8·1 per thousand; of births in 1898, 40·9 per thousand; of deaths, 17·67 per thousand. At the same date the number of property owners was 45,848. As regards public instruction, the census of 1895 showed that of children from six to fourteen years of age 93,560 were attending school or knew how to read and write, out of a total of 117,388, or 719 to each 1000. Most of the immigration to the republic enters through Buenos Aires. In 1896, 102,000 entered; in 1898, 95,190; in 1899, 88,000, of whom 13,000 were agricultural families with 40,000 members. Buenos Aires is the head of six railway lines—the Southern, Pacific, Rosario, La Ensenada, Argentine Central, and Western. In 1898 these lines took, at the various stations within the municipality, 10,962,240 passengers and 2,346,946 tons of merchandise. The tramways at the end of 1898 extended over 246 miles, and carried 105,964,631 passengers. The post office received in 1887, 10,752,284 pieces of mail matter; in 1898, 53,175,579. In 1887, 11,243,017 pieces were despatched; in 1898, 61,374,446 pieces. The telegraphic bureau in 1898 received 707,812 telegrams and despatched 479,793. The commercial community is for the most part comprised of foreigners:—British and Germans in the higher branches of banking and finance; British, Spaniards, Germans, and Italians in the import and export trade; Italians, French, and Spaniards in the retail business. The value of the imports and exports of Buenos Aires from 1880 to 1898 is shown in the following table, the value being given in gold pesos:—

Year.	Imports.	Exports.
1880	$37,095,243	$39,887,302
1885	69,787,044	51,996,527
1890	103,175,961	57,742,342
1895	82,048,177	62,531,492
1898	92,206,491	70,956,559

The movement of shipping in 1887 and 1898 is shown in the subjoined table:—

	1887.				1898.			
	Sailing.		Steam.		Sailing.		Steam.	
	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.
Entered .	3358	704,036	1542	1,278,668	2204	457,836	2307	2,564,298
Cleared .	1325	308,744	1769	1,226,671	1987	352,401	2311	2,383,675

Buffalo, the second city in size in the state of New York and the eighth in the United States of America, situated at the foot of Lake Erie where the Niagara River begins its connecting course to Lake Ontario, and the Erie Canal, by its artificial channel, continues the water route to the sea-board. It is practically the midway point between Chicago and New York or Boston; the journey by rail from New York being somewhat over 400 miles, from Boston a little less than 500, and from Chicago a little more than 500 miles. Its position, practically in the centre of the thickly populated portion of the United States, and at the transfer point between the east and the west, accounts for the development of this city during the last twenty years of the 19th century. Shortly after 1880 the rapid growth began. In that year the population was 155,134; in 1890 it had attained to 255,664, and in 1900 it reached 352,387. The assessed valuation of real and personal property grew from $38,000,000 in 1873 to nearly $246,000,000 in 1900. The net debt in 1900 was $15,753,582, and the tax rate $23.48 per $1000. It was in the decade from 1880 to 1890 that most of the great railway building was done which has made Buffalo a transportation centre of almost unrivalled facilities. There are thirty different railway divisions meeting in the city, and the railways own 6 of the city's total area of 42 square miles, and have over 500 miles of track within the city's limits. The trunk lines entering the city from the east are the New York Central, West Shore, Erie, Lackawanna, Lehigh, and Pennsylvania; from the west and south, the Lake Shore, Michigan Central, Nickel Plate, Grand Trunk, Wabash, and Canadian Pacific. In short, all the trunk lines of what may be called the northern route between the east and the west have made Buffalo a central distributing point. The commerce of the lakes has increased as rapidly as that of the railways. The vessels which arrived at the port of Buffalo in 1899 numbered over 5000, with a tonnage of over 5,000,000. The average annual receipts of grain and flour by the lakes in 1875 was 50,000,000 bushels; now it is over 200,000,000 bushels. The elevators, which even then were a famous and picturesque feature of Buffalo, now

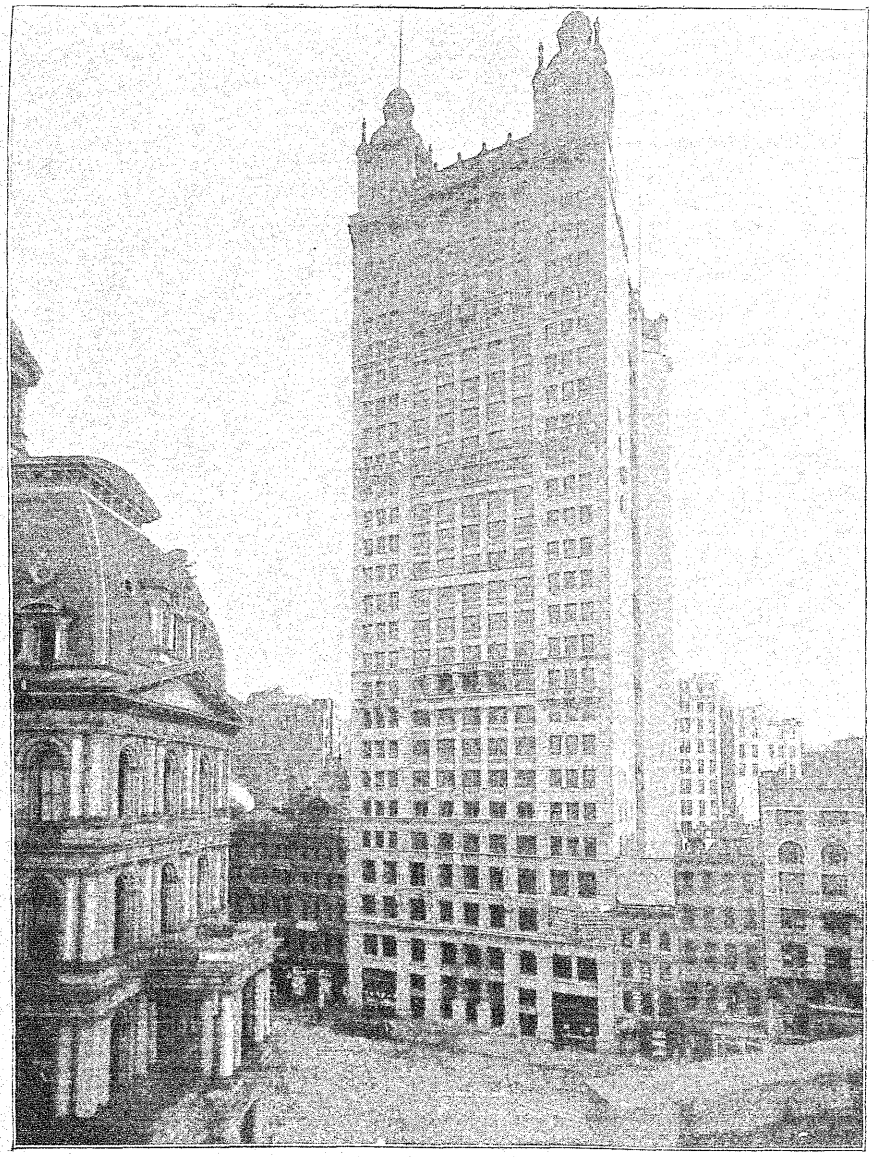
have a storage capacity of over 21,000,000 bushels as against the 7,000,000 bushels of that time. The coal trade of Buffalo, which in 1875 was in its infancy, has now become a great feature of the lake commerce; for of the 5,000,000 tons of anthracite coal received in 1899, 2,700,000 tons were shipped to the west by vessel. 3,000,000 tons of bituminous coal were also received by rail in 1899, though only a small amount was shipped. The lumber imports by lake were 230,000,000 feet in 1899, and in the same year over 1,500,000 tons of iron ore were brought from Lake Superior to the port of Buffalo. For the protection of this lake commerce and the increase of the harbour facilities the United States has built an outer breakwater of stone and cement almost four miles in length, and costing over $2,000,000. This breakwater and the new post-office, a huge granite pile with a tower over 200 feet in height, are the most noticeable of the newer public improvements. The two public libraries are also among the newer public buildings which decorate the city. The Grosvenor library, for reference only, has over 55,000 volumes, while the Buffalo library has 160,000 volumes. The public school system has grown with the growth of the city. In 1900 there were two high schools with an average attendance of 2228 scholars. The district or grammar schools numbered sixty, with an average attendance of 38,462. There were 114,396 persons of school age (5 to 20 years inclusive). Out of 97,938 males of voting age (21 years and over), 5168 were illiterate (unable to write), of whom 4813 were foreign-born. Buffalo has always been greatly admired for its broad and spacious streets, almost all of which are handsomely shaded. The streets in the residential portion are mainly occupied by detached houses, largely built of wood and surrounded by lawns and gardens. This system of building and a remarkably cool summer climate have given Buffalo its reputation as a delightful place of residence, and have attracted visitors from all parts of the world. In 1901 the Pan-American Exposition was held from May to November in the park and adjoining lands to the north of the city. It was on a scale eclipsed only by the Expositions at Chicago and Paris. Two of the buildings were permanent additions to the attractions of the park, namely, the Albright Art Gallery and the New York State building, which is to house the collections of the Buffalo Historical Society. It was during a visit to the Exposition on 6th September that President McKinley was assassinated by Czolgosz. At the south end of the city, on the lake shore protected by the new breakwater, stands the great steel plant of the Lackawanna Steel Company. The property owned by this company, which is capitalized at $20,000,000, extends more than a mile along the shore and its new works are intended to employ over 6000 men. Much of the power used in Buffalo is from electricity generated at Niagara Falls, some 20 miles away, and most of the residences are heated by natural gas brought from the Canadian and Pennsylvania gas fields. The park system in Buffalo comprises 1000 acres and contains 20 miles of boulevards. Of the total population in 1900, 248,135 were native-born and 104,252 foreign-born, 350,586 white and only 1801 coloured, of whom 1698 were negroes. The healthfulness of the city is attested by its low death-rate of 14·8 per thousand in 1900. (G. E. M.)

Building.—The most important development in building since the article on that subject in the ninth edition of this work was published has been in the direction of steel construction, and it is with this that the following article will deal. The very tall buildings which are such prominent objects in the principal cities of the United States are the natural and logical result of the introduction of new materials and devices, and of the application of modern science to the solution of the problem of economical construction (see Plate). Apart from the æsthetic considerations to which have been due the construction of spires, towers, domes, high roofs, &c., the form and height of buildings have always been largely controlled by a practical consideration of their value for personal use or rental. The cost of buildings of the same class and finish is in direct proportion to their cubic contents, and each cubic foot constructed is commercially unprofitable which does not do its part in paying interest on the capital invested. Until the latter half of the 19th century, these considerations practically limited the height of buildings on city streets to five or six storeys. The manufacture of the wrought-iron "I" beam in 1855 made cheaper fireproof construction possible, and together with the introduction of passenger lifts (see ELEVATORS) about ten years later led to the erection of buildings to be used as hotels, flats, offices, factories, and for other commercial purposes, containing many more storeys than had formerly been found profitable. The practical limit of height was reached when the sectional area of the masonry of the piers of the exterior walls in the lower storey became sufficiently great, in order to support safely the weight of the dead load of the walls and floors and the accidental load imposed upon the latter in use, to affect seriously the value of the lower storeys on account of the loss of light and floor space. This limit was found to be about ten storeys. Various devices were successively made to reduce the size of the exterior piers. In 1881 the walls of a very large courtyard were constructed by building a braced cage of iron and filling the panels with masonry, a system of construction which had been used in the early part of the century for a tall shot-tower erected in the city of New York. Subsequently several buildings were erected in which the entire weight of the floors and roofs was carried by a system of metal columns placed against the inner surface of the exterior walls. The walls thus supported no load but their own weight, and were tied to the inner cage formed by the wall columns, interior columns, girders, and floors, by anchors arranged to provide for the shrinkage of masonry in drying out which always occurs to a greater or less extent. By the use of this form of construction buildings were carried to the height of eighteen or nineteen storeys.

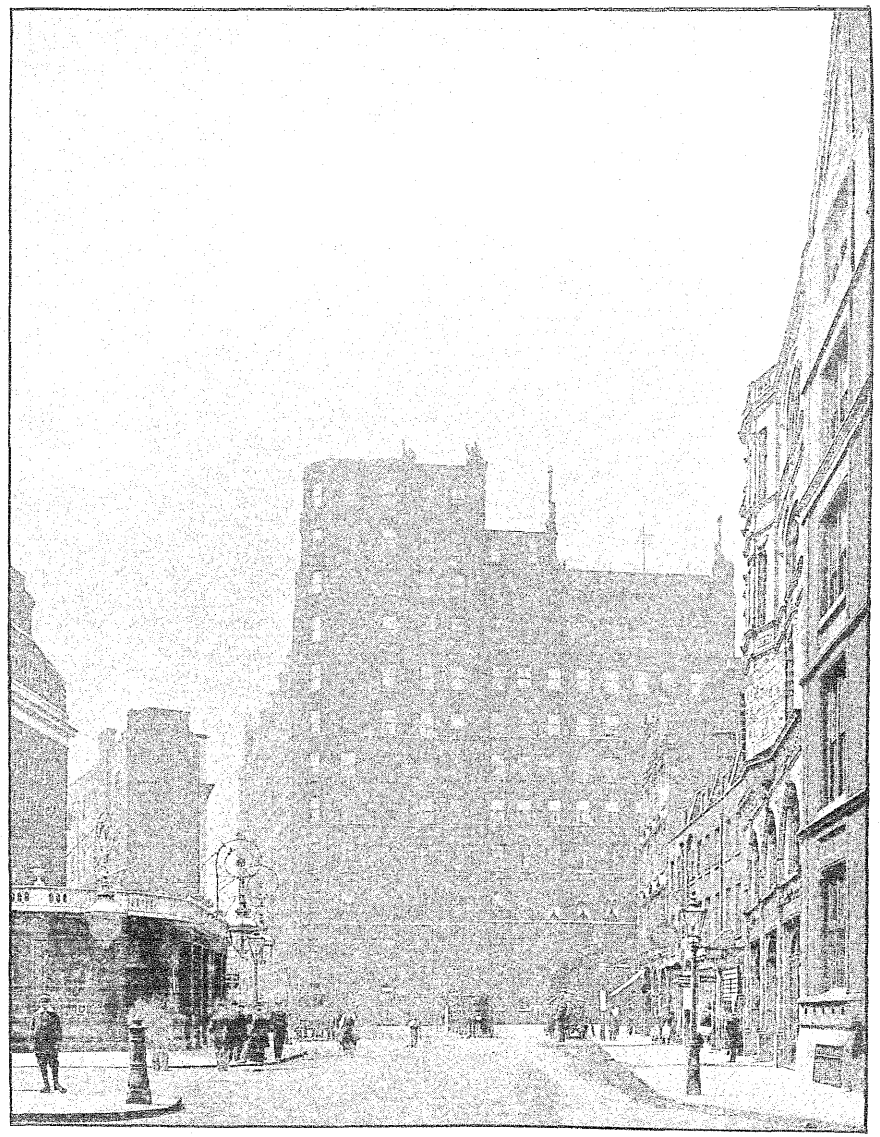
The first building used for tenants, in which the entire construction including the exterior walls was carried by a metal frame, was erected in Chicago in 1883.

Steel cage construction.

With the introduction of cheap structural steel, this system (known as the steel cage construction) came rapidly into use. The dimensions of the exterior piers ceased to control the height of the building, which was limited alone by the possibility of securing adequate foundations, and by a consideration of the amount of floor space which could be devoted without too great loss to a system of passenger lifts of sufficient capacity to afford rapid access to all parts of the building. The advantages that led to the very rapid introduction of this system were not only the power of greatly reducing the size of the piers, but the enormous facility afforded for rapid construction, the small amount of materials relatively used, and the proportionately small load upon the foundations, and the fact that as the walls are supported at each storey directly from the cage, the masonry can be commenced at any storey independently of the masonry below it. It is a disadvantage of the system that defects of proportion, material, or workmanship, which would be of less moment in an old-fashioned construction, may become an element of danger in building with the steel cage, while the possibility of securing a



PARK ROW BUILDING, NEW YORK.
(From a Photograph by Irving Underhill, New York.)



QUEEN ANNE MANSIONS, LONDON.

AMERICAN AND EUROPEAN BUILDING—A CONTRAST

permanent protection of all parts of the cage from corrosion is a most serious consideration. The safety of the structure depends upon the preservation of the absolute integrity of the cage. It must not only be strong enough to sustain all possible vertical loads, but it must be sufficiently rigid to resist without deformation or weakening all lateral disturbing forces, the principal of which are the pressure of wind, the possible sway of moving crowds or moving machinery, and the vibration of the earth from the passage of loaded vans and trolleys and slight earthquakes which at times visit almost all localities. In buildings wide in proportion to their height it is the ordinary practice to make the floors sufficiently rigid to transfer the lateral strains to the walls, and to brace the wall framings to resist them. In buildings of small width in proportion to their height this method of securing rigidity is generally found to be inadequate, and the frame is also braced at right angles to the outer walls to take up the strains directly. In each case all strains are carefully computed. The bracing is accomplished by the introduction at the angles of the columns and girders or beams of gusset plates or knee braces, or by diagonal straps or rods properly attached by rivet or pin connexions. All portions of the frame are united by hot rivets of mild steel or wrought iron, care being taken that the sum of the sectional areas of rivets affords in each case a sufficient amount of metal for the safe transfer of the stresses. The greatest care should be taken to see that all rivet holes are accurately punched, and if necessary that they are reamed so that each rivet will have its full value.

Foundations.

It is evident that with this system of construction all serious inequality of settlement must be avoided, and unusual care, therefore, must be employed to secure perfect foundations. As a preliminary to the design of the foundations a knowledge of the character of the site for a considerable distance below the footings should be gained by borings, and in cases where a certain settlement must be expected the footings must be so proportioned that the pressure at their bottom on each square foot of surface of the soil shall be uniform, so that inequality of settlement may be prevented. Experience has shown that a very close approximation to this result may be secured by assuming in the case of residences, hotels, offices, and other buildings in which the principal variable load is that of men and women, that the load on each lower column base is the sum of the dead load of the weight of materials borne by it, and 20 per cent. of the variable loads which may be imposed upon the floor and roof surface it sustains. In the case of shops, factories, &c., increased percentages of the variable loads must be assumed to be borne by the lower column bases in proportion to the relative amounts of the variable loads which will be imposed upon the floors for any considerable length of time. The foundations must be spread below the column bases until such areas are reached that the pressure on the soil is not greater than its safe sustaining power. This is accomplished by rackings of stone or brickwork, or steppings of concrete, or systems of inverted arches, or systems of steel girders and cantilevers bearing on grillages of parallel steel "I" beams kept a uniform distance apart by separators, and bolted together by steel rods. The grillage beams rest upon and are embedded in concrete, and in many cases the girders and cantilevers are also embedded in concrete. The tables of grillage must be so arranged and proportioned that there is no serious eccentricity of loading from the columns. Shear and bending moment, as well as the absolute strength of all girders, cantilevers, and "I" beams, must be carefully computed. Before building on an elastic or yielding bottom the sustaining strength of the soil must be ascertained. On the bottom is placed a table with a single leg of a recorded dimension arranged so that it can only move vertically. This is loaded upon the top with pig-iron or other material of known weight, and the pressure is noted under which initial compression of the soil takes place, and the load under which the settlement becomes marked. At this point the increase of load is stopped and the soil is allowed to remain under pressure for several days, careful observations being taken at regular intervals of the rate of settlement until no further settlement occurs. A foundation which will not settle may be secured :—

(*a*) By spreading the footings until the pressure on the bottom is less than the load at which the initial settlement occurred, which will be found to vary from $1\frac{1}{2}$ short tons per foot for ordinary wet clay or earth, to 3 or 5 tons per foot for retained sand or hard pan; (*b*) by building on piles driven to refusal (that is, until they will not move under the repeated blows of a heavy pile-driving hammer), in which case they must not be loaded beyond their safe computed strength as columns with free ends; pile foundations should never be used unless the circumstances are such as to ensure that they with their cappings will be constantly covered with water; (*c*) by excavating to bed-rock and laying foundations upon it. Where the rock is covered by dry earth or gravel this can be accomplished without particular difficulty by careful sheath-piling to retain the sides of the excavation, but where the covering is quicksand or swamp-mud pneumatic caissons must be sunk. A pneumatic caisson is a round or polygonal shell of wood or metal open at the bottom, which is called the "cutting edge," about 6 feet above which is built a removable roof, which forms an air-tight chamber. This chamber is entered through the roof by a metal cylinder about 3 feet in diameter, which extends to the top of the caisson, and is called the "air-shaft." On the top of this air-shaft is bolted a cylinder of greater diameter, provided with doors at its top and bottom, which is called the "air-lock." Air is supplied through pipes to the air-chamber, and constantly maintained at a sufficient pressure to keep water from entering the air-chamber, and to expel it from the ground immediately below it. The exterior of the caisson is made very smooth, and is thoroughly lubricated. The caisson is sufficiently loaded to cause it to sink as the material within it is excavated and removed. Access to or from the caisson for both men and materials is gained without altering the air-pressure in the caisson, by opening and closing the doors of the air-lock successively. When the sound bottom is reached it is faced off to secure a good bearing, and concrete is introduced through the air-locks and bedded in the bottom of the caisson to a sufficient depth to form a water seal. The air-locks, air-shaft, and roof are then removed from the top of the caisson, and an open well remains in which the building may be extended with appropriate materials to the concrete foundations at the bottom. No reliance is placed upon the strength of the caissons as a direct support to the building. A well-constructed and carefully-handled caisson, in which a proper air-pressure is maintained without interruption, may be sunk through flowing quicksand or mud in close proximity to the foundations of an adjoining building standing on the crust above the soft bottom, without injury to it. Until very lately it has been assumed that a depth of 110 feet below the water-level was the practical limit to which caissons could be sunk, for men cannot safely work in an air-pressure of more than about 50 pounds to the square inch, but it is now found that they can be safely sunk to a considerably greater depth, for recent experience has shown that the exterior water-pressure at the base of a caisson is in

inverse proportion to the resistance to the flow of water through the material in which the caisson is sunk, and that the air-pressure which it is necessary to maintain in the air-chamber, to expel the water and dry the bottom, is always much less than, and frequently not more than 33 per cent. of, the pressure due to the column of water equal in height to the depth of immersion of the cutting edge.

Columns.

In transferring the loads from the column bases to the bottom of the footings the greatest care must be taken in all systems of construction that the stresses throughout at no point exceed the safe limits of stress for the various materials used. Steel is generally used for columns in preference to cast iron, because it affords greater facility for securing satisfactory connexions, because its defects of quality or workmanship are more surely detected by careful test and inspection, and because, on account of its superior elasticity and ductility, its fibre is less liable to fracture from slight deformations. It is used in preference to wrought iron on account of its lesser cost. Columns are generally built of riveted work of zeebars, channels, angles, plates, or lattice, of such form as will make the simplest and most easily constructed framing in the particular position in which the column is placed. The columns are sometimes run through two or more storeys and arranged to break joints at the different floors. In buildings to be used as offices, hotels, apartments, &c., it is usual in establishing the loads for the purpose of computation to assume that the columns carrying the roof and the upper storey will be called upon to sustain the full dead load due to material and the maximum computed variable load, but it is customary to reduce the variable loads at the rate of about 5 per cent. storey by storey towards the base, until a minimum of about 20 per cent. of the entire variable load is reached, for it is evidently impossible that the building can be loaded by a densely packed moving crowd in all of its storeys simultaneously. In the case of factories and buildings used for storage purposes the maximum variable load which can be imposed for any serious length of time on each floor must be used without reduction in computing the loads of the lower column, and proper allowances must be made for vibrating loads. In the case of very tall exposed buildings of small depth, the vertical load on the columns due to wind-pressure on the opposite side of the building must be computed and allowed for, and in case the lower columns are without lateral support their bending moment must be sufficient to resist the lateral pressure due to wind and eccentricity of loading. In computing the column sections a proper allowance must be made for any eccentricity of loading. It is usual to limit the height of sections of columns without lateral support to 30 diameters, and to limit the maximum fibre stress to 12,000 lb per square inch. The sectional areas are computed by the use of the ordinary formulæ for columns and struts.

Girders.

For girders of small spans "I" beams or channels are generally used, but for greater spans girders are built of riveted work in the form of boxes with top and bottom plates, side plates, and angles with proper stiffening bars on the side plates, or "I's," or lattice, or other forms of truss work. In girders and beams the maximum fibre stress is usually limited to 16,000 lb. In very short girders the shear must be computed, and in long girders the deflexion, particularly the flexure from the variable load, since a flexure of more than $\frac{1}{300}$ of the length is liable to crack the plastering of the ceilings carried by the girders. The same necessity for computing shear and flexure applies to the floor beams. The floors between the girders are constructed of "I" beams, spaced generally about 5 feet between centres; their ends are usually framed to fit the form of the girders, and rest either upon their lower flanges, or upon seats formed of angles riveted to their webs, being secured to them by a pair of angles at each end of the beam riveted to its web and to the web of the girder. Sometimes the beams rest upon the girders, and are riveted through the flanges to it; in this case the abutting ends of beams are spliced by scarf plates placed on each side of the webs and secured by rivets. A similar construction is followed for flat roofs, the grades being generally formed in the girder and beam construction, and a flat ceiling secured by hanging from them, with steel straps, a light tier of ceiling beams. The floor beams are tied laterally by rods in continuous lines placed at or above their neutral axis. It is usual in both girders and beams to provide not only for the safe support of the greatest possible distributed load, but for the greatest weight, such as that of a safe or other heavy piece of furniture which may be moved over the floor at its weakest points, the centres of the girders and beams. It must always be borne in mind that the formulæ for the ultimate strength of the "I" beams only hold good when the upper chord or flange is supported laterally.

Forms of steel cage.

Steel cages may be divided into two classes. In the first and more frequent type the exterior columns and girders are embedded in and hidden by the masonry of the walls, in some cases being covered on their exterior surface by as little as 4 and generally by only 8 inches of masonry. In the second system the columns are placed inside of the wall, and beams or channels in couples are run in each side of and past the wall columns, or a floor beam is run through the column and allowed to project beyond it, or the floor beams are allowed to run over a wall girder between the columns and project beyond it, the projections in each case serving as cantilevers to carry the girders which are incorporated in the masonry of the wall for its direct support. The wall girders in both forms of construction are formed of "Z's," "T's," or channels, sometimes carrying plates of proper forms which are riveted to them. The wall girders are always incorporated in the masonry. When the exterior columns and girders are embedded in the wall, the cement masonry and painted surfaces of the steel are expected to guard it from corrosion. Time only can prove whether this protection will be permanently efficient; for masonry, particularly when of brick, unless absolutely free from defects or cracks, and unless kept perfectly painted, will not only fail as a waterproof covering, but will maintain a damp surface in contact with the frame for a considerable time after each beating storm. It is claimed that a coating of cement mortar will prevent the oxidation of steel, but it is certain that it is very efficient in preventing the oxidation of paint. For the cantilever system it is claimed that all eccentricity of column loads is avoided, that the columns standing free within the wall are as readily protected from corrosion as any interior columns, that they can be at any time uncovered, examined, and if necessary replaced, and that while the failure of a column may result in the collapse of the building, the failure of a wall girder would be a local injury of relatively small importance, since in almost all cases there is a sufficient margin of strength in the wall to transfer the load to the wall girder next below.

Materials used.

The steel used throughout the entire structure should be subjected to the most thorough chemical and mechanical tests and inspection, first at the mill and subsequently at the fabricating shops and the building, to insure that it shall not contain more than ·08 per cent. of phosphorus or ·06 per cent. of sulphur, that it shall have an ultimate strength of between 60,000 and 70,000 lb per square inch, with an elastic limit of not less than 35,000 lb per square inch, and an elongation

before fracture of not less than 25 per cent. in 8 inches of length, and that a piece of the material may be bent cold 180 degrees over a mandril equal to the thickness of the piece tested without fracture of the fibre on the outside of the bend. At least two pieces are taken from each melt or blow at the mill, and are stamped or marked, and all the various sections rolled from the melt or blow are required to bear a similar stamp or mark for identification. All finished material is carefully examined to see that it possesses a smooth surface, and that it is free from cracks, seams, and other defects, and that it is true to section throughout. Rivets are either of wrought iron or of extra soft steel, with an ultimate tensile strength of 55,000 lb per square inch. The material must be sufficiently tough to bend cold 180 degrees flat on itself without sign of fracture. The greatest care is taken that no steel is left in a brittle condition by heating and cooling without proper annealing. All abutting joints in riveted work are faced to exact lengths and absolutely at right angles to the axis of the piece, and are spliced by scarf plates of proper dimensions adequately secured by rivets. The work should be so accurate that no packing pieces are necessary. If the conditions are such that a packing or filling piece must be used, the end of one piece is cut to a new and true surface, and the filling piece is planed to fill the space accurately. Where cast iron is used it must be of tough gray iron free from defects. In testing it pieces 1 inch square, 14 inches long, are cast from each heat and supported on blunt knife edges spaced 12 inches apart; under a load in the centre of the piece of 2500 lb the deflexion must not exceed $\frac{3}{16}$ of an inch.

All metal should receive one coat of paint at the works before shipment. All faced and turned surfaces should receive a coat of white lead or tallow before leaving the shop, and the entire structure should receive two coats of paint after erection. As the protection from corrosion will largely depend upon the paint, the most careful inspection is employed to insure that the metal is perfectly clean from scale and thoroughly dry when painted, and that no painting is done in damp or frosty weather. The paint must be applied with an ordinary painter's brush, and well worked in over the entire surface by hand to secure an even and perfect covering. It is valuable as a protection from corrosion in proportion to the amount of oil with which the metal can be coated by its application. The pigment itself is of small value except as a vehicle to assist in the spread of oil, and as facilitating the inspection of the work to insure that the oil has been thoroughly and evenly spread. The pigment which allows the spread of the largest percentage of oil is therefore the most valuable as a preventive of corrosion.

The filling between the girders and floor beams consists of segmental arches of brick, segmental or flat arches of porous (sawdust) terra cotta, or hard-burned hollow terra-cotta voussoirs, or various patented forms of concrete floors containing ties or supports of steel or iron. In all cases it is customary to fill on top of the arches with a strong Portland cement concrete to a uniform level, generally the top of the deepest beam; the floor filling is constructed and carried to this level immediately upon the completion of each tier of beams, for the purpose not only of stiffening the frame laterally, and of adding to its stability by the imposition of a static load, but also to afford constantly safe and strong working platforms at regular and convenient intervals for use throughout the entire period of the construction. In cases in which the lateral rigidity of the floors is depended upon to transfer the horizontal strains to the exterior walls which are framed to resist them, no form of floor construction should be used which is not laterally strong and rigid. With very rapid building, no method of construction of floors, furrings, or partitions should be adopted which will not dry out with great speed. In flat forms of masonry floor construction the level of its bottom is placed somewhat below the bottom of the "I" beams and girders, so that when it is plastered a continuous surface of at least an inch of mortar will form a fireproof protection for the lower flanges of the beams and girders. Where the width of the flange is considerable it is first covered with metal lath secured to the under side of the floor masonry. Girders projecting below the floor are usually encased in from 1 to 2 inches of fireproof material, 2 or 4 inches of which is also put on all columns. Such fireproof coverings, and also interior partitions, are composed of hollow, hard-burned terra-cotta blocks, of porous (sawdust) terra cotta, or various plastic compositions applied to metallic lath, many of which are patented both as to material and method of application. The most simple test for the value of a system of fireproof coverings, and of partitions and furrings, is to erect a large sample of the work and to subject it alternately to the continued action of an intensely hot flame which is allowed to impinge upon it, and to a stream of cold water directed upon it from the ordinary service nozzle of a steam fire-engine. It is important in all fireproofing of columns and girders, and in all floor construction, furring, and partitions, that there shall be no continuous voids, either vertical or horizontal, which may possibly serve as flues for the spread of heat or flame in case of fire. All furrings and partitions must be started on the solid masonry of the floors to prevent the possible passage of fire from the room in which it may occur. The failure to make this provision has been the cause of very serious losses in buildings which were supposed to be fireproof.

Floors and partitions.

It is customary to lay all necessary horizontal gas pipes and electric wire conduits on the flat Portland cement concrete surface of the floors, and, where wooden floors are to be used, to lay wooden sleepers on the same surface of a uniform depth as great as the diameter of the hubs at the joints of the largest pipes. The sides of the sleepers are bevelled inwards toward their tops. The entire surface is filled to the level of the sleepers, which is the underside of the wooden floor, or to the same level if marble or tile floors are to be laid, with a very light concrete formed of screened anthracite coal cinders, or preferably locomotive screenings mixed with enough cement only to produce a hard mass. A wooden floor laid in contact with masonry needs no fireproofing; it will smoulder, but it will not burn rapidly.

In some buildings the wood used for door sashes and trimming is subjected to one of the patented fireproofing processes. If such are used it is important that they should be tested to prove both that the fireproofing is permanent, and that it will not cause in the presence of water the corrosion of the steel with which it may be in contact. In some buildings doors, sashes, and window frames are covered with light metals, or are made of patented fireproof composition. If covered with metal, in order to be thoroughly efficient, the parts must be united with lock joints, not solder. In some buildings the sashes of interior partitions are glazed with wire-glass (a glass in which a mesh of fine wire is bedded in the centre of the sheet), and in some cases squares of plate-glass not more than 4 inches in diameter, united by a heavy joint of copper electrically deposited, are used for the same purpose. Both methods have proved singularly efficient in arresting the spread of fire.

It is impossible to design a building which cannot be injured by fire, but the construction should be such that

inverse proportion to the resistance to the flow of water through the material in which the caisson is sunk, and that the air-pressure which it is necessary to maintain in the air-chamber, to expel the water and dry the bottom, is always much less than, and frequently not more than 33 per cent. of, the pressure due to the column of water equal in height to the depth of immersion of the cutting edge.

Columns.

In transferring the loads from the column bases to the bottom of the footings the greatest care must be taken in all systems of construction that the stresses throughout at no point exceed the safe limits of stress for the various materials used. Steel is generally used for columns in preference to cast iron, because it affords greater facility for securing satisfactory connexions, because its defects of quality or workmanship are more surely detected by careful test and inspection, and because, on account of its superior elasticity and ductility, its fibre is less liable to fracture from slight deformations. It is used in preference to wrought iron on account of its lesser cost. Columns are generally built of riveted work of zeebars, channels, angles, plates, or lattice, of such form as will make the simplest and most easily constructed framing in the particular position in which the column is placed. The columns are sometimes run through two or more storeys and arranged to break joints at the different floors. In buildings to be used as offices, hotels, apartments, &c., it is usual in establishing the loads for the purpose of computation to assume that the columns carrying the roof and the upper storey will be called upon to sustain the full dead load due to material and the maximum computed variable load, but it is customary to reduce the variable loads at the rate of about 5 per cent. storey by storey towards the base, until a minimum of about 20 per cent. of the entire variable load is reached, for it is evidently impossible that the building can be loaded by a densely packed moving crowd in all of its storeys simultaneously. In the case of factories and buildings used for storage purposes the maximum variable load which can be imposed for any serious length of time on each floor must be used without reduction in computing the loads of the lower column, and proper allowances must be made for vibrating loads. In the case of very tall exposed buildings of small depth, the vertical load on the columns due to wind-pressure on the opposite side of the building must be computed and allowed for, and in case the lower columns are without lateral support their bending moment must be sufficient to resist the lateral pressure due to wind and eccentricity of loading. In computing the column sections a proper allowance must be made for any eccentricity of loading. It is usual to limit the height of sections of columns without lateral support to 30 diameters, and to limit the maximum fibre stress to 12,000 lb per square inch. The sectional areas are computed by the use of the ordinary formulæ for columns and struts.

Girders.

For girders of small spans "I" beams or channels are generally used, but for greater spans girders are built of riveted work in the form of boxes with top and bottom plates, side plates, and angles with proper stiffening bars on the side plates, or "I's," or lattice, or other forms of truss work. In girders and beams the maximum fibre stress is usually limited to 16,000 lb. In very short girders the shear must be computed, and in long girders the deflexion, particularly the flexure from the variable load, since a flexure of more than $\frac{1}{500}$ of the length is liable to crack the plastering of the ceilings carried by the girders. The same necessity for computing shear and flexure applies to the floor beams. The floors between the girders are constructed of "I" beams, spaced generally about 5 feet between centres; their ends are usually framed to fit the form of the girders, and rest either upon their lower flanges, or upon seats formed of angles riveted to their webs, being secured to them by a pair of angles at each end of the beam riveted to its web and to the web of the girder. Sometimes the beams rest upon the girders, and are riveted through the flanges to it; in this case the abutting ends of beams are spliced by scarf plates placed on each side of the webs and secured by rivets. A similar construction is followed for flat roofs, the grades being generally formed in the girder and beam construction, and a flat ceiling secured by hanging from them, with steel straps, a light tier of ceiling beams. The floor beams are tied laterally by rods in continuous lines placed at or above their neutral axis. It is usual in both girders and beams to provide not only for the safe support of the greatest possible distributed load, but for the greatest weight, such as that of a safe or other heavy piece of furniture which may be moved over the floor at its weakest points, the centres of the girders and beams. It must always be borne in mind that the formulæ for the ultimate strength of the "I" beams only hold good when the upper chord or flange is supported laterally.

Forms of steel cage.

Steel cages may be divided into two classes. In the first and more frequent type the exterior columns and girders are embedded in and hidden by the masonry of the walls, in some cases being covered on their exterior surface by as little as 4 and generally by only 8 inches of masonry. In the second system the columns are placed inside of the wall, and beams or channels in couples are run in each side of and past the wall columns, or a floor beam is run through the column and allowed to project beyond it, or the floor beams are allowed to run over a wall girder between the columns and project beyond it, the projections in each case serving as cantilevers to carry the girders which are incorporated in the masonry of the wall for its direct support. The wall girders in both forms of construction are formed of "Z's," "T's," or channels, sometimes carrying plates of proper forms which are riveted to them. The wall girders are always incorporated in the masonry. When the exterior columns and girders are embedded in the wall, the cement masonry and painted surfaces of the steel are expected to guard it from corrosion. Time only can prove whether this protection will be permanently efficient; for masonry, particularly when of brick, unless absolutely free from defects or cracks, and unless kept perfectly painted, will not only fail as a waterproof covering, but will maintain a damp surface in contact with the frame for a considerable time after each beating storm. It is claimed that a coating of cement mortar will prevent the oxidation of steel, but it is certain that it is very efficient in preventing the oxidation of paint. For the cantilever system it is claimed that all eccentricity of column loads is avoided, that the columns standing free within the wall are as readily protected from corrosion as any interior columns, that they can be at any time uncovered, examined, and if necessary replaced, and that while the failure of a column may result in the collapse of the building, the failure of a wall girder would be a local injury of relatively small importance, since in almost all cases there is a sufficient margin of strength in the wall to transfer the load to the wall girder next below.

Materials used.

The steel used throughout the entire structure should be subjected to the most thorough chemical and mechanical tests and inspection, first at the mill and subsequently at the fabricating shops and the building, to insure that it shall not contain more than ·08 per cent. of phosphorus or ·06 per cent. of sulphur, that it shall have an ultimate strength of between 60,000 and 70,000 lb per square inch, with an elastic limit of not less than 35,000 lb per square inch, and an elongation

before fracture of not less than 25 per cent. in 8 inches of length, and that a piece of the material may be bent cold 180 degrees over a mandril equal to the thickness of the piece tested without fracture of the fibre on the outside of the bend. At least two pieces are taken from each melt or blow at the mill, and are stamped or marked, and all the various sections rolled from the melt or blow are required to bear a similar stamp or mark for identification. All finished material is carefully examined to see that it possesses a smooth surface, and that it is free from cracks, seams, and other defects, and that it is true to section throughout. Rivets are either of wrought iron or of extra soft steel, with an ultimate tensile strength of 55,000 lb per square inch. The material must be sufficiently tough to bend cold 180 degrees flat on itself without sign of fracture. The greatest care is taken that no steel is left in a brittle condition by heating and cooling without proper annealing. All abutting joints in riveted work are faced to exact lengths and absolutely at right angles to the axis of the piece, and are spliced by scarf plates of proper dimensions adequately secured by rivets. The work should be so accurate that no packing pieces are necessary. If the conditions are such that a packing or filling piece must be used, the end of one piece is cut to a new and true surface, and the filling piece is planed to fill the space accurately. Where cast iron is used it must be of tough gray iron free from defects. In testing it pieces 1 inch square, 14 inches long, are cast from each heat and supported on blunt knife edges spaced 12 inches apart; under a load in the centre of the piece of 2500 lb the deflexion must not exceed $\frac{3}{16}$ of an inch.

All metal should receive one coat of paint at the works before shipment. All faced and turned surfaces should receive a coat of white lead or tallow before leaving the shop, and the entire structure should receive two coats of paint after erection. As the protection from corrosion will largely depend upon the paint, the most careful inspection is employed to insure that the metal is perfectly clean from scale and thoroughly dry when painted, and that no painting is done in damp or frosty weather. The paint must be applied with an ordinary painter's brush, and well worked in over the entire surface by hand to secure an even and perfect covering. It is valuable as a protection from corrosion in proportion to the amount of oil with which the metal can be coated by its application. The pigment itself is of small value except as a vehicle to assist in the spread of oil, and as facilitating the inspection of the work to insure that the oil has been thoroughly and evenly spread. The pigment which allows the spread of the largest percentage of oil is therefore the most valuable as a preventive of corrosion.

The filling between the girders and floor beams consists of segmental arches of brick, segmental or flat arches of porous (sawdust) terra cotta, or hard-burned hollow terra-cotta voussoirs, or various patented forms of concrete floors containing ties or supports of steel or iron. In all cases it is customary to fill on top of the arches with a strong Portland cement concrete to a uniform level, generally the top of the deepest beam; the floor filling is constructed and carried to this level immediately upon the completion of each tier of beams, for the purpose not only of stiffening the frame laterally, and of adding to its stability by the imposition of a static load, but also to afford constantly safe and strong working platforms at regular and convenient intervals for use throughout the entire period of the construction. In cases in which the lateral rigidity of the floors is depended upon to transfer the horizontal strains to the exterior walls which are framed to resist them, no form of floor construction should be used which is not laterally strong and rigid. With very rapid building, no method of construction of floors, furrings, or partitions should be adopted which will not dry out with great speed. In flat forms of masonry floor construction the level of its bottom is placed somewhat below the bottom of the "I" beams and girders, so that when it is plastered a continuous surface of at least an inch of mortar will form a fireproof protection for the lower flanges of the beams and girders. Where the width of the flange is considerable it is first covered with metal lath secured to the under side of the floor masonry. Girders projecting below the floor are usually encased in from 1 to 2 inches of fireproof material, 2 or 4 inches of which is also put on all columns. Such fireproof coverings, and also interior partitions, are composed of hollow, hard-burned terra-cotta blocks, of porous (sawdust) terra cotta, or various plastic compositions applied to metallic lath, many of which are patented both as to material and method of application. The most simple test for the value of a system of fireproof coverings, and of partitions and furrings, is to erect a large sample of the work and to subject it alternately to the continued action of an intensely hot flame which is allowed to impinge upon it, and to a stream of cold water directed upon it from the ordinary service nozzle of a steam fire-engine. It is important in all fireproofing of columns and girders, and in all floor construction, furring, and partitions, that there shall be no continuous voids, either vertical or horizontal, which may possibly serve as flues for the spread of heat or flame in case of fire. All furrings and partitions must be started on the solid masonry of the floors to prevent the possible passage of fire from the room in which it may occur. The failure to make this provision has been the cause of very serious losses in buildings which were supposed to be fireproof.

Floors and partitions.

It is customary to lay all necessary horizontal gas pipes and electric wire conduits on the flat Portland cement concrete surface of the floors, and, where wooden floors are to be used, to lay wooden sleepers on the same surface of a uniform depth as great as the diameter of the hubs at the joints of the largest pipes. The sides of the sleepers are bevelled inwards toward their tops. The entire surface is filled to the level of the sleepers, which is the underside of the wooden floor, or to the same level if marble or tile floors are to be laid, with a very light concrete formed of screened anthracite coal cinders, or preferably locomotive screenings mixed with enough cement only to produce a hard mass. A wooden floor laid in contact with masonry needs no fireproofing; it will smoulder, but it will not burn rapidly.

In some buildings the wood used for door sashes and trimming is subjected to one of the patented fireproofing processes. If such are used it is important that they should be tested to prove both that the fireproofing is permanent, and that it will not cause in the presence of water the corrosion of the steel with which it may be in contact. In some buildings doors, sashes, and window frames are covered with light metals, or are made of patented fireproof composition. If covered with metal, in order to be thoroughly efficient, the parts must be united with lock joints, not solder. In some buildings the sashes of interior partitions are glazed with wire-glass (a glass in which a mesh of fine wire is bedded in the centre of the sheet), and in some cases squares of plate-glass not more than 4 inches in diameter, united by a heavy joint of copper electrically deposited, are used for the same purpose. Both methods have proved singularly efficient in arresting the spread of fire.

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in case of an interior fire the damage may be confined to the place in which it originates, and that the efficiency of the weight-carrying supports shall not be destroyed. Experience has proved that unprotected steel and iron are not fireproof—when heated to a dull red heat they lose their efficiency—but that it is difficult, if not impossible, to heat metal, which is embedded in masonry or protected by a substantial and proper fireproof covering, to the point at which its strength is seriously impaired. Unless the building is surrounded by fireproof structures, the danger from exterior conflagration is infinitely greater than from interior fires, and is usually greater on the rear and sides than on the public streets. When there is a possibility that a mass of flame from the conflagration of adjacent property may be driven by wind against the exterior walls, the windows should be protected by fireproof shutters (wood covered by metal has proved the most efficient), or the sash should be covered with metal and glazed with wire-glass, or with very small panes of thick plate-gass in metal sash. In warehouses and shops and structures erected to contain large quantities of inflammable material, there should be used the least possible amount of material which is at all affected by fire, and every precaution should be observed to isolate the different floors and sections in case of conflagration. The lifts should be enclosed in masonry shafts, and should have self-closing fireproof doors, and the staircases should be built in masonry enclosures shut off from the lifts by similar doors. In hotels, apartments, and office buildings the mass of inflammable material which they contain is so small that unless there has been careless or improper construction a fire is readily confined to the place in which it originates until it can be extinguished; but the staircases should be built as far as possible from the lifts, and if they are constructed with stone treads laid on metal strings, the treads and platforms should be supported throughout their entire surface by metal, that they may afford safe footing for the tenants and for firemen in case they are shattered by the action of heat, water, or falling material.

Fireproof construction.

Very tall buildings should be supplied with special arrangements to facilitate the extinction of fire, since the longitudinal strength of a fire hose is not great enough to permit it to support its own weight when filled if hoisted to a sufficient height to reach the upper storeys, and passing the hose in and out of windows or up staircases to give it the necessary support is both difficult and untrustworthy. It has become the practice to erect at convenient points within the building steel stand-pipes, generally 6 inches in diameter, extending from the pavement to the roof, provided at each storey with double branches and plugs of the dimension and pitch of screw to receive the regulation fire-hose connexion. Sufficient lengths of hose are constantly connected to these stand-pipes to reach all parts of the building. At the bottom is a check-valve. A branch is connected with the house tank so that the stand-pipes are constantly kept full of water, and as far as the supply of the tank is concerned are immediately efficient in case of fire. At the pavement proper screw plugs are provided to make connexions with the town steam fire-engines, and at the tank a check-valve is provided to act against the fire-engine pressure. The whole system is tested to a pressure of 300 lb to the inch. With careful construction, the best materials, and good workmanship throughout, there is no reason why a very tall building which depends upon a steel cage for its stability should not be as substantial, durable, and fireproof as a structure of ordinary height, with interior columns and girders of iron, and the ordinary fireproof floor construction. (G. B. P.)

Fire extinction.

Building Societies. — *United Kingdom* (for description, see *Ency. Brit.* iv. 513). By an Act passed in 1894 all the Benefit Building Societies established under the Act of 1836 after the year 1856 were required to become incorporated under the Act of 1874. There are, therefore, three categories of building societies:—1. Those established before 1856, which have not been incorporated under the Act of 1874 and remain under the Act of 1836. 2. Those established before 1874 under the Act of 1836, which have been incorporated under the Act of 1874. 3. Those which have been established since the Act of 1874 was passed. The first class still act by means of trustees. Of these societies about 70 are still in existence, the principal one being the Birkbeck. As most of them are of fifty years' standing or more, they are well established, and are still increasing their business. The second and third classes exceed 2000 in number, and have passed through some vicissitudes since the article in the ninth edition of the *Encyclopædia Britannica* was written. For several years their progress was steady, but there were not wanting signs that their prosperity was unsubstantial. A practice of receiving deposits repayable at call had sprung up, which must lead to embarrassment where the funds are invested in loans repayable during a long term of years. It was surmised, if not actually known, that many societies had large amounts of property on their hands, which had been reduced into possession in consequence of the default of borrowers in paying their instalments. A practice had also grown up of establishing mushroom societies, which did little more than pay fees to the promoters. The vicious system of trafficking in advances that had been awarded by ballot, near akin to gambling, prevailed in many societies. These signs of weakness had been observed by the well-informed, and the disastrous failure of a large society incorporated under the Act of 1874, the Liberator, which had in fact long ceased to do any genuine building society business, hastened the crisis. This society had drawn funds to the amount of more than a million sterling from provident people in all classes of the population and all parts of the country by specious representations, and had applied those funds not to the legitimate purpose of a building society, but to the support of other undertakings in which the same persons were concerned who were the active managers of the society. The consequence was that the whole group of concerns became insolvent, and the Liberator depositors and shareholders were defrauded of every penny of their investments. Many of them suffered great distress from the loss of their savings, and some were absolutely ruined. The result was to weaken confidence in building societies generally, though this was not quite logical, inasmuch as the Liberator Society had long ceased to do any legitimate building society business; but it was very marked in the rapid decline of the amount of the capital of the incorporated building societies. From its highest point (nearly 54 millions) reached in 1887, it fell to below 43 millions in 1895. On some societies, which had adopted the deposit system, a run was made, and several were unable to stand it. The Birkbeck Society was for two days besieged by an anxious crowd of depositors clamouring to withdraw their money; but luckily for that society, and for the building societies generally, a very large portion of its funds was invested in easily convertible securities, and it was enabled by that means to get sufficient assistance from the Bank of England to pay every depositor who asked for his money without a moment's hesitation. Its credit was so firmly established by this means that many persons sought to pay money in. Had this very large society succumbed the results would have been disastrous to the whole body of building societies. As the case stood, the energetic

The "Liberator."

means it adopted to save its own credit reacted in favour of the societies generally.

The Liberator disaster convinced everybody that something must be done towards avoiding such calamities in future. The Government of the day brought in a bill for that purpose, and several private members also prepared measures—most of them more stringent than the Government bill. All the bills were referred to a select committee, of which Mr Herbert Gladstone was the chairman. As the result of the deliberations of the committee, the Building Societies Act of 1894 was passed. Meanwhile the Rt. Hon. W. L. Jackson, a member of the committee, moved for an address to Her Majesty for a return of the property held in possession by building societies. This was the first time such a return had been called for, and the managers of the societies much resented it; there were no means of enforcing the return, and the consequence was that many large societies failed to make it, notwithstanding frequent applications by the Registrar. The Act provided that henceforth all incorporated societies should furnish returns in a prescribed form, including schedules showing respectively the mortgages for amounts exceeding £5000; the properties of which the societies had taken possession for more than twelve months through default of the mortgagors; and the mortgages which were more than twelve months in arrear of repayment subscription. The Act did not come into operation till 1st January 1895, and the first complete return under it was not due till 1896, when it appeared that the properties in possession at the time of Mr. Jackson's return must have been counted for at least seven and a half millions in the assets of the societies. This has since been reduced to four and a quarter millions. In the two years 1897, 1898, the societies reduced their properties in possession from 14 per cent. of the whole of their mortgages to 10 per cent. Though this operation must have been attended with some sacrifice in many societies, upon the whole the balance of profit has increased rather than diminished; and if a loss is to be sustained, it is always best to face it at once and write it off. Thus this provision of the Act, though it greatly alarmed the managers of societies, has really been a blessing in disguise. The Act also gave power to the Registrar, upon the application of ten members, to order an inspection of the books of a society, but it did not confer upon individual members the right to inspect the books, which would have been more effective. It empowered the Registrar, upon the application of one-fifth of the members, to order an inspection upon oath into the affairs of a society, or to investigate its affairs with a view to dissolution, and even in certain cases to proceed without an application from members. It gave him ample powers to deal with a society which upon such investigation proved to be insolvent, and these have been exercised so as to procure the cheap and speedy dissolution of such societies. It also prohibited the future establishment of societies making advances by ballot, or dependent on any chance or lot, and provided an easy method by which existing societies could discontinue the practice of balloting. This method has been adopted in a few instances only. The Act, or the circumstances which led to it, has greatly diminished the number of new societies applying for registry.

The statistics of building societies belonging to all the three classes mentioned show that there were on 31st December 1898, 2586 societies in existence in the United Kingdom. Of these, 2495, having 612,874 members, made returns. Their gross receipts for the financial year were £38,221,443. The capital belonging to their members was £34,606,447, and the undivided balance of profit £3,334,129. Their liabilities to depositors and other creditors were £21,533,550. To meet this they had mortgages on which £44,449,008 was due, but of this £4,226,325 was on properties which had been in possession more than a year, and £271,992 on mortgages which had fallen into arrear more than a year. Their other assets were £14,563,966, and certain societies showed a deficit balance which in the aggregate was £461,152. The total assets and income are more than three times the amount of the conjectural estimate made for 1870 by the Royal Commission, but though the increase of both in the twenty-eight years has undoubtedly been great, that estimate was probably under the mark. It is not too much to say that a quarter of a million persons have been enabled by means of building societies to become the proprietors of their own homes. (E. W. B.)

United States.—"Building and loan association" is a general term applied in the United States to such institutions as mutual loan associations, homestead aid associations, savings fund and loan associations, co-operative banks, co-operative savings and loan associations, &c. They are private corporations, for the accumulation of savings, and for the loaning of money to build homes. The first association of this kind in the United States of which there is any record was organized at Frankford, a suburb of Philadelphia, 3rd January 1831, under the title of the Oxford Provident Building Association. Their permanent inception took place between 1840 and 1850. The receipts or capital of the building and loan association consists of periodical payments by the members, interest and premiums paid by borrowing members or others, fixed periodical instalments by borrowing members, fines for failures to pay such fixed instalments, forfeitures, fees for transferring stock, entrance fees, and any other revenues or payments,—all of which go into the common treasury. When the instalment payments and profits of all kinds equal the face value of all the shares issued, the assets, over and above expenses and losses, are apportioned among members, and this apportionment cancels the borrower's debt, while the non-borrower is given the amount of his stock. A man who wishes to borrow, let us say, $1000 for the erection of a house ordinarily takes five shares in an association, each of which, when he has paid all the successive instalments on it, will be worth $200, and he must offer suitable security for his loan, usually the lot on which he is to build. The money is not lent to him at regular rates of interest, as in the case of a savings bank or other financial institution, but is put up at auction usually in open meeting at the time of the payment of dues, and is awarded to the member bidding the highest premium. To secure the $1000 borrowed, the member gives the association a mortgage on his property and pledges his five shares of stock. Some associations, when the demand for money from the shareholders does not exhaust the surplus, lend their funds to persons not shareholders, upon such terms and conditions as may be approved by their directors. Herein lies a danger, for such loans are sometimes made in a speculative way, or on insufficient land value. Some associations make stock loans, or loans on the shares held by a stockholder without real estate security; these vary in different associations, some applying the same rules as to real estate loans. To cancel his debt the stockholder is constantly paying his monthly or semi-monthly dues, until such time as these payments, plus the accumulation of profits through compound interest, mature the shares at $200 each, when he surrenders his shares, and the debt upon his property is cancelled.

Every member of a building and loan association must be a stockholder, and the amount of interest which a member has in a building and loan association is indicated by the number of shares

he holds, the age of the shares, and their maturing value. The difference between a stockholder in such an association and one in an ordinary corporation for usual business purposes lies in the fact that in the latter the member or stockholder buys his stock and pays for it at once, and as a rule is not called upon for further payment; all profits on such stocks are received through dividends, the value of shares depending upon the successful operation of the business. In the former the stockholder or member pays a stipulated minimum sum, say $1, when he takes his membership and buys a share of stock. He continues to pay a like sum each month until the aggregate of sums paid, increased by the profits and all other sources of income, amounts to the maturing value of the stock, usually $200, when the stockholder is entitled to the full maturing value of the share and surrenders the same. Shares are usually issued in series. When a second series is issued the issue of the stock of the first series ceases. Profits are distributed and losses apportioned before a new series can be issued. The term during which a series is open for subscription differs, but it usually extends over three or six months, and sometimes a year. Some associations, usually known as perpetual associations, issue a new series of stock without regard to the time of maturity of previous issues. It is the practice in such associations to issue a new series of stock every year. Instead of shares that are paid in instalments, some associations issue prepaid shares and paid-up shares. *Prepaid shares*, known also as partly paid-up shares, are issued at a fixed price per share in advance. They usually participate as fully in the profits as the regular instalment shares, and when the amount originally paid for such shares, together with the dividends accrued thereon, reaches the maturing or par value, they are disposed of in the same manner as regular instalment shares. Some associations, instead of crediting all the profits made on this class of shares, allow a fixed rate of interest on the amount paid therefor at each dividend period, which is paid in cash to the holder thereof. This interest is then deducted from the profits to which the shares are entitled, and the remainder is credited to the shares until such unpaid portion of the profits, added to the amount orginally paid, equals the maturing or par value. *Paid-up shares* are issued upon the payment of the full maturity or par value, when a certificate of paid-up stock is issued, the owners being entitled to receive in cash the amount of all dividends declared thereon, subject to such conditions or limitations as may be agreed upon. These shares sometimes participate as fully in the profits as the regular instalment shares, but in most cases a fixed rate of interest only is allowed, the holders of the shares usually assigning to the association all right to profits above that amount. Certificates of matured shares are also issued to holders of regular instalment shares, who prefer to leave their money with the association as an investment.

Shares.

Prior to the maturing of a share it has two values, the holding or book value and the withdrawal value. The book value is ascertained by adding all the dues that have been paid to the profits that have accrued; that is to say, it is the actual value of a share at any particular time. The withdrawal value is that amount of the book value which the association is willing to pay to a shareholder who desires to sever his connexion with the association before his share is matured. Some associations do not permit their members to withdraw prior to the maturing of their shares. Then the only way a shareholder can realize upon his shares is by selling them to some other person at whatever price he can obtain. There are twelve or more plans for the withdrawal of funds. Every association has full regulations on all such matters.

The purchase of a share binds the shareholder to the necessity of keeping up his dues, and thus secures to him not only the benefits of a savings bank but the benefit of constantly accruing compound interest. This accomplishes the first feature of the motive of a building and loan association. The second is accomplished by enabling a man to borrow money for building purposes. It is a moot question whether this method of obtaining money for the building of homes is more or less economical than that of obtaining it from the ordinary savings banks or from other sources. Sometimes the premium which must be paid to secure a loan increases the regular interest to such an amount as to make the building and loan method more expensive than the ordinary method of borrowing money, but a building and loan association has a moral influence upon its members, in that it encourages a regular payment of instalments. Some associations have a fixed or established premium rate, and under such circumstances loans are awarded to the members in the order of their applications or by lot. The premium may consist of the amount which the borrower pays in excess of the legal interest, or it may consist of a certain number of payments of dues or of interest to be made in advance. There are very many plans for the payment of premiums, nearly seventy relating to real estate loans being in vogue in different associations in different parts of the United States; but in nearly all cases the borrower makes his regular payments of dues and interest until the shares pledged have reached maturing value. There is also a great variety of plans for the distribution of profits, something like twenty-five such plans being in existence. The methods of calculating interest and profits are somewhat complicated, but they are all found in the books to which reference will be made. The various plans for the payment of premiums, distribution of profits, and withdrawals, and the calculations under each, are given in full in the Ninth Annual Report of U.S.A. Commissioner of Labour.

Variations in methods.

Most building and loan associations confine their operations to a small community, usually to the county in which they are situated; but some of them operate on a large scale, extending their business enterprises even beyond the borders of their own State. These national associations are ready to make loans on property anywhere, and sell their shares to any person without reference to his residence. In local associations the total amount of dues paid in by the shareholders forms the basis for the distribution of profits, while in most national associations only a portion of the dues paid in by the shareholders is considered in the distribution. For instance, in a national association the dues are generally 60 cents a share per month, out of which either 8 or 10 cents are carried to an expense fund, the remainder being credited on the loan fund. The expense fund thus created is lost to the shareholders, except in the case of a few associations which carry the unexpended balances to the profit and loss account, and whatever profits are made are apportioned on the amount of dues credited to the loan fund only. The creation of an expense fund in the nationals has sometimes been the source of disaster. Safety or security in both local and national associations depends principally upon the integrity with which their affairs are conducted, and not so much upon the form of organization or the method of distribution. Some of the States—New York, Massachusetts, New Jersey, Ohio, Illinois, California, and others—bring building and loan associations under the same general supervision of law thrown around savings banks. In some States nothing is officially known of them beyond the formalities of their incorporation. Though the business of the associations is conducted by men not trained as bankers, it yet meets with rare success. Associations disband when not successful, but when they disband great loss does not occur because the whole business of the association consists of its loans, and these loans are to its own shareholders, as a rule, who hold the securities in their associated forms. The amount of money on hand is always small, because it is sold or lent as fast as paid in. A disbanded association, therefore, simply returns to its own members their own property, and but few real losses occur. Investment in a building and loan association is as nearly absolutely safe as it can be, for the monthly dues and the accumulated profits, which give the actual capital of the association, are lent or sold, as it is termed, by the association as fast as they accumulate, and upon real estate or upon the stock of the association itself. The opportunities for embezzlement, therefore, or for shrinkage of securities, are reduced to the minimum, and an almost absolute safety of the investment is secured.

Statistics.

The growth of these associations has been very rapid since 1840. In 1900 they numbered 5838, and occur in forty-eight States and territories. Pennsylvania has the greatest number, 1079. The next in order are—Ohio, 721; Illinois, 669; Indiana, 445; New York, 418; Missouri, 366; New Jersey, 288; Maryland, 240; Kentucky, 148; California, 133; Massachusetts, 115; Minnesota, 97. Their accummulated assets have increased to an enormous amount. The Federal Government, through the Department of Labour, made an investigation of building and loan associations, and published its report in 1893, with the results given in the table on the next page.

The total dues paid in on instalment shares, according to the following statement, amounted to $450,667,594. The business represented by this great sum, conducted quietly, with little or no advertising, and without the experienced banker in charge, shows that the common people, in their own ways, are quite competent to take care of their savings, especially when it was shown by the report cited that but thirty-five of the associations then in existence met with a net loss at the end of their latest fiscal year, and that this loss amounted to only a little over $23,000. In addition to the statistics of a general character quoted in the table, Bulletin No. 10 (May 1897) of the United States Department of Labour contains a calculation of the business at that date, based upon such States' reports as were available. That calcula-

Statistics of Building and Loan Associations, 1893.—General Results for the United States.

	Local.	National.	Total.
Number of associations	5,598	240	5,838
Male shareholders in associations reporting	[a]710,156	[a]209,458	[a]919,614
Female shareholders in associations reporting	[a]263,388	[a]44,440	[a]307,828
Total shareholders in associations reporting	[b]1,359,366	[b]386,359	[b]1,745,725
Average shareholders per association reporting	[b]244·5	[b]1,637·1	[b]301·2
Shareholders who are borrowers in associations reporting	[c]402,212	[c]53,199	[c]455,411
Per cent. of borrowers in associations reporting	[c]29·83	[c]13·77	[c]26·25
Number of shares in associations reporting	[d]10,381,031	[d]2,874,841	[d]13,255,872
Total dues and profits	$413,647,228	$37,020,366	$450,667,594
Average shares per shareholder in associations reporting	[e]7·6	[e]7·2	[e]7·5
Average dues and profits per shareholder in associations reporting	[e]$303.11	[e]$86.73	[e]$257.26
Average value of shares in associations reporting	[e]$39.75	[f]$12.12	[e]$34.18
Total profits	$74,402,969	$6,261,147	$80,664,116
Average size of loans in associations reporting	[f]$1,133	[f]$920	[f]$1,120
Homes acquired in associations reporting	[g]290,803	[g]23,952	[g]314,755

[a] Associations not reporting, local, 1503; national, 66; total, 1569.
[b] Associations not reporting, local, 38; national, 4: total, 42.
[c] Associations not reporting, local, 69; national, 4; total, 73.
[d] Associations not reporting, local, 18; national, 4; total, 22.
[e] Based on 5535 local associations, 226 national associations; total, 5761.
[f] Based on 2128 local associations, 45 national associations; total, 2173.
[g] Associations not reporting, local, 1326; national, 68; total, 1394.

tion showed a growth in almost every item. It is safe to say that the total dues and profits of building and loan associations in 1901, constituting their assets, reached about $600,000,000, with probably 6000 associations constantly contributing to its growth. During the years of depression ending with 1899 the growth of building and loan associations was naturally slower than in prosperous periods.

See *Ninth Annual Report of U.S.A. Commissioner of Labour*, 1893. *Bulletin*, No. 10 (May 1897), of the Department of Labour. *How to Manage Building Associations*, by Edmund Rigley, published in 1873. *A Treatise on Co-operation Savings and Loan Associations*, by Seymour Dexter, New York; D. Appleton and Co., 1891. *A Treatise on Building Associations*, adapted to the use of Lawyers and Officers, by Charles N. Thompson, Chicago; Callaghan and Co., 1892. (C. D. W.)

Buitenzorg, a district in the island of Java (till 1866 an assistant residency), forming the southern part of the residency of Batavia, with an area of 1447 square miles. It occupies the northern slopes of a range of hills separating it from Preanger, and has a fertile soil. Tea, coffee, cinchona, sugar-cane, and rice are cultivated, as are also nutmegs, cloves, and pepper. *Buitenzorg*, the capital, in direct line about 32 miles S. of Batavia, is the usual residence of the Governor-General of the Dutch East Indies. Since 1875 the offices of the General Secretary and the bureaux of mines and of the state railway have been transferred to this place, which has a well-equipped hospital and sanatorium. A Chinese colony numbering about 5000 has been established in the vicinity.

Bukovina, a duchy and crown-land in the Cisleithan half of the Austro-Hungarian monarchy. Population in 1869, 511,964; in 1880, 571,671; in 1890, 646,591, which is equivalent to 160·2 inhabitants per square mile. Proportion of females to males, 993 to 1000; 41·77 per cent. are Ruthenians, 32·41 per cent. Rumanians, 20·79 per cent. Germans, 3·67 per cent. Poles, the remainder being made up of Czechs, Russians, &c.; 69·71 belong to the Greek Oriental Church, 12·79 per cent. are Jews, 11·19 per cent. Roman Catholics, 3·25 per cent. Greek United Church, and 2·5 per cent. are Protestant. Population in 1900, 729,921. In 1896 the marriage-rate was 7·85; the birth-rate, 44·99, or, excluding still-births, 43·86; and the death-rate 29·90—with the exception of Istria and Carniola the highest in Austria. The illegitimate births were 12·24 per cent. of the whole. The marriage-, birth-, and death-rates, as well as the proportion of illegitimacy, are diminishing. Bukovina sends 11 members to the Reichsrath (5 Rumanians, 2 Ruthenians, 3 Germans, and 1 Pole). The Diet is composed of 14 Rumanians, 8 Germans, 5 Ruthenians, and 4 Poles. German enjoys special privileges in this crown-land, being the official language of the administration, of law, and of instruction in the university. Education is provided for by a university at Czernowitz (three faculties: theology, law, and philosophy—371 students), 5 gymnasia, 346 elementary schools (attended by about 63 per cent. of the children), together with 54 technical and continuation schools. The latter show a marked increase, and progress is also visible in elementary education. In 1890 the illiterates formed 77·2 per cent. of the population, a reduction of 6·3 per cent on the preceding decade. With the exception of Dalmatia, Bukovina has the largest proportion of illiterates in Austria. Of the 31 periodicals and newspapers published in 1898, 19 are German, 6 Ruthenian, 3 Rumanian, 1 Polish, and 2 polyglot. Three-fourths of the population are engaged in agriculture and forestry, 13·76 per cent. in mining and industry, and 5·31 per cent. in trade. Agriculture has made considerable progress. Distilleries, milling, and brewing represent the most important industries. Commerce is chiefly in the hands of the Jews and Armenians, and is mainly confined to raw products, such as corn, cattle, wood, wool, and other animal products. Horse-breeding is encouraged by a government stud at Radautz. In 1897 there were 351 kilometres of railway, 4088 kilometres of roads, and 351 kilometres of waterways, serviceable only for floating timber. There were 93 post and 46 telegraph offices, with 761 kilometres of line and 1772 kilometres of wire.

See Bidermann. *Die Bukowina unter der oesterreich. Verwaltung*, 1775-1875. Lemberg, 1876.—Wickenhauser. *Molda, oder Beiträge zur Geschichte der Moldau und Bukowina*. Czernowitz, 1882.—Dan. *Die Völkerschaften der Bukowina*. Czernowitz, 1890. (Æ. O'N.)

Bulandshahr, a town and district of British India, in the Meerut division of the North-West Provinces. The town is on the right bank of the Kali Nadi. The population in 1891 was 16,931; the municipal income in 1897-98 was Rs.17,347. Its present handsome appearance is due to a recent collector, the late Mr F. S. Growse, who was active in erecting public buildings, and in encouraging the local gentry to beautify their own houses. In particular, it boasts a fine bathing-ghat, a town hall, a market-place, a tank to supply water, and a public garden.

The district of Bulandshahr has an area of 1911 square miles. The population in 1891 was 949,914, being 497 persons per square mile. Classified according to religion, Hindus numbered 769,401; Mahommedans, 179,019; Christians, 210, of whom 79 were Europeans; "others," 1284. In 1901 the population was 1,138,296, showing an increase of 20 per cent. The land revenue and rates were Rs.22,73,390, the incidence of assessment being R.1:10:7 per acre; the number of police was 2801. Out of a total cultivated area in 1896-97 of 845,668 acres, 199,272 were irrigated from the Ganges canal and 193,522 from wells. There are 190 indigo factories, employing 16,000 persons, with an out-turn valued at Rs.10,52,190; and five mills for pressing and cleaning cotton. The main line of the East Indian railway and the Oudh and Rohilkhand railway cross the district. The chief centre of trade is Khurja.

Bulawayo, a town of British South Africa, the largest place in Southern Rhodesia, and formerly chief military kraal

of the Matabele state. It occupies a central position, about 5000 feet above sea-level, on the Matoppo hills, and is 1360 miles from Cape Town, with which it is connected by rail. It is the present terminus of the southern section of the Cape to Cairo trunk line, which was in 1901 advancing in the direction of the rich coalfields discovered in the Wanki district below the Victoria Falls of the Zambezi. The "Place of Slaughter," as its name is interpreted, was originally founded about 1838 by Lobengula's father, Moselekatse, some distance to the south of its present position, and continued to be the royal residence till its occupation by the British South Africa Chartered Company's forces in 1893. Since then it has been completely transformed, and is now one of the most flourishing European towns in South Africa, with a population estimated in 1900 at 6000, of whom over 3000 were whites. There have been erected substantial government offices, a municipal building, banks, churches, hotels, schools, hospitals, a public library, newspaper and telegraph offices. An extensive telephone system has been for some time in operation. Lying in the midst of rich goldfields, and also possessing considerable agricultural resources, it has every prospect of becoming the centre of European culture and civilizing influences in the region between the Limpopo and the Zambezi.

Buldana, a town and district of India, in Berar or the Hyderabad assigned districts, under British administration. The town had a population in 1891 of 3243. The district has an area of 2809 square miles; and had a population in 1891 of 477,138, being 171 persons per square mile. Classified according to religion, Hindus numbered 442,588; Mahommedans, 34,405; Christians, 103, of whom 18 were Europeans; "others," 42. In 1901 the population was 423,685, showing a decrease of 12 per cent., due to the effects of famine.. The land revenue and rates in 1897-98 were Rs.12,55,977, the incidence of assessment being 13 annas per acre; the number of police was 455. In 1897-98, out of a total cultivated area of 1,208,008 acres, 55,471 were irrigated from wells, &c. The only manufacture is cotton cloth. Cotton, wheat, and oil-seeds are largely exported. The Nagpur line of the Great Indian Peninsula railway runs through the north of the district. The most important place of trade is Malkapur—population (1891), 9222—with three factories for ginning and pressing cotton. In 1896-97 there were 214 schools, with 7500 pupils, the proportion of boys at school being 20 per cent. of the estimated male population of school-going age. The death-rate in 1897 was 53·6 per 1000.

Buldur, or BURDUR, chief town of a sanjak in the Konia viláyet in Asia Minor, called by the Christians *Polydorion*, altitude 3150 feet, situated, in the midst of gardens, about two miles from the brackish lake Buldur Geul, ancient Ascania Limne. Linen-weaving and leather-tanning are the principal industries. Population, 12,000.

BULGARIA.

1. GEOGRAPHY AND STATISTICS.

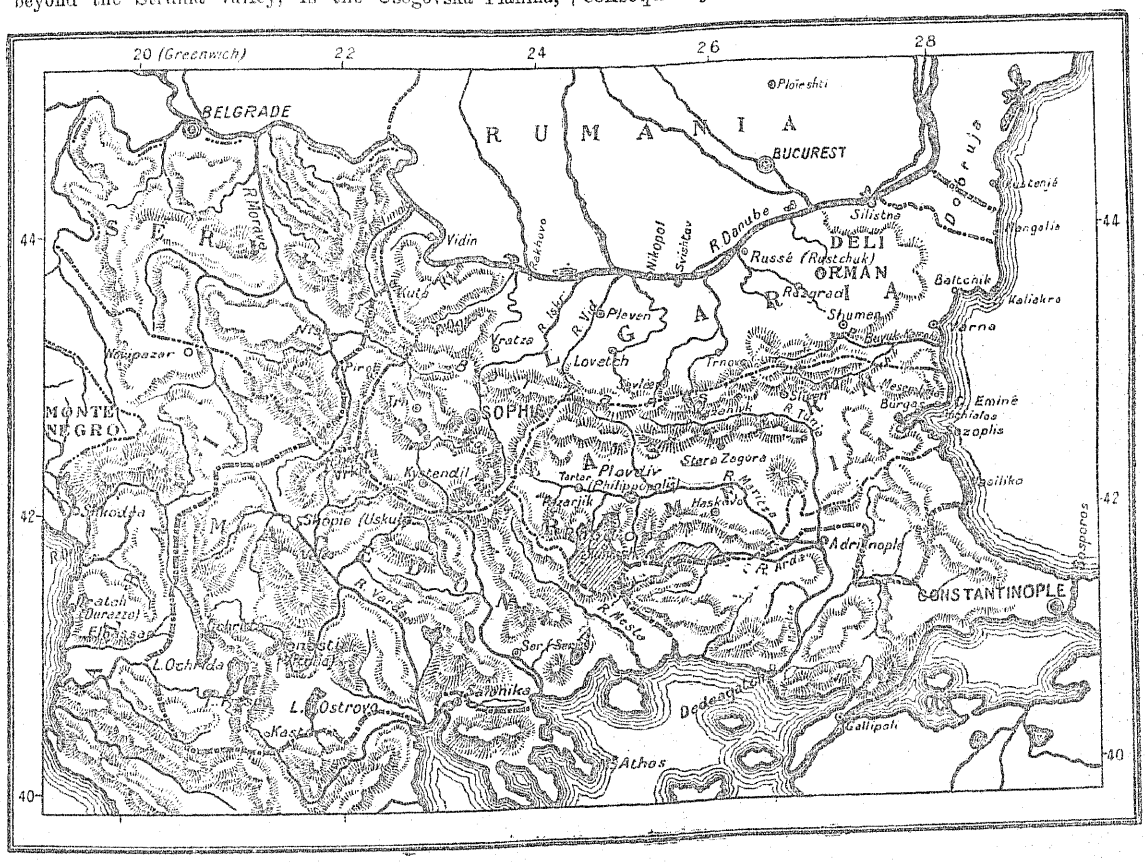
BULGARIA, the youngest of European states, obtained its independence under the first article of the Treaty of Berlin (13th July 1878), being declared an autonomous and tributary principality under the suzerainty of the sultan of Turkey. The newly-created state comprised only the territory between the Balkans and the Danube, together with the mountainous districts of Sofia, Samakov, Küstendil, and Trn. By Article XIII. of the same instrument, a province designated "Eastern Rumelia" was formed south of the Balkans, endowed with administrative autonomy under a Christian governor-general, but left subject to the direct political and military authority of the sultan. The *de facto* union of the two political divisions was accomplished by the revolution of Philippopolis in 1885. In the following year Prince Alexander of Bulgaria was nominated to the governor-generalship of Eastern Rumelia by the Sultan, and in 1896 his successor, Prince Ferdinand, was confirmed in that office. A legal union of the two Bulgarias was thus effected in the person of their ruler; and as their administrations have been amalgamated without protest on the part of Turkey, we are justified in treating of them as a single state.

Bulgaria is bounded on the north by the Danube, from its confluence with the Timok to the eastern suburbs of Silistra (Silistria), whence a line, forming the Rumanian frontier, is drawn to a point on the Black Sea coast a little south of Mangalia. On the east it is washed by the Black Sea; on the south the Turkish frontier, starting from a point on the coast about 15 kilometres south of Sozopolis, runs in a south-westerly direction, crossing the river Maritza at Mustafa Pasha, and reaching the Arda at Adakali. The line laid down by the Berlin Treaty ascended the Arda to Ishiklar, thence following the crest of Rhodope to the westwards, but the cantons of Krjali and Rupchus included in this boundary were restored to Turkey in 1886. The present frontier, passing to the north of these districts, reaches the watershed of Rhodope a little north of the Dospat valley, and then follows the crest of the Rilska Planina to the summit of Tchrni Vrkh, where the Servian, Turkish, and Bulgarian territories meet. From this point the western or Servian frontier passes northwards, leaving Trn to the east and Pirot to the west, reaching the Timok near Kula, and following the course of that river to its junction with the Danube. The area thus enclosed extends from lat. 44° 12′ 30″ to 41° 37′ 30″ N., and from long. 26° 16′ 31″ to 19° 52′ 31″ E. (meridian of Paris). The Berlin Treaty boundary is far from corresponding with the ethnological limits of the Bulgarian race, which were more accurately defined by the abrogated treaty of San Stefano (see BALKAN PENINSULA). A considerable portion of Macedonia, the districts of Pirot and Vrania, now belonging to Servia, the northern half of the vilayet of Adrianople, and large tracts of the Dóbruja are, according to the best and most impartial authorities, mainly inhabited by a Bulgarian population.

Physical features.

The most striking physical features are the two mountain-chains of the Balkans and Rhodope, the former running east and west through the heart of the country, the latter forming for a considerable distance its southern boundary. The Balkans constitute the southern half of the great semicircular range known as the anti-Dacian system, of which the Carpathians form the northern portion. The great chain is sundered at the Iron Gates by the passage of the Danube; its two component parts present many points of resemblance in their aspect and outline, geological formation, and flora. The Balkans (ancient *Hæmus*) run almost parallel to the Danube, the mean interval being 60 miles; the summits are, as a rule, rounded, and the slopes gentle. The culminating points are in the centre of the range: Yumrukchál (2385 metres), Maragudúk (2380 m.), and Kadimlía (2275 m.). The Balkans are known to the people of the country as the *Stara Planina* or "Old Mountain," the adjective denoting their greater size as compared with that of the adjacent ranges: "Balkán" is not a distinctive term, being applied by the Bulgarians, as well as the Turks, to all mountains. Closely parallel to the south are the minor ranges of the Sredna Gora or "Middle Mountains" (highest summit 1575 m.) and the Karaja Dagh, enclosing respectively the sheltered valleys of Karlovo and Kazanlyk. At its eastern extremity the Balkan chain divides into three ridges, the central terminating in the Black Sea at Cape Eminé ("Hæmus"), the northern forming the watershed between the tributaries of the Danube and the rivers falling directly into the Black Sea. The Rhodope, or southern group, is altogether distinct from the Balkans, with which, however, it is connected by the Malka Planina and the Ikhtiman hills, respectively west and east of Sofia; it may be regarded as a continuation of the great Alpine system which traverses the Peninsula from the Dinaric Alps and the Shar Planina on the west to the Shabkhana Dagh near the Ægean coast; its sharper outlines and pine-clad steeps reproduce the scenery of the Alps

rather than that of the Balkans. The imposing summit of Musallá (2930 m.), next to Liubotrn and Olympus, the highest in the Peninsula, forms the centre-point of the group; it stands within the Bulgarian frontier at the head of the Mesta valley, on either side of which the Perin Dagh and the Despoto Dagh descend south and south-east respectively towards the Ægean. The chain of Rhodope proper radiates to the east; owing to the retrocession of territory already mentioned, its central ridge no longer completely coincides with the Bulgarian boundary, but two of its principal summits, Sytkć (2188 m.) and Karlyk (2081 m.), are within the frontier. From Musallá in a westerly direction extends the majestic range of the Rilska Planina, enclosing in a picturesque valley the celebrated monastery of Rila; many summits of this chain attain 2200 m. Farther west, beyond the Struma valley, is the Osogovska Planina, culminating in Ruyen (2253 m.). To the north of the Rilska Planina the almost isolated mass of Vitosha (2291 m.) overhangs Sofia. Snow and ice remain in the sheltered crevices of Rhodope and the Balkans throughout the summer. The fertile slope trending northwards from the Balkans to the Danube is for the most part gradual and broken by hills; the eastern portion known as the *Deli Orman*, or "Wild Wood," is almost waterless, covered by forest, and thinly inhabited. The abrupt and sometimes precipitous character of the Bulgarian bank of the Danube contrasts with the swampy lowlands and lagoons of the Rumanian side. Northern Bulgaria is watered by the Lom, Ogust, Iskr, Vid, Osem, Yantra, and Eastern Lom, all, except the Iskr, rising in the Balkans, and all flowing into the Danube. The channels of these rivers are deeply furrowed and the fall is rapid; irrigation is consequently difficult and navigation impossible. The course of



Servian and Montenegrin frontiers.
Boundaries of Bulgaria and E. Rumelia according to the Berlin Treaty.
Boundary of Bulgaria according to the Treaty of San Stefano.
Restored to Turkey in 1886.

SKETCH MAP OF BULGARIA.

the Iskr is remarkable: rising in the Rilska Planina, the river descends into the basin of Samakov, passing thence through a serpentine defile into the plateau of Sofia, where in ancient times it formed a lake; it now forces its way through the Balkans by the picturesque gorge of Iskretz. Somewhat similarly the Deli, or "Wild," Kamchik breaks the central chain of the Balkans near their eastern extremity and, uniting with the Great Kamchik, falls into the Black Sea. The Maritza, the ancient *Hebrus*, springs from the slopes of Musallá, and, with its tributaries, the Tunja and Arda, waters the wide plain of Eastern Rumelia. The Struma (anc. and mod. Greek *Strymon*) drains the valley of the same name, and, like the Maritza, flows into the Ægean. The Küstendil, and, like the Maritza, flows into the Ægean. The elevated basins of Samakov (lowest altitude, 930 m.), Trn (770 m.), Breznik (750 m.), Radomir (630 m.), Sofia (500 m.), and Küstendil (470 m.), are a peculiar feature of the western highlands.

Geology. The stratified formation presents a remarkable variety, almost all the systems being exemplified. The Archæan, composed of gneiss and crystalline schists, and traversed by eruptive veins, extends over the greater part of the Eastern Rumelian plain, the Rilska Planina, Rhodope, and the adjacent ranges. North of the Balkans it appears only in the neighbourhood of Berkovitza. The other earlier Palæozoic systems are wanting, but the Carboniferous appears in the western Balkans with a continental *facies* (Kulm). Here anthracitiferous coal is found in beds of argillite and sandstone. Red Sandstone and Conglomerate, representing the Permian system, appear especially around the basin of Sofia. Above these, in the western Balkans, are Mesozoic deposits, from the Trias to the upper Jurassic, also occurring in the central part of the range. The Cretaceous system, from the infra-Cretaceous Hauterivien to the Senonian, appears throughout the whole extent of Northern Bulgaria, from the summits of the Balkans to the Danube. Gosau beds are found on the southern declivity of the chain. Flysch, representing both the Cretaceous and Eocene systems, is widely distributed. The Eocene, or older Tertiary, further appears with nummulitic formations on both sides of the eastern Balkans; the Oligocene only near the Black Sea coast at Burgas. Of the Neogene, or younger Tertiary, the Mediterranean, or earlier, stage appears near Pleven (Plevna) in the Leithakalk and Tegel forms, and between Varna and Burgas with beds of spaniodons, as in the Crimea; the Sarmatian stage in the plain of the Danube and in the districts of Silistra and Varna. A rich mammaliferous deposit (*Hipparion, Rhinoceros, Dinotherium, Mastodon*, &c.) of this period has been found near Mesemvria. Other Neogene strata occupy a more limited space. The Quaternary era is represented

by the typical loess, which covers most of the Danubian plain; to its later epochs belong the alluvial deposits of the riparian districts with remains of the *ursus, equus*, &c., found in bone-caverns. Eruptive masses intrude in the Balkans and Sredna Gora, as well as in the Archæan formation of the southern ranges, presenting granite, syenite, diorite, diabase, quartz-porphyry, melaphyre, liparite, trachyte, andesite, basalt, &c.

Climate. The severity of the climate of Bulgaria in comparison with that of other European regions of the same latitude is attributable in part to the number and extent of its mountain ranges, in part to the general configuration of the Balkan Peninsula. Extreme heat in summer and cold in winter, great local contrasts, and rapid transitions of temperature occur here as in the adjoining countries. The local contrasts are remarkable. In the districts extending from the Balkans to the Danube, which are exposed to the bitter north wind, the winter cold is intense, and the river, notwithstanding the volume and rapidity of its current, is frequently frozen over; the temperature has been known to fall to −31° (Celsius). Owing to the shelter afforded by the Balkans against hot southerly winds, the summer heat in this region is not unbearable; its maximum is 37°. The high table-land of Sofia is generally covered with snow in the winter months; it enjoys, however, a somewhat more equable climate than the northern district, the maximum temperature being 30°, the minimum −19°; the air is bracing, and the summer nights are cool and fresh. In the eastern districts the proximity of the sea moderates the extremes of heat and cold, which attain 32° and −13° respectively; the sea is occasionally frozen at Varna. The coast-line is exposed to violent north-east winds, and the Black Sea, the *πόντος ἄξεινος*, maintains its evil reputation for storms. The sheltered plain of Eastern Rumelia possesses a comparatively warm climate; spring begins six weeks earlier than elsewhere in Bulgaria, and the vegetation is that of Southern Europe. In general the Bulgarian winter is short and severe; the spring short, changeable, and rainy; the summer hot, but tempered by thunderstorms; the autumn (*yasen*, "the clear time") magnificently fine and sometimes prolonged into the month of December. The mean temperature is 11°. The climate is healthy, especially in the mountainous districts. Malarial fever prevails in the valley of the Maritza, in the low-lying regions of the Black Sea coast, and even in the upland plain of Sofia, owing to neglect of drainage. The mean annual rainfall is 650 millimetres (Gabrovo, 1060; Sofia, 703; Varna, 470 millimetres).

Minerals. The mineral wealth of Bulgaria is not inconsiderable. Among the minerals which are important, from an industrial point of view, are gold (found in small quantities), silver, graphite, galenite, pyrite, marcasite, chalcosine, sphalerite, chalcopyrite, bornite, cuprite, hæmatite, limonite, ochre, chromite, magnetite, azurite, manganese, malachite, gyps, &c. The combustibles are anthracitiferous coal, coal, "brown coal," and lignite. With the exception of coal, the minerals have hitherto been scarcely worked. The coal mines opened at Pernik in 1891 yielded in 1898 an output of 100,000 tons. Coal beds have recently been discovered at Trevna. Thermal springs, mostly sulphureous, exist in forty-three localities along the southern slope of the Balkans, in Rhodope, and in the districts of Sofia and Küstendil; maximum temperature at Zaparevo, near Dupnitza, 82°·5 (Celsius), at Sofia 48°. Many of these are frequented now, as in Roman times, owing to their valuable therapeutic qualities. The mineral springs on the north of the Balkans are, with one exception (Vrshetz, near Berkovitza), cold.

Fauna. Few special features are noticeable in the Bulgarian fauna. Bears are still abundant in the higher mountain districts, especially in the Rilska Planina and Rhodope; the Bulgarian bear is small and of brown colour, like that of the Carpathians. Wolves are very numerous, and in winter commit great depredations even in the larger country towns and villages; in hard weather they have been known to approach the outskirts of Sofia. The Government offers a reward for the destruction of both these animals. The roe deer is found in all the forests, the red deer is less common; the chamois haunts the higher regions of the Rilska Planina, Rhodope, and the Balkans. The jackal (*Canis aureus*) appears in the district of Burgas; the lynx is said to exist in the Sredna Gora; the wild boar, otter, fox, badger, hare, wild cat, marten, polecat (*Fœtorius putorius*: the rare tiger polecat, *Fœtorius sarmaticus*, is also found), weasel and shrewmouse (*Spermophilus citillus*) are common. The beaver (Bulg. *bebr*) appears to have been abundant in certain localities, *e.g.*, Bebrovo, Bebresh, &c., but it is now apparently extinct. Snakes (*Coluber natrix* and other species), vipers (*Vipera berus* and *V. ammodytes*), and land and water tortoises are numerous. The domestic animals are the same as in the other countries of south-eastern Europe; the fierce shaggy gray sheep-dog leaves a lasting impression on most travellers in the interior. Fowls, especially turkeys, are everywhere abundant, and great numbers of geese may be seen in the Moslem villages. The ornithology of Bulgaria is especially interesting. Eagles (*Aquila imperialis* and the rarer *Aquila fulva*), vultures (*Vultur monachus, Gyps fulvus, Neophron percnopterus*), owls, kites, and the smaller birds of prey are extraordinarily abundant; singing birds are consequently rare. The lammergeier (*Gypaëtus barbatus*) is not uncommon. Immense flocks of wild swans, geese, pelicans, herons, and other waterfowl haunt the Danube and the lagoons of the Black Sea coast. The cock of the woods (*Tetrao urogallus*) is found in the Balkan and Rhodope forests, the wild pheasant in the Tunja valley, the bustard (*Otis tarda*) in the Eastern Rumelian plain. Among the migratory birds are the crane, which hibernates in the Maritza valley, woodcock, snipe, and quail: the great spotted cuckoo (*Coccystes glandarius*) is an occasional visitant. The red starling (*Pastor roseus*) sometimes appears in large flights. The stork, which is never molested, adds a picturesque feature to the Bulgarian village. Of fresh-water fish, the sturgeon (*Acipenser sturio* and *A. huso*), sterlet, salmon (*Salmo hucho*), and carp are found in the Danube; the mountain streams abound in trout. The Black Sea supplies turbot, mackerel, &c.; dolphins and flying fish may sometimes be seen.

Flora. The vegetation of Bulgaria has only recently received the scientific attention it deserves. In regard to its flora the country may be divided into (1) the northern plain sloping from the Balkans to the Danube, (2) the southern plain between the Balkans and Rhodope, (3) the districts adjoining the Black Sea, (4) the elevated basins of Sofia, Samakov, and Küstendil, (5) the Alpine and sub-Alpine regions of the Balkans and the southern mountain group. In the first-mentioned region the vegetation resembles that of the Russian and Rumanian steppes; in the spring the country is adorned with the flowers of the crocus, orchis, iris, tulip, and other bulbous plants, which in summer give way to tall grasses, umbelliferous growths, dianthi, astragali, &c. In the more sheltered district south of the Balkans the richer vegetation recalls that of the neighbourhood of Constantinople and the adjacent parts of Asia Minor. On the Black Sea coast many types of the Crimean, Transcaucasian, and even the Mediterranean flora present themselves. The plateaux of Sofia and Samakov furnish specimens of sub-alpine plants, while the vine disappears; the hollow of Küstendil, owing to its southerly aspect, affords the vegetation of the Macedonian valleys. The flora of the Balkans corresponds with that of the Carpathians; the Rila and Rhodope group is rich in purely indigenous types combined with those of the Central European Alps and the mountains of Asia Minor. The Alpine types are often represented by variants: *e.g.*, the *Campanula alpina* by the *Campanula orbelica*, the *Primula farinosa* by the *Primula frondosa* and *P. exigua*, the *Gentiana germanica* by the *Gentiana bulgarica*, &c. The southern mountain group, in common, perhaps, with the unexplored highlands of Macedonia, presents many isolated types, unknown elsewhere in Europe, and in some cases corresponding with those of the Caucasus. Among the more characteristic genera of the Bulgarian flora are the following:—Centaurea, Cirsium, Linaria, Scrophularia, Verbascum, Dianthus, Silene, Trifolium, Euphorbia, Cytisus, Astragalus, Ornithogalum, Allium, Crocus, Iris, Thymus, Umbellifera, Sedum, Hypericum, Scabiosa, Ranunculus, Orchis, Ophris.

Forests. The principal forest trees are the oak, beech, ash, elm, walnut, cornel, poplar, pine, and juniper. The oak is universal in the thickets, but large specimens are now rarely found. Magnificent forests of beech clothe the valleys of the higher Balkans and the Rilska Planina; the northern declivity of the Balkans is, in general, well wooded, but the southern slope is bare. The walnut and chestnut are mainly confined to Eastern Rumelia. Conifers (*Pinus silvestris, Picea excelsa, Pinus laricis*) are rare in the Balkans, but abundant in the higher regions of the southern mountain group, where the *Pinus peuce*, otherwise peculiar to the Himalayas, also flourishes. The wild lilac forms a beautiful feature in the spring landscape. Wild fruit-trees, such as the apple, pear, and plum, are common. The vast forests of the Middle Ages disappeared under the supine Turkish administration, which took no measures for their protection, and even destroyed the woods in the neighbourhood of towns and highways in order to deprive brigands of shelter. A law passed in 1889 prohibits disforesting, limits the right of cutting timber, and places the State forests under the control of inspectors. According to official statistics, 46,000 square kilometres, or nearly half the superficies of the Principality, are under forest, but the greater portion of this area is covered only by brushwood and scrub.

Ethnology. The Bulgarians, who constitute 75·67 per cent. of the inhabitants of the principality, are found in their purest type in the mountain districts, the Ottoman conquest and subsequent colonization having introduced a mixed population into the plains. The northern slopes of the Balkans from Belogradchik to Elena

are inhabited almost exclusively by Bulgarians; in Eastern Rumelia the national element is strongest in the Sredna Gora and Rhodope. Possibly the most genuine representatives of the race are the Pomaks or Mahommedan Bulgarians, whose conversion to Islam preserved their women from the license of the Turkish conqueror; they inhabit the highlands of Rhodope and certain districts in the neighbourhood of Lovetch (Lovtcha) and Pleven (Plevna). Retaining their Bulgarian speech and many ancient national usages, they may be compared with the indigenous Cretan, Bosnian, and Albanian Moslems. The Pomaks in the Principality are estimated at 26,000, but their numbers are declining. In the north-eastern district between the Yantra and the Black Sea the Bulgarian race is as yet thinly represented; most of the inhabitants are Turks, a quiet, submissive, agricultural population, which unfortunately shows a tendency to emigrate. The Black Sea coast is inhabited by a variety of races. The Greek element is strong in the maritime towns, and displays its natural aptitude for navigation and commerce. The Gagäuzi, a peculiar race of Turkish-speaking Christians, inhabit the littoral from Cape Eminé to Cape Kaliakra: they are of Turanian origin and descend from the ancient Kumani. The valleys of the Maritza and Arda are occupied by a mixed population consisting of Bulgarians, Greeks, and Turks: the principal Greek colonies are in Stanimaka, Kavakli, and Philippopolis. The origin of the peculiar Shôp tribe which inhabits the mountain tracts of Sofia, Breznik, and Radomir is a mystery. The Shôps are conceivably a remnant of the aboriginal race which remained undisturbed in its mountain home during the Slavonic and Bulgarian incursions: they cling with much tenacity to their distinctive customs, apparel, and dialect. The considerable Vlakh or Ruman colony in the Danubian districts dates from the last century, when large numbers of Wallachian peasants sought a refuge on Turkish soil from the tyranny of the boyars or nobles: the department of Vidin alone contains thirty-six Ruman villages with a population of 30,550. Especially interesting is the race of nomad shepherds from the Macedonian and the Ægean coast who come in thousands every summer to pasture their flocks on the Bulgarian mountains; they are divided into two tribes—the Kutzovlakhs, or "lame Vlakhs," who speak Rumanian, and the Hellenized Karakatchans or "black shepherds" (comp. the Mavro-vlakhs, *μαῦροι βλάχες*, of the Dalmatian coast) who speak Greek. The Tatars, a peaceable industrious race, are chiefly found in the neighbourhood of Varna and Silistra; they were introduced as colonists by the Turkish Goverment in 1861. They may be reckoned at 12,000. The gypsies, who are scattered in considerable numbers throughout the country, came into Bulgaria in the 14th century. They are for the most part Moslems, and retain their ancient Indian speech. They live in the utmost poverty, occupy separate cantonments in the villages, and are treated as outcasts by the rest of the population. The Bulgarians, being of mixed origin, possess few salient physical characteristics. The Slavonic type is far less pronounced than among the kindred races; the Ugrian or Finnish cast of features occasionally asserts itself in the central Balkans. The face is generally oval, the nose straight, the jaw somewhat heavy. The men, as a rule, are rather below middle height, compactly built, and, among the peasantry, very muscular; the women are generally deficient in beauty and rapidly grow old. The upper class, the so-called "intelligenzia," is physically very inferior to the rural population.

The character of the Bulgarians presents a singular contrast to that of the neighbouring nations. Less quick-witted than the Greeks, less prone to idealism than the Servians, less apt to assimilate the externals of civilization than the Rumanians, they possess in a remarkable degree the qualities of patience, perseverance, and endurance, with the capacity for laborious effort peculiar to an agricultural race. The tenacity and determination with which they pursue their national aims seem likely in the end to give them the advantage over their more brilliant competitors in the struggle for hegemony in the Peninsula. Unlike most southern races, the Bulgarians are reserved, taciturn, phlegmatic, unresponsive, and extremely suspicious of foreigners. The peasants are industrious, peaceable, and orderly; the vendetta, as it exists in Albania, Montenegro, and Macedonia, and the use of the knife in quarrels, so common in southern Europe, are alike unknown. The tranquillity of rural life has, unfortunately, been invaded in recent years by the intrigues of political agitators, and bloodshed is not uncommon at elections. All classes practise thrift bordering on parsimony, and any display of wealth is generally resented. The standard of sexual morality is high, especially in the rural districts; the unfaithful wife is an object of public contempt, and in former times was punished with death. Marriage ceremonies are elaborate and protracted, as is the case in most primitive communities; elopements are frequent, but usually take place with the consent of the parents on both sides, in order to avoid the expense of a regular wedding. The principal amusement on Sundays and holidays is the *choró* (*χορός*), which is danced on the village green to the strains of the *gaïda*, or bagpipe, and the *gûsla*, a rudimentary fiddle. The Bulgarians are religious in a simple way, but not fanatical, and the influence of the priesthood is limited. Many ancient superstitions linger among the peasantry, such as the belief in the vampire and the evil eye; witches and necromancers are numerous and are much consulted.

National character.

The area of northern Bulgaria is 62,789·10 square kilometres, of eastern Rumelia 32,915·40 sq. kil., of united Bulgaria, 95,704·50 sq. kil. According to the census of 1st January 1893, the population of northern Bulgaria was 2,312,282, or 36·8 per sq. kil.; of eastern Rumelia, 998,431, or 30·33 per sq. kil.; of united Bulgaria, 3,310,713, or 34·59 per sq. kil. Bulgaria thus ranks between Rumania and Portugal in regard to area; between the Netherlands and Switzerland in regard to population: in density of population it may be compared with Spain and Greece. The only previous census of united Bulgaria was taken in 1888: it gave the total population as 3,154,375, or 32·96 per sq. kil. The increase in five years was consequently 156,338, or 1 per cent. per annum. The area and population of the principal subdivisions are shown in the following table:—

Population.

Northern Bulgaria, 16 *Departments*.

	Population.	Per square Kilometre.
Varna	215,213	25·68
Vidin	121,131	38·03
Vratza	151,196	27·04
Küstendil	167,175	31·43
Lovetch	125,829	30·02
Lom	115,393	32·78
Pleven	99,290	36·85
Razgrad	129,531	45·64
Russé	162,589	41·62
Svishtov	94,119	34·48
Sevlievo	93,275	49·14
Silistra	111,830	40·18
Sofia	244,824	43·82
Trn	79,248	36·30
Trnovo	224,163	45·09
Shumen	177,476	36·41

Eastern Rumelia, 6 Departments.

	Population.	Per square Kilometre.
Philippopolis . .	232,507	33·45
Sliven . . .	170,514	27·36
Stara Zagora . .	215,483	33·43
Tatar-pazarjik .	138,778	24·10
Haskovo . .	124,985	38·38
Burgas . . .	116,164	19·74

The population of the principal towns in 1893 was as follows:—Sofia, the capital (the Bulgarian name *Sredetz* is now little used), 46,593; Philippopolis or Plovdiv (capital of eastern Rumelia), 41,068; Russé (Turkish *Rûstchuk*), 37,174; Varna, 28,174; Trnovo (the ancient Bulgarian capital), 25,295; Gornia Orêkhovitza, 25,013; Sliven (Russian *Slivno*), 23,210; Pleven (Russian *Plevna*), 23,178; Tatar-pazarjik, 22,056; Razgrad, 21,551. The increase of the population of Sofia in the period 1888-93 was 10·62 per cent. yearly; the capital now probably possesses 65,000 inhabitants.

The population according to sex is given as 1,690,626 males and 1,620,087 females, or 51 males to 49 females. A somewhat similar disparity may be observed in the other countries of the Peninsula. Classified according to occupation, 2,447,198 persons, or 73·9 per cent. of the population, are engaged in agriculture; 421,121 in various productive industries; 145,988 in the service of the government or the exercise of liberal professions, and 122,104 in commerce. The population according to race cannot be stated with absolute accuracy, but it is approximately shown by the census of 1893, which gives the various nationalities according to language as follows:—Bulgars, 2,505,326; Turks, 569,723; Rumans, 62,628; Greeks, 58,518; Gypsies (Tziganes), 52,132; Jews (Spanish-speaking), 27,531; Tatars, 16,290; Armenians, 6445; other nationalities, 12,115. The Bulgarian inhabitants of the Peninsula beyond the limits of the Principality may, perhaps, be estimated at 1,500,000 or 1,600,000, and the grand total of the race possibly reaches 4,500,000.

The movement of the population at intervals of five years has been as follows:—

Year.	Marriages.	Births (living).	Still-born.	Deaths.	Natural Increase.[1]
1882	19,795	74,642	300	38,884	35,758
1887	20,089	83,179	144	39,396	43,783
1892	27,553	117,883	321	103,550	14,333
1897	29,227	149,631	858	90,134	59,497

The death-rate shows a tendency to rise. In the five years 1882-86 the mean death-rate was 18·0 per 1000; in 1887-91, 20·4; in 1892-96, 27·0. Infant mortality is high, owing to various causes, especially among the peasants. As the less healthy infants rarely survive, the adult population is in general robust, hardy, and long-lived. The census of 1893 gives 3372 persons of 100 years and upwards. Young men, as a rule, marry before the age of twenty-five, girls before eighteen. The number of illegitimate births is inconsiderable, averaging only 0·12 of the total.

The devastation of the country which followed the Turkish conquest resulted in the extirpation or flight of a large proportion of the Bulgarian inhabitants of the plains, who were replaced by Turkish colonists. The mountainous districts, however, retained their original population and sheltered large numbers of the fugitives. The passage of the Turkish armies during the wars with Austria, Poland, and Russia led to further Bulgarian emigrations. The flight to the Banat, where 22,000 Bulgarians still remain, took place in 1730. At the beginning of the 19th century the majority of the population of the Eastern Rumelian plain was Turkish. The Turkish colony, however, declined, partly in consequence of the drain caused by military service, while the Bulgarian remnant increased, notwithstanding a considerable emigration to Bessarabia before and after the Russo-Turkish campaign of 1828. Efforts were made by the Porte to strengthen the Moslem element by planting colonies of Tatars in 1861 and Circassians in 1864. The advance of the Russian army in 1877-78 caused an enormous exodus of the Turkish population, of which only a small proportion returned to settle permanently. The emigration continued after the conclusion of peace, and is still in progress, notwithstanding the efforts of the Bulgarian Government to arrest it. In twenty years (1879-99), at least 150,000 Turkish peasants left Bulgaria. Much of the land thus abandoned still remains unoccupied. On the other hand, a considerable influx of Bulgarians from Macedonia, the vilayet of Adrianople, Bessarabia, and the Dóbruja took place within the same period, and the inhabitants of the mountain villages show a tendency to migrate into the richer districts of the plains.

[1] Excess of births over deaths.

Government.

The principality is a constitutional monarchy, hereditary in the family of a prince "freely elected by the population and confirmed by the Sublime Porte with the assent of the Powers" (Berlin Treaty, Art. III.). According to the constitution of Trnovo, voted by the Assembly of Notables, 29th April 1879, and revised by the Grand Sobranye, 27th May 1893, the princely dignity descends in the direct male line. The prince must profess the Orthodox faith, only the first elected sovereign and his immediate heir being released from this obligation. The legislative power is vested in the prince in conjunction with the national assembly; he is supreme head of the army, supervises the executive power, and represents the country in its foreign relations. In case of a minority or an interregnum, a regency of three persons is appointed. The national representation is embodied in the Sobranye, or ordinary assembly (Bulgarian, *Sŭbraniie*, the Russian form *Sobranye* being usually employed by foreign writers), and the Grand Sobranye, which is convoked in extraordinary circumstances. The former is elected by manhood suffrage, in the proportion of 1 to 20,000 of the population, for a term of five years. Every Bulgarian citizen who can read and write and has completed his thirtieth year is eligible as a deputy. Annual sessions are held from the 27th October to the 27th December. All legislative and financial measures must first be discussed and voted by the Sobranye, and then sanctioned and promulgated by the prince. The Government is responsible to the Sobranye and the ministers, whether deputies or not, attend its sittings. The Grand Sobranye, which is elected in the proportion of 2 to every 20,000 inhabitants, is convoked to elect a new prince, to appoint a regency, to sanction a change in the constitution, or to ratify an alteration in the boundaries of the principality. The executive is entrusted to a cabinet of eight members—the ministers of foreign affairs and religion, finance, justice, public works, the interior, commerce and agriculture, education, and war. Local administration, which is organized on the Belgian model, is under the control of the minister of the interior. The country is divided into twenty-two departments (*okrŭg*, pl. *okrŭzi*), each administered by a prefect (*uprávitel*), assisted by a departmental council, and eighty-four sub-prefectures (*okolía*), each under a sub-prefect (*okoliiski natchálnik*). The number of these functionaries is excessive and will probably be reduced. The four principal towns have each in addition a prefect of police (*gradonatchalnik*) and one or more commissaries (*pristav*). The gendarmery numbers about 4000 men, or 1 to 825 of the inhabitants. The prefects and sub-prefects have replaced the Turkish *mutessarifs* and *kaimakams*; but the system of municipal government, left untouched by the Turks, descends from primitive times. Every commune (*obshtina*), urban or rural, has its *kmet*, or mayor, and council; the commune is bound to maintain its primary schools, a public library or reading-room, &c.; the kmet possesses certain magisterial powers, and in the rural districts he collects the taxes. Each village, as a rule, forms a separate commune, but occasionally two or more villages are grouped together.

Justice.

The civil and penal codes are, for the most part, based on the Ottoman law. As the principality forms a portion of the Turkish empire, the privileges of the capitulations are guaranteed to foreign subjects (Berlin Treaty, Art. VIII.). The lowest civil and criminal court is that of the village kmet, whose jurisdiction is confined to the limits of the commune; no corresponding tribunal exists in the towns. Each sub-prefecture and town has a justice of the peace—in some cases two or more;

the number of these officials is 130. Next follows the departmental tribunal, or court of first instance, which is competent to pronounce sentences of death, penal servitude, and deprivation of civil rights; in specified criminal cases the judges are aided by three assessors chosen by lot from an annually prepared panel of forty-eight persons. Three courts of appeal sit respectively at Sofia, Russé, and Philippopolis. The highest tribunal is the Court of Cassation, sitting at Sofia, and composed of a president, two vice-presidents, and nine judges. There is also a High Court of Audit (*vrkhovna smetna palata*), similar to the French Cour des Comptes. The judges are insufficiently paid and are removable by the Government.

Religion.

The Orthodox Bulgarian National Church claims to be an indivisible member of the eastern Orthodox communion, and asserts historic continuity with the autocephalous Bulgarian church of the Middle Ages. It was, however, declared schismatic by the Greek Patriarch of Constantinople in 1872, although differing in no point of doctrine from the Greek church. The Exarch, or supreme head of the Bulgarian church, resides at Constantinople; he enjoys the title of "Beatitude" (*negovo Blazhenstvo*), receives an annual subvention of about £6000 from the principality, and exercises jurisdiction over the Bulgarian hierarchy in all parts of the Ottoman empire. The Exarch is elected by the Bulgarian episcopate, the Holy Synod, and a general assembly (*obshti sbor*), in which the laity is represented; their choice is subject to the Sultan's approval. The occupant of the dignity is titular Metropolitan of a Bulgarian diocese. The organization of the church within the principality was regulated by statute in 1883. There are eleven eparchies or dioceses in the country, each administered by a metropolitan with a diocesan council; one diocese has also a suffragan bishop. Church government is vested in the Holy Synod, consisting of four Metropolitans, which assembles once a year. The laity take part in the election of Metropolitans and parish priests, only the "black clergy," or monks, being eligible for the episcopate. All ecclesiastical appointments are subject to the approval of the Government. There are 2106 parishes (*eparii*) in the principality with 9 archimandrites, 1936 parish priests, and 21 deacons, 78 monasteries with 184 monks, and 12 convents with 346 nuns. The celebrated monastery of Rila possesses a vast estate in the Rilska Planina; its abbot or *hegumen* owns no spiritual superior but the Exarch. Ecclesiastical affairs are under the control of the minister of public worship; the clergy of all denominations are paid by the State, being free, however, to accept fees for baptisms, marriages, burials, the administering of oaths, &c. The census of 1893 gives 2,606,786 persons of the Orthodox faith, 643,258 Mahommedans, 28,307 Jews, 22,617 Catholics, 6643 Gregorian Armenians, 2384 Protestants, and 718 whose religion is not stated. The Greek Orthodox community has four metropolitans dependent on the Patriarchate. The Mahommedan community is rapidly diminishing. The Catholics, who have two bishops, are for the most part the descendants of the mediæval Paulicians; they are especially numerous in the neighbourhood of Philippopolis and Svishtov. The Armenians have one bishop. The Protestants are mostly Methodists; since 1857 Bulgaria has been a special field of activity for American Methodist missionaries, who have established an important school at Samakov. The Berlin Treaty (Art. V.), forbids religious disabilities in regard to the enjoyment of civil and political rights, and guarantees the free exercise of all religions.

Education.

Education has made astonishing progress since the liberation of the country from Turkish rule. No educational system existed in the rural districts before 1878; the peasantry was sunk in ignorance, and the older generation is now totally illiterate. In the towns the schools were under the superintendence of the Greek clergy, and Greek was the language of instruction. The first Bulgarian school was founded at Gabrovo in 1835 by the patriot Neophyt. After the Crimean war, Bulgarian schools began to appear in the villages of the Balkans and the south-eastern districts. The children of the wealthier class were generally educated abroad. The American institution of Robert College on the Bosporos rendered an invaluable service to the newly-created State by providing it with a number of well-educated young men fitted for positions of responsibility. Primary education was declared obligatory from the first, but the scarcity of properly qualified teachers and the lack of all requisites proved serious impediments to educational organization. The Government has made great efforts and incurred heavy expenditure for the spread of education; the satisfactory results obtained are largely due to the keen desire for learning which exists among the people. All the villages now possess "national" (*narodni*) primary schools, maintained by the communes with the aid of a State subvention and supervised by departmental and district inspectors. The State also assists a large number of Turkish primary schools. The penalties for non-attendance are not enforced, and it has been found necessary to close the schools in the rural districts during the summer, the children being required for labour in the fields. The age for primary instruction is six to twelve years; in 1890, 47·01 per cent. of the boys and 16·11 per cent. of the girls attended the primary schools; in 1898, 85 per cent. of the boys and 40 per cent. of the girls. In the latter year there were 4686 primary schools, of which 3111 were "national" or communal, and 1575 denominational (including 1342 Turkish, 43 Tatar, 42 Greek, 16 Armenian, and 38 Jewish), attended by 348,716 pupils, representing a proportion of 10·57 per hundred inhabitants. In 1888 only 327,766 persons, or 11 per cent. of the population, were literate; in 1893 the proportion rose to 19·88 per cent.; in 1897 of 25,620 young men presenting themselves for military service, 12,119, or 47·27 per cent., were literate. In the system of secondary education the distinction between the classical and "real" or special courses of study is maintained as in most European countries; there are 121 secondary schools (43 for boys, 38 for girls, and 40 mixed), for the most part with 3 classes, and 16 gymnasia (9 for boys and 7 for girls) with 7 classes. In addition to these there are 6 technical and 3 agricultural schools; 5 of pedagogy, 1 theological, 1 commercial, 1 of forestry, 1 of design, 1 for surgeons' assistants, and a large military school at Sofia. Government aid is given to students of limited means, both for secondary education and the completion of their studies abroad. The university of Sofia, of which the organization is incomplete, is still known as the high school (*vishé utchilishté*); it possesses a staff of 17 professors and 25 lecturers. The number of students is 288. The progress of learning has, unfortunately, tended to create a distaste for agricultural and industrial pursuits; the daily increasing number of candidates for State employment swells the ranks of the various political parties, and the country is threatened with the growth of an educated proletariat.

Finance.

At the outset of its career the principality was practically unencumbered with any debt, external or internal. The stipulations of the Berlin Treaty (Art. IX.), with regard to the payment of a tribute to the Sultan and the assumption of an "equitable proportion" of the Ottoman debt, were never carried into effect. In 1883 the claim of Russia (under Art. XX. of the Treaty) for the expenses of the occupation, was fixed at 26,545,625 fr., payable in annual instalments of 2,100,000 fr. The union with Eastern Rumelia in 1885 entailed liability for the obligations of that province, consisting of an annual tribute to Turkey of 2,951,000 fr., and a loan of 3,375,000 fr., contracted with the Imperial Ottoman Bank. In 1888 the purchase of the Varna-Russé railway for 46,777,500 fr., was effected by the issue to the vendors of treasury bonds at 6 per cent. In 1889 a loan of 30,000,000 fr., bearing 6 per cent. interest, was contracted with the Vienna Länderbank and Bankverein at 85½. In 1892 a further 6 per cent loan of 142,780,000 fr. in six options was contracted with the Länderbank at 83, 86, and 89, of which 126,480,000 fr. had been issued up to 31st October 1899, together with an advance of 7,000,000 fr. In August 1899 the national debt stood as follows: Outstanding amount of the above-mentioned loans, 184,898,000 fr.; advanced by the Länderbank (June 1889), 7,000,000 fr.; due to Russia, 9,718,296 fr.; arrears of the Eastern Rumelian tribute, 5,451,900 fr.: total external debt 207,068,196 fr. The total internal debt at the same date was about 33,100,000. The entire national liabilities were, therefore, approximately 240,168,196 fr. The Eastern Rumelian tribute and the rent of the Vakarel-Belovo railway, if capitalized at 6 per cent., would represent a further sum of 50,919,100 fr. On the 1st Jan. 1900 a 6 per cent. guaranteed loan of 25,000,000 fr. at 89, repayable in 5 years, was contracted with a group of foreign banks in order to meet immediate liabilities. The national debt is not disproportionately great in comparison with annual revenue. After the union with Eastern Rumelia the budget receipts increased from 40,893,262 leva (=francs) in 1886 to 101,872,280 leva in 1894; the estimated revenue for 1900 was 83,827,862 leva, of which 35,294,900 were derived from direct, 29,901,000 from indirect taxation; the estimated expenditure was 83,270,370 leva, the principal items being: public debt, 24,646,849; army, 20,773,432; education, 8,114,526; interior, 7,238,880; public works, 5,863,176 leva. In 1895 direct taxation, which pressed heavily on the agricultural class, was diminished, and indirect taxation (import duties and excise) considerably increased. The former is now 10·22 leva per head of the population, the latter 9·65 leva. The financial difficulties into which the country has recently fallen are to be attributed, not to excessive indebtedness, but to heavy outlay on public works, the army, and education, and to the maintenance of an unnecessary number of officials; the economic situation has been aggravated by a succession of bad harvests. The expenditure on public works, however, will ultimately prove remunerative. The war budget during ten years (1888-97) absorbed the large sum of 275,832,017 leva, or 35·77 per cent. of the whole national income within that period. Expenditure on education, which was 2,648,154 leva in 1888, reached 9,313,137 leva in 1897. The excess of expenditure over actual receipts (the

latter including the proceeds of the various loans), from the creation of the principality to the beginning of the financial year 1896, was 55,823,574 leva. Arrears of taxation are considerable: the outstanding amount at the beginning of 1897 was 16,259,340 leva.

Army and Navy.

The organization of the military forces of the principality was undertaken by Russian officers, who for a period of six years (1879-85) occupied all the higher posts in the army. In Eastern Rumelia during the same period the "militia" was instructed by foreign officers; after the union it was merged in the Bulgarian army. The present organization is based on the law of 27th December 1891. The army consists of: (1) the active or field army (*deïstvuyushta armia*) divided into (i.) the active army; (ii.) the active army reserve; (2) the reserve army (*reservna armia*); (3) the *opltchenie* or militia: the two former may operate outside the principality, the latter only within the frontier for purposes of defence. In time of peace the active army (i.) alone is on a permanent footing. The peace strength in 1899 was 2154 officers, 38,987 men, and 5764 horses, the active army being composed of 6 divisions of infantry, 5 regiments of cavalry, 7 regiments of artillery, and 1 regiment of engineers, together with artillery garrisons, &c. The total effective in time of war is 152,938 officers and men, with 84,000 officers and men of the reserve army; grand total 236,938, exclusive of the opltchenie, which as yet is without equipment. Military service is obligatory, but Moslems may claim exemption on payment of £20; the age of recruitment in time of peace is nineteen, in time of war eighteen. Each conscript serves two years in the infantry and subsequently eight years in the active reserve or three years in the other corps and six years in the active reserve; he is then liable to seven years' service in the reserve army and finally passes into the opltchenie. The Bulgarian peasant makes an admirable soldier—courageous, obedient, persevering, and inured to hardship; the officers are painstaking and devoted to their duties. The hours of drill, &c., are perhaps excessive, but the results are satisfactory. The cavalry is the least efficient branch of the service. Under the new arrangements for mobilization the reserve army will be organized in twelve regiments corresponding with those of the active army. The active army is furnished with the ·315″ Mannlicher magazine rifle, the reserve with the Mannlicher and Berdan; the artillery mainly consists of 8·7- and 7·5-cm. Krupp guns and 12-cm. Krupp howitzers. The army is locally distributed in six divisions, with headquarters at Sofia, Philippopolis, Sliven, Shumen, Russé, and Vidin. The last-named is the only fortified town, but defensive works are in progress at Sofia and Slivnitza, and an entrenched camp has been formed at Belogradchik. The naval force of the principality consists of a flotilla stationed at Russé and Varna. It is composed of 1 prince's yacht (800 tons), 3 gunboats, 3 torpedo boats, and 10 other small vessels, with a complement of 69 officers and 488 men.

Agriculture.

Agriculture, the main source of wealth to the country, is still in an extremely primitive condition. The ignorance and conservatism of the peasantry, the habits engendered by wide-spread insecurity and the fear of official rapacity under Turkish rule, insufficiency of communications, want of capital, and in some districts sparsity of population, have all tended to retard the development of this most important industry. The peasants cling to traditional usage, and look with suspicion on modern implements and new-fangled modes of production. The plough is of a primeval type, rotation of crops is only partially practised, and the use of manure is almost unknown. The Government has sedulously endeavoured to introduce more enlightened methods and ideas by the establishment of agricultural schools, the appointment of itinerant professors and inspectors, the distribution of better kinds of seeds, improved implements, &c. Efforts have latterly been made to improve the breeds of native cattle and horses, and stallions have been introduced from Hungary and distributed throughout the country. Oxen and buffaloes are the principal animals of draught; the buffalo, which was apparently introduced from Asia in remote times, is much prized by the peasants for its patience and strength; it is, however, somewhat delicate and requires much care. In the eastern districts camels are also employed. The Bulgarian horses are small, but remarkably hardy, wiry, and intelligent; they are as a rule unfitted for draught and cavalry purposes. The best sheep are found in the district of Karnobat in Eastern Rumelia. The number of goats in the country has considerably declined in recent years, the Government having imposed a relatively high tax on these animals owing to the injury they inflict on young trees. The average price of oxen is £5 each, draught oxen £12 the pair, buffaloes £14 the pair, cows £2, horses £6, sheep, 7s., goats 5s. each. The principal cereals are wheat, maize, rye, barley, oats, and millet. The cultivation of maize is increasing in the Danubian and eastern districts. Rice-fields are found in the neighbourhood of Philippopolis. Cereals represent about 80 per cent. of the total exports. Besides grain, Bulgaria produces wine, tobacco, attar of roses, silk, and cotton. The quality of the grape is excellent, and could the peasants be induced to abandon their highly primitive mode of wine-making the Bulgarian vintages would rank among the best European growths. The tobacco, which is not of the highest quality, is grown in considerable quantities for home consumption, and only an insignificant amount is exported. The best tobacco-fields in Bulgaria are on the northern slopes of Rhodope, but the southern declivity, which produces the famous Kavala growth, is more adapted to the cultivation of the plant. The rose-fields of Kazanlyk and Karlovo lie in a sheltered valley between the Balkans and the parallel chains of the Sredna Gora and Karaja Dagh. About 6000 pounds of the rose-essence are annually exported, valuing from £12 to £14 per pound. Sericulture, formerly an important industry, has declined owing to disease among the silkworms, but efforts are being made to revive it with promise of success. Cotton is grown in the southern districts of Eastern Rumelia.

Peasant proprietorship is universal, the small freeholds averaging about 18 acres each. There are scarcely any large estates owned by individuals, but some of the monasteries possess considerable domains. The large *tchiftliks*, or farms, formerly belonging to Turkish landowners, have been divided among the peasants. The rural proprietors enjoy the right of pasturing their cattle on the common lands belonging to each village, and of cutting wood in the State forests. They live in a condition of rude comfort, and poverty is practically unknown, except in the towns. A peculiarly interesting feature in Bulgarian agricultural life is the *zadruga*, or house-community, a patriarchal institution apparently dating from prehistoric times. Family groups, sometimes numbering several dozen persons, dwell together on a farm in the observance of strictly communistic principles. The association is ruled by a house-father (*domakin*, *stareïshina*), and a house-mother (*domakinia*), who assign to the members their respective tasks. In addition to the farm work the members often practise various trades, the proceeds of which are paid into the general treasury. The community sometimes includes a priest, whose fees for baptisms, &c., augment the common fund. The national aptitude for combination is also displayed in the associations of market gardeners (*gradinarski druzhini*, *taifi*), who in the spring leave their native districts for the purpose of cultivating gardens in the neighbourhood of some town, either in Bulgaria or abroad, returning in the autumn, when they divide the profits of the enterprise; the number of persons annually thus engaged probably exceeds 10,000.

The development of manufacturing enterprise on a large scale has been retarded by want of capital. The principal

establishments for the native manufactures of *aba* and *shayak* (rough and fine homespuns), and of *gaitan* (braided embroidery) are at Sliven and Gabrovo respectively. The Bulgarian homespuns, which are made of pure wool, are of admirable quality. The exportation of textiles is almost exclusively to Turkey: value in 1896, £104,046; in 1897, £116,250; in 1898, £144,726. Unfortunately the home demand for native fabrics is diminishing owing to foreign competition; the smaller textile industries are declining, and the picturesque, durable, and comfortable costume of the country is giving way to cheap ready-made clothing imported from Austria. The Government has endeavoured to stimulate the home industry by ordering all persons in its employment to wear the native cloth, and the army is supplied almost exclusively by the factories at Sliven. A great number of small distilleries exist throughout the country; there are breweries in all the principal towns, tanneries at Sevlievo, Varna, &c., numerous corn-mills worked by water and steam, and saw-mills, turned by the mountain torrents, in the Balkans and Rhodope. A certain amount of foreign capital has recently been invested in industrial enterprises; the most notable are a sugar-refinery in the neighbourhood of Sofia, and a cotton-spinning mill at Varna, on which an English company has expended about £60,000.

Manufactures.

The usages of internal commerce have been considerably modified by the development of communications. The primitive system of barter in kind still exists in the rural districts, but is gradually disappearing. The great fairs (panaïri, *panigyreis*) held at Eski-Jumaia, Hajioloupazarjik, and other towns, which formerly attracted multitudes of foreigners as well as natives, have lost much of their importance; a considerable amount of business, however, is still transacted at these gatherings, of which ninety-seven were held in 1898. The principal seats of the export trade are Varna, Burgas, and Baltchik on the Black Sea, and Svishtov, Russé, Nikopolis, Silistra, Rakhovo, and Vidin on the Danube. The chief centres of distribution for imports are Varna, Sofia, Russé, Philippopolis, and Burgas. About 10 per cent. of the exports passes over the Turkish frontier, but the Government is making great efforts to divert the trade to Varna and Burgas, and important harbour works have been undertaken at both these ports. In 1887 the total value of Bulgarian foreign commerce was £4,419,589. The following table gives the values for the six years ending 1899. The great fluctuations in the exports are due to the variations of the harvest, on which the prosperity of the country practically depends:—

Commerce.

Year.	Exports.	Imports.	Total.
	£	£	£
1894	2,914,027	3,969,168	6,883,195
1895	3,107,422	2,760,812	5,868,235
1896	4,349,599	3,061,211	7,410,810
1897	2,391,620	3,359,770	5,751,390
1898	2,661,480	2,909,210	5,570,690
1899	2,138,684	2,407,123	4,545,807

The principal exports are cereals, live stock, homespuns, hides, cheese, eggs, attar of roses. Exports to the United Kingdom in 1898 were valued at £413,668, in 1899 at £394,954. The principal imports are textiles, metal goods, colonial goods, implements, furniture, leather, petroleum. Imports from the United Kingdom in 1898, £695,345; in 1899, £493,736. The following is the average percentage of imports from various countries in ten years (1888-97)—from Austria-Hungary, 33·32; United Kingdom, 24·09; Turkey, 12·70; Germany, 9·53; Russia, 5·18; France, 4·56; Italy, 2·36; Belgium, 2·26; other countries, 6·0.

The National Bank, a State institution with a capital of 10,000,000 leva, has its central establishment at Sofia and branches at Philippopolis, Russé, Varna, and Trnovo. Besides conducting the ordinary banking operations, it issues loans on mortgage. There are several private banks in the country. The Imperial Ottoman Bank and the Industrial Bank of Kiev have branches at Philippopolis and Sofia respectively. The agricultural chests, founded by Midhat Pasha in 1863, and reorganized in 1894, have done much to rescue the peasantry from the hands of usurers. They serve as treasuries for the local administration, accept deposits at interest, and make loans to the peasants on mortgage or the security of two solvent landowners at 8 per cent. Their capital in 1887 was 14,231,440 leva; in 1898, 30,657,360 leva. The post-office savings banks, established 1896, have a capital of 3,403,318 leva. There are over 200 registered provident societies in the country. The legal rate of interest is 10 per cent., but much higher rates are not uncommon.

Bulgaria, like the neighbouring states of the Peninsula, has adopted the metric system. Turkish weights and measures, however, are still largely employed in local commerce. The monetary unit is the *lev*, or "lion" (pl. *leva*), nominally equal to the franc, with its submultiple the *stotinka* (pl. *-ki*), or centime. The coinage consists of nickel and bronze coins (2½, 5, 10, and 20 *stotinki*) and silver coins (50 *stotinki*; 1, 2, and 5 *leva*). A gold coinage was struck in 1893 with pieces corresponding to those of the Latin Union. The Turkish pound and foreign gold coins are also in general circulation. The National Bank issues notes for 5, 10, 20, 50, and 100 *leva*, formerly payable in gold, but since November 1899 payable in silver with the agio. Notes payable in silver are also issued. The gold premium has considerably increased in recent years.

In 1878 the only railway in Bulgaria was the Russé-Varna line (221 kilometres) constructed by an English company in 1867. In Eastern Rumelia the line from Sarambey to Philippopolis and the Turkish frontier (196 kilometres), with a branch to Yamboli (106 kilometres) had been built by Baron Hirsch in 1873; it is now worked by the Oriental Railways Company. The construction of a railway from the Servian frontier at Tzaribrod to the Eastern Rumelian frontier at Vakarel was imposed on the principality by the Berlin Treaty, but political difficulties intervened, and the line, which touches Sofia, was not completed till 1888. In that year the Bulgarian Government seized the short connecting line Vakarel-Belovo belonging to Turkey, and railway communication between Constantinople and the western capitals was established. Since that time great progress has been made in railway construction. In 1888, 384 kilometres of State railways were open to traffic; in 1893, 493 kilometres; in 1898, 681 kilometres; and in December 1899, 1250 kilometres. All these lines are worked by the State, and, with the exception of the Vakarel-Belovo line (46 kilometres), are its property. The completion of the important line Radomir-Sofia-Shumen (November 1899) opened up the rich agricultural district between the Balkans and the Danube. Branches to Samovit and Russé establish connexion with the Rumanian railway system on the opposite side of the river. It is hoped, with the consent of the Turkish Government, to extend the line Sofia-Radomir to Uskub, and thus to secure a direct route to Salonika and the Ægean.

Communications.

The total receipts of the State railways in 1898 were 5,103,554 leva; working expenses, 5,598,053 leva. The expenditure on construction and purchase of railways and rolling stock up to the year 1897 is given as 114,433,522 leva. Road communication is still in an unsatisfactory condition. Roads are divided into three classes: "State roads" or main highways, maintained by the Government; "district roads" maintained by the district councils; and "inter-village roads" (*mezhduselski shosseta*), maintained by the communes. Of the first there are 4200 kilometres, of the second, 3515 kilometres. Repairs are effected by the *corvée* system with requisitions of material; 1086 kilometres of new roads are now in construction. There are no canals, and inland navigation is confined to the Danube. The Austrian Donaudampschiffartsgesellschaft and the Russian "Gagarine" steamship company compete for the river traffic; the grain trade is largely served by steamers belonging to Greek merchants. The coasting trade on the Black Sea is carried on by a Bulgarian steamship company; the steamers of the Austrian Lloyd, and other foreign companies call at Varna, and occasionally at Burgas.

The great development of postal and telegraphic communication attests the advance of civilization. The number of letters posted in 1886 was 1,468,494; in 1896, 4,370,216; in 1898, 5,869,034. The number of telegrams in 1886 was 527,556; in 1896, 1,082,326; in 1898, 1,099,163. Receipts of posts and telegraphs were in 1886, 1,024,386 leva; in 1896, 2,327,660 leva; in 1898, 2,900,732 leva. In 1898 there were 5244 kilometres of telegraph lines and 87 kilometres of telephones.

2. Political History.

The ancient Thraco-Illyrian race which inhabited the district between the Danube and the Ægean was expelled, or more probably absorbed, by the great Slavonic immigration which took place at various intervals between the end of the 3rd century after Christ and the beginning of the 6th. The numerous tumuli which are found in all parts of the country (see Herodotus, v. 8) and some stone tablets with bas-reliefs remain as monuments of the aboriginal population; and certain structural peculiarities, which are common to the Bulgarian and Rumanian languages, may conceivably be traced to the influence of the primitive Illyrian speech, now represented by the Albanian. The Slavs, an agricultural people, were governed, even in those remote times, by the democratic local institutions to which they are still attached; they possessed no national leaders or central organization, and their only political unit was the *pleme*, or tribe. They were considerably influenced by contact with Roman civilization. It was reserved for a foreign race, altogether distinct in origin, religion, and customs, to give unity and coherence to the scattered Slavonic groups, and to weld them into a compact and powerful State which for some centuries played an important part in the history of eastern Europe and threatened the existence of the Byzantine empire.

The Bulgars.

The Bulgars, a Turanian race akin to the Tatars, Huns, Avars, Petchenegs, and Finns, made their appearance on the banks of the Pruth in the latter part of the 7th century. They were a horde of wild horsemen, fierce and barbarous, practising polygamy, and governed despotically by their khans and boyars (or bolyars). Their original abode was the tract between the Ural mountains and the Volga, where the kingdom of Great (or Black) Bolgary existed down to the 13th century. In 679, under their khan Asparukh (or Isperikh), they crossed the Danube, and, after subjugating the Slavonic population of Moesia, advanced to the gates of Constantinople and Salonika. The Byzantine emperors were compelled to cede to them the province of Moesia and to pay them an annual tribute. The invading horde was not numerous, and during the next two centuries it became gradually merged in the Slavonic population. Like the Franks in Gaul the Bulgars gave their name and a political organization to the more civilized race which they conquered, but adopted its language, customs, and local institutions. Not a trace of the Ugrian or Finnish element is to be found in the Bulgarian speech. This complete assimilation of a conquering race may be illustrated by many parallels.

Early dynasties.

The history of the early Bulgarian dynasties is little else than a record of continuous conflicts with the Byzantine emperors. The tribute first imposed on the Greeks by Asparukh was again exacted by Kardam (791-797) and Krum (802-815), a sovereign noted alike for his cruelty and his military and political capacity. Under his rule the Bulgarian realm extended from the Carpathians to the neighbourhood of Adrianople; Serdica (the present Sofia) was taken, and the valley of the Struma conquered. Prêslav, the Bulgarian capital, was attacked and burnt by the emperor Nikephóros, but the Greek army on its return was annihilated in one of the Balkan passes; the emperor was slain, and his skull was converted by Krum into a goblet. The reign of Boris (852-884) is memorable for the introduction of Christianity into Bulgaria. Two monks of Salonika, SS. Cyril and Methodius, are generally reverenced as the national apostles; the scene of their labours, however, was among the Slavs of Moravia, and the Bulgars were evangelized by their disciples. Boris, finding himself surrounded by Christian states, decided from political motives to abandon paganism. He was baptized in 864, the emperor Michael III. acting as his sponsor. It was at this time that the controversies broke out which ended in the schism between the Latin and Orthodox communities. Boris long wavered between Constantinople and Rome, but the refusal of the Pope to recognize an autocephalous Bulgarian church determined him to offer his allegiance to the Greek Patriarch. The decision was fraught with momentous consequences for the future of the race. The nation altered its religion in obedience to its sovereign, and some of the boyars who resisted the change paid with their lives for their fidelity to the ancient belief. The independence of the Bulgarian church was recognized by the Patriarchate, a fact much dwelt upon in recent controversies. The Bulgarian primates subsequently received the title of patriarch; their see was transferred from Prêslav to Sofia, Voden, and Prespa successively, and finally to Okhrida.

First empire.

The national power reached its zenith under Simeon (893-927), a monarch distinguished in the arts of war and peace. In his reign, says Gibbon, "Bulgaria assumed a rank among the civilized powers of the earth." His dominions extended from the Black Sea to the Adriatic, and from the borders of Thessaly to the Save and the Carpathians. Having become the most powerful monarch in Eastern Europe, Simeon assumed the style of "Emperor and Autocrat of all the Bulgars and Greeks" (*tsar i samodrzhetz vsêm Blgarom i Grkom*), a title which was recognized by Pope Formosus. During the latter years of his reign, which were spent in peace, his people made great progress in civilization, literature flourished, and Prêslav, according to contemporary chroniclers, rivalled Constantinople in magnificence. After the death of Simeon the Bulgarian power declined owing to internal dissensions; the land was distracted by the Bogomile heresy, and a separate or western empire, including Albania and Macedonia, was founded at Okhrida by Shishman, a boyar from Trnovo. A notable event took place in 967, when the Russians, under Sviatoslav, made their first appearance in Bulgaria. The Bulgarian tsar, Boris II., with the aid of the emperor John Zimisces, expelled the invaders, but the Greeks took advantage of their victory to dethrone Boris, and the first Bulgarian empire thus came to an end after an existence of three centuries. The empire at Okhrida, however, rose to considerable importance under Samuel, the son of Shishman (976-1014), who conquered the greater part of the Peninsula, and ruled from the Danube to the Morea. After a series of campaigns this redoubtable warrior was defeated at Bêlasitza by the emperor Basil II., surnamed Bulgaroktónos, who put out the eyes of 15,000 prisoners taken in the fight, and sent them into the camp of his adversary. The Bulgarian tsar was so overpowered by the spectacle that he died of grief. A few years later his dynasty finally disappeared, and for more than a century and a half (1018-1186) the Bulgarian race remained subject to the Byzantine emperors.

Second empire.

In 1186, after a general insurrection under the brothers Ivan and Peter Asên of Trnovo, who claimed descent from the dynasty of the Shishmanovtzi, the nation recovered its independence, and Ivan Asên assumed the title of "Tsar of the Bulgars and Greeks." The seat of the second empire was at Trnovo, which the Bulgarians regard as the historic capital of their race. Kaloyan, the third of the Asên monarchs, extended his dominions to Belgrade, Nish, and Skopïe (Usküb); he acknowledged the spiritual supremacy of the Pope, and received the royal crown from a papal legate. The greatest of all Bulgarian rulers was Ivan Asên II. (1218-1241), a man of humane and enlightened character. After a series of victorious campaigns he established his sway over Albania, Epirus, Macedonia, and Thrace, and governed his wide dominions with justice, wisdom, and moderation. In his time the nation attained a prosperity hitherto unknown: commerce, the arts, and literature flourished; Trnovo, the capital, was enlarged and embellished, and great numbers of churches and monasteries were founded or endowed. The dynasty of the Asêns became extinct in 1257, and a period of decadence began. Two other dynasties, both of Kuman origin, followed—the Terterovtzi, who ruled at Trnovo, and the Shishmanovtzi, who founded an independent State at Vidin, but afterwards reigned in the national capital. Eventually, on the 28th June 1330, a day commemorated with sorrow in Bulgaria, Tsar Michael Shishman was defeated and slain by the Servians, under Stephen Urosh III., at the battle of Velbûzhd (Küstendil). Bulgaria, though still retaining its native rulers, now became subject to Servia, and formed part of the short-lived empire of Stephen Dushan (1331-1355). The Servian hegemony vanished after the death of Dushan, and the Christian races of the Peninsula, distracted by the quarrels of their petty princes, fell an easy prey to the advancing might of the Moslem invader.

Turkish conquest.

In 1340 the Turks had begun to ravage the valley of the Maritza; in 1362 they captured Philippopolis, and in 1382 Sofia. In 1366 Ivan Shishman III., the last Bulgarian tsar, was compelled to declare himself the vassal of the Sultan Murad I., and to send his sister to the harem of the conqueror. In 1389 the rout of the Servians, Bosnians, and Croats on the famous field of Kossovo decided the fate of the Peninsula. Shortly afterwards Ivan Shishman was attacked by the Turks; and Trnovo, after a siege of three months, was captured, sacked, and burnt in 1393. The fate of the last Bulgarian sovereign is unknown; the national legend represents him as perishing in a battle near Samakov. Vidin, where Ivan's brother,

Strazhimir, had established himself, was taken in 1396, and with its fall the last remnant of Bulgarian independence disappeared.

The five centuries of Turkish rule (1396-1878) form a dark epoch in Bulgarian history. The invaders carried fire and sword through the land; towns, villages, and monasteries were sacked and destroyed, and whole districts were converted into desolate wastes. The inhabitants of the plains fled to the mountains, where they founded new settlements. Many of the nobles embraced the creed of Islam, and were liberally rewarded for their apostasy; others, together with numbers of the priests and people, took refuge across the Danube. All the regions formerly ruled by the Bulgarian tsars, including Macedonia and Thrace, were placed under the administration of a governor-general, styled the beylerbey of Rum-ili, residing at Sofia; Bulgaria proper was divided into the sanjaks of Sofia, Nikopolis, Vidin, Silistra, and Küstendil. Only a small proportion of the people followed the example of the boyars in abandoning Christianity; the conversion of the isolated communities now represented by the Pomaks took place at various intervals during the next three centuries. A new kind of feudal system replaced that of the boyars, and fiefs or *spahiliks* were conferred on the Ottoman chiefs and the renegade Bulgarian nobles. The Christian population was subjected to heavy imposts, the principal being the *haratch*, or capitation-tax, paid to the imperial treasury, and the tithe on agricultural produce, which was collected by the feudal lord. Among the most cruel forms of oppression was the requisitioning of young boys between the ages of ten and twelve, who were sent to Constantinople as recruits for the corps of janissaries. Notwithstanding the horrors which attended the Ottoman conquest, the condition of the peasantry during the first three centuries of Turkish government was scarcely worse than it had been under the tyrannical rule of the boyars. The contemptuous indifference with which the Turks regarded the Christian *rayas* was not altogether to the disadvantage of the subject race. Military service was not exacted from the Christians, no systematic effort was made to extinguish either their religion or their language, and within certain limits they were allowed to retain their ancient local administration and the jurisdiction of their clergy in regard to inheritances and family affairs. At the time of the conquest certain towns and villages, known as the *voïnitchki sela*, obtained important privileges which were not infringed till the 18th century; on condition of furnishing contingents to the Turkish army or grooms for the Sultan's horses they obtained exemption from most of the taxes and complete self-government under their *voïvodi* or chiefs. Some of them, such as Koprivshtitza in the Sredna Gora, attained great prosperity, which has somewhat declined since the establishment of the principality. While the Ottoman power was at its height the lot of the subject-races was far less intolerable than during the period of decadence, which began with the unsuccessful siege of Vienna in 1683. Their rights and privileges were respected, the law was enforced, commerce prospered, good roads were constructed, and the great caravans of the Ragusan merchants traversed the country. Down to the end of the 18th century there appears to have been only one serious attempt at revolt—that occasioned by the advance of Prince Sigismund Báthory into Wallachia in 1595. A kind of guerilla warfare was, however, maintained in the mountains by the *haiduti*, or outlaws, whose exploits, like those of the Greek *klephts*, have been highly idealized in the popular folk-lore. As the power of the Sultans declined anarchy spread through the Peninsula. In the earlier decades of the 18th century the Bulgarians suffered terribly from the ravages of the Turkish armies passing through the land during the wars with Austria. Towards its close their condition became even worse owing to the horrors perpetrated by the Krjalis, or troops of disbanded soldiers and desperadoes, who, in defiance of the Turkish authorities, roamed through the country, supporting themselves by plunder and committing every conceivable atrocity. After the peace of Belgrade (1737), by which Austria lost her conquests in the Peninsula, the Servians and Bulgarians began to look to Russia for deliverance, and their hopes were encouraged by the treaty of Kainarji, under which the Empress Catherine obtained the protectorate of the orthodox Christians in the Turkish empire. In 1794 Pasvan-oglu, one of the chiefs of the Krjalis, established himself as an independent sovereign at Vidin, putting to flight three large Turkish armies which were despatched against him. This adventurer possessed many remarkable qualities. He adorned Vidin with handsome buildings, maintained order, levied taxes, and issued a separate coinage. He died in 1807. The memoirs of Sofronii, bishop of Vratza, present a vivid picture of the condition of Bulgaria at this time. "My diocese," he writes, "was laid desolate; the villages disappeared—they had been burnt by the Krjalis and Pasvan's brigands; the inhabitants were scattered far and wide over Wallachia and other lands."

At the beginning of the 19th century the existence of the Bulgarian race was almost unknown in Europe even to students of Slavonic literature. Disheartened by ages of oppression, isolated from Christendom by their geographical position, and cowed by the proximity of Constantinople, the Bulgarians took no collective part in the insurrectionary movement which resulted in the liberation of Servia and Greece. The Russian invasions of 1810 and 1828 only added to their sufferings, and great numbers of fugitives took refuge in Bessarabia, annexed by Russia under the treaty of Bucarest. But the long-dormant national spirit now began to awake under the influence of a literary revival. The precursors of the movement were Paisii, a monk of Mount Athos, who wrote a history of the Bulgarian tsars and saints (1762), and Bishop Sofronii, whose memoirs have been already mentioned. After 1824 several works written in modern Bulgarian began to appear, but the most important step was the foundation, in 1835, of the first Bulgarian school at Gabrovo. Within ten years at least 53 Bulgarian schools came into existence, and five Bulgarian printing-presses were at work. The literary movement led the way to a reaction against the influence and authority of the Greek clergy. The spiritual domination of the Greek Patriarchate had tended more effectually than the temporal power of the Turks to the effacement of Bulgarian nationality. After the conquest of the Peninsula the Greek Patriarch became the representative at the Sublime Porte of the *Rûm-milleti*, the Roman nation, in which all the Christian nationalities were comprised. The independent patriarchate of Trnovo was suppressed; that of Okhrida was subsequently Hellenized. The Phanariot clergy—unscrupulous, rapacious, and corrupt—succeeded in monopolizing the higher ecclesiastical appointments and filled the parishes with Greek priests, whose schools, in which Greek was exclusively taught, were the only means of instruction open to the population. By degrees Greek became the language of the upper classes in all the Bulgarian towns, the Bulgarian language was written in Greek characters, and the illiterate peasants, though speaking the vernacular, called themselves Greeks. The Slavonic liturgy was suppressed in favour of the Greek, and in many places the old Bulgarian manuscripts, images, testaments, and missals were committed to the flames. The patriots of the literary movement, recognizing in the Patriarchate the most determined foe to a national revival, directed all their efforts to the abolition of Greek ecclesiastical ascendancy and the restoration of the Bulgarian autonomous church. Some of the leaders went so far as to open negotiations with Rome, and an archbishop of the Uniate Bulgarian church was nominated by the Pope. The struggle was prosecuted with the utmost tenacity for forty years. Incessant protests and memorials were addressed to the Porte, and every effort was made to undermine the position of the Greek bishops, some of whom were compelled to abandon their sees. At the same time no pains were spared to diffuse education and to stimulate the national sentiment. Various insurrectionary movements were attempted by the patriots Rakovski, Panayot Khitoff, Haji Dimitr, Stephen Karaja, and others, but received little support from the mass of the people. The recognition of Bulgarian nationality was won by the pen, not the sword. The Patriarchate at length found it necessary to offer some concessions, but these appeared illusory to the Bulgarians, and long and acrimonious discussions followed. Eventually the Turkish Government intervened, and on the 28th February 1870 a firman was issued establishing the Bulgarian Exarchate, with jurisdiction over fifteen dioceses, including Nish, Pirot, and Veles; the other dioceses in dispute were to be added to these in case two-thirds of the Christian population so desired. The election of the first exarch was

National revival.

delayed till February 1872, owing to the opposition of the Patriarch, who immediately afterwards excommunicated the new head of the Bulgarian church and all his followers. The official recognition now acquired tended to consolidate the Bulgarian nation and to prepare it for the political developments which were soon to follow. A great educational activity at once displayed itself in all the districts subjected to the new ecclesiastical power.

Under the enlightened administration of Midhat Pasha (1864-68) Bulgaria enjoyed comparative prosperity, but that remarkable man is not remembered with gratitude by the people owing to the severity with which he repressed insurrectionary movements. In 1861, 12,000 Crimean Tatars, and in 1864 a still larger number of Circassians from the Caucasus, were settled by the Turkish Government on lands taken without compensation from the Bulgarian peasants. The Circassians, a lawless race of mountaineers, proved a veritable scourge to the population in their neighbourhood. In 1875 the insurrection in Bosnia and Herzegovina produced immense excitement throughout the Peninsula. The fanaticism of the Moslems was aroused, and the Bulgarians, fearing a general massacre of Christians, endeavoured to anticipate the blow by organizing a general revolt. The rising, which broke out prematurely at Koprivshtitza and Panagurishté in May 1876, was mainly confined to the sanjak of Philippopolis. Bands of bashi-bazouks were let loose throughout the district by the Turkish authorities, the Pomaks, or Moslem Bulgarians, and the Circassian colonists were called to arms, and a succession of horrors followed to which a parallel can scarcely be found in the history of the Middle Ages. The principal scenes of massacre were Panagurishté, Perushtitza, Bratzigovo, and Batak; at the last-named town, according to an official British report, 5000 men, women, and children were put to the sword by the Pomaks under Achmet Aga, who was decorated by the Sultan for this exploit. Altogether some 15,000 persons were massacred in the district of Philippopolis, and fifty-eight villages and five monasteries were destroyed. Isolated risings which took place on the northern side of the Balkans were crushed with similar barbarity. These atrocities, which were first made known by an English journalist and an American consular official, were denounced by Gladstone in a celebrated pamphlet which aroused the indignation of Europe. The Great Powers remained inactive, but Servia declared war in the following month, and her army was joined by 2000 Bulgarian volunteers. A conference of the representatives of the Powers, held at Constantinople towards the end of the year, proposed, among other reforms, the organization of the Bulgarian provinces, including the greater part of Macedonia, in two vilayets under Christian governors, with popular representation. These recommendations were practically set aside by the Porte, and in April 1877 Russia declared war. In the campaign which followed the Bulgarian volunteer contingent in the Russian army played an honourable part; it accompanied Gourko's advance over the Balkans, behaved with great bravery at Stara Zagora, where it lost heavily, and rendered valuable services in the defence of Shipka.

Revolt of 1876.

The victorious advance of the Russian army to Constantinople was followed by the treaty of San Stefano (3rd March 1878), which realized almost to the full the national aspirations of the Bulgarian race. All the provinces of European Turkey in which the Bulgarian element predominated were now included in an autonomous principality, which extended from the Black Sea to the Albanian mountains, and from the Danube to the Ægean, enclosing Okhrida, the ancient capital of the Shishmans, Dibra, and Kastoria, as well as the districts of Vranya and Pirot, and possessing a Mediterranean port at Kavala. The Dóbruja, notwithstanding its Bulgarian population, was not included in the new state, being reserved as compensation to Rumania for the Russian annexation of Bessarabia; Adrianople, Salonika, and the Chalcidian peninsula, were left to Turkey. The area thus delimited constituted three-fifths of the Balkan Peninsula, with a population of 4,000,000 inhabitants. The Great Powers, however, anticipating that this extensive territory would become a Russian dependency, intervened; and on the 13th July of the same year was signed the Treaty of Berlin, which in effect divided the "Big Bulgaria" of the San Stefano Treaty into three portions. The limits of the principality of Bulgaria, as now defined, and the autonomous province of Eastern Rumelia, have been already described; the remaining portion, including almost the whole of Macedonia and part of the vilayet of Adrianople, was left under Turkish administration. No special organization was provided for the districts thus abandoned; it was stipulated that laws similar to the organic law of Crete should be introduced into the various parts of Turkey in Europe, but this engagement was never carried out by the Porte. Vranya, Pirot, and Nish were given to Servia, and the transference of the Dóbruja to Rumania was sanctioned. This artificial division of the Bulgarian nation could scarcely be regarded as possessing elements of permanence. It was provided that the prince of Bulgaria should be freely elected by the population, and confirmed by the Sublime Porte with the assent of the Powers, and that, before his election, an assembly of Bulgarian notables, convoked at Trnovo, should draw up the organic law of the principality. The drafting of a constitution for Eastern Rumelia was assigned to a European commission.

Treaty of Berlin.

Pending the completion of their political organization, Bulgaria and Eastern Rumelia were occupied by Russian troops and administered by Russian officials. The assembly of notables, which met at Trnovo in 1879, was mainly composed of half-educated peasants, who from the first displayed an extremely democratic spirit, in which they proceeded to manipulate the very liberal constitution submitted to them by Prince Dondukoff-Korsakoff, the Russian governor-general. The long period of Turkish domination had effectually obliterated all social distinctions, and the radical element, which now formed into a party under Tzankoff and Karaveloff, soon gave evidence of its predominance. Manhood suffrage, a single chamber, payment of deputies, the absence of a property qualification for candidates, and the prohibition of all titles and distinctions, formed salient features in the constitution now elaborated. The organic statute of Eastern Rumelia was largely modelled on the Belgian constitution. The governor-general, nominated for five years by the Sultan with the approbation of the Powers, was assisted by an Assembly, partly representative, partly composed of *ex-officio* members; a permanent committee was entrusted with the preparation of legislative measures and the general supervision of the administration, while a council of six "directors" fulfilled the duties of a ministry.

The New constitution.

On the 29th April 1879 the Assembly at Trnovo, on the proposal of Russia, elected as first sovereign of Bulgaria Prince Alexander of Battenberg, a member of the grand ducal house of Hesse and a nephew of the Tsar Alexander II. Arriving in Bulgaria on the 7th July, Prince Alexander, then in his twenty-third year, found all the authority, military and civil, in Russian hands. The history of the earlier portion of his reign is marked by two principal

Prince Alexander.

features—a strong Bulgarian reaction against Russian tutelage and a vehement struggle against the autocratic institutions which the young ruler, under Russian guidance, endeavoured to inaugurate. Both movements were symptomatic of the determination of a strong-willed and egoistic race, suddenly liberated from secular oppression, to enjoy to the full the moral and material privileges of liberty. In the Assembly at Trnovo the popular party had adopted the watchword "Bulgaria for the Bulgarians," and a considerable anti-Russian contingent was included in its ranks. Young and inexperienced, Prince Alexander, at the suggestion of the Russian consul-general, selected his first ministry from a small group of "Conservative" politicians whose views were in conflict with those of the parliamentary majority, but he was soon compelled to form a "Liberal" administration under Tzankoff and Karaveloff. The Liberals, once in power, initiated a violent campaign against foreigners in general and the Russians in particular; they passed an alien law, and ejected foreigners from every lucrative position. The Russians made a vigorous resistance, and a state of chaos ensued. Eventually the prince, finding good government impossible, obtained the consent of the Tsar to a change of the constitution, and assumed absolute authority on the 9th May 1881. The Russian general Ernroth was appointed sole minister, and charged with the duty of holding elections for the Grand Sobranye, to which the right of revising the constitution appertained. So successfully did he discharge his mission that the national representatives, almost without debate, suspended the constitution and invested the prince with absolute powers for a term of seven years (July 1881). A period of Russian government followed under Generals Skobeleff and Kaulbars, who were specially despatched from St Petersburg to enhance the authority of the prince. Their administration, however, tended to a contrary result, and the prince, finding himself reduced to impotence, opened negotiations with the Bulgarian leaders and effected a coalition of all parties on the basis of a restoration of the constitution. The generals, who had made an unsuccessful attempt to remove the prince, withdrew; the constitution of Trnovo was restored by proclamation (19th September 1883), and a coalition ministry was formed under Tzankoff. Prince Alexander, whose relations with the court of St Petersburg had become less cordial since the death of his uncle, the Tsar Alexander II., in 1881, now incurred the serious displeasure of Russia, and the breach was soon widened by the part which he played in encouraging the national aspirations of the Bulgarians.

Union with E. Rumelia.

In Eastern Rumelia, where the Bulgarian population never ceased to protest against the division of the race, political life had developed on the same lines as in the principality. Among the politicians two parties had come into existence—the Conservatives or self-styled "Unionists," and the Radicals, derisively called by their opponents "Kazioni" or treasury-seekers; both were equally desirous of bringing about the union with the principality. Neither party, however, while in power would risk the sweets of office by embarking in a hazardous adventure. It was reserved for the Kazioni, under their famous leader Zakharia Stoyánoff, who in early life had been a shepherd, to realize the national programme. In 1885 the Unionists were in office, and their opponents lost no time in organizing a conspiracy for the overthrow of the governor-general, Krstovitch Pasha. Their designs were facilitated by the circumstance that Turkey had abstained from sending troops into the province. Having previously assured themselves of Prince Alexander's acquiescence, they seized the governor-general and proclaimed the union with Bulgaria (18th September). The revolution took place without bloodshed, and a few days later Prince Alexander entered Philippopolis amid immense enthusiasm. His position now became precarious. The Powers were scandalized at the infraction of the Berlin Treaty; England alone showed sympathy, while Russia denounced the union and urged the Porte to reconquer the revolted province—both Powers thus reversing their respective attitudes at the Berlin congress.

Servian war.

The Turkish troops were massed at the frontier, and Servia, hoping to profit by the difficulties of her neighbour, suddenly declared war (14th November). At the moment of danger the Russian officers, who filled all the higher posts in the Bulgarian army, were withdrawn by order of the Tsar. In these critical circumstances Prince Alexander displayed considerable ability and resource, and the nation gave evidence of hitherto unsuspected qualities. Contrary to general expectation, the Bulgarian army, imperfectly equipped and led by subaltern officers, successfully resisted the Servian invasion. After brilliant victories at Slivnitza (19th November) and Tsaribrod, Prince Alexander crossed the frontier and captured Pirot (27th November), but his further progress was arrested by the intervention of Austria. The Treaty of Bucarest followed (3rd March 1886), restoring the *status quo ante;* Servia, notwithstanding her aggression, escaped a war indemnity, but the union with Eastern Rumelia was practically secured. By the convention of Top-Khané (5th April) Prince Alexander was recognized by the Sultan as governor-general of Eastern Rumelia; a personal union only was sanctioned, but in effect the organic statute disappeared and the countries were administratively united. These military and diplomatic successes, which invested the prince with the attributes of a national hero, quickened the decision of Russia to effect his removal. An instrument was found in the discontent of several of his officers, who considered themselves slighted in the distribution of rewards, and a conspiracy was formed in which Tzankoff, Karaveloff (the prime minister), Archbishop Clement, and other prominent persons were implicated. On the night of the 21st August the prince was seized in his palace by several officers and compelled, under menace of death, to sign his abdication; he was then hurried to the Danube at Rakhovo and transported to Russian soil at Reni. This violent act met with instant disapproval on the part of the great majority of the nation. Stambuloff, the president of the Assembly, and Colonel Mutkuroff, commandant of the troops at Philippopolis, initiated a counter-revolution; the provisional government set up by the conspirators immediately fell, and a few days later the prince, who had been liberated by the Russian authorities, returned to the country amid every demonstration of popular sympathy and affection. His arrival forestalled that of a Russian imperial commissioner, who had been appointed to proceed to Bulgaria. He now committed the error of addressing a telegram to the Tsar in which he offered to resign his crown into the hands of Russia. This unfortunate step, by which he ignored the suzerainty of Turkey, and represented Bulgaria as a Russian dependency, exposed him to a stern rebuff, and fatally compromised his position. The national leaders, after obtaining a promise from the Russian representative at Sophia that Russia would abstain from interference in the internal affairs of the country, consented to his departure; on the 8th September he announced his abdication, and on the following day he left Bulgaria.

A regency was now formed, in which the prominent figure was Stambuloff, the most remarkable man whom modern Bulgaria has produced. A series of attempts to

throw the country into anarchy were firmly dealt with, and the Grand Sobranye was summoned to elect a new prince.

The regency. The candidature of the prince of Mingrelia was now set up by Russia, and General Kaulbars was despatched to Bulgaria to make known to the people the wishes of the Tsar. He vainly endeavoured to postpone the convocation of the Grand Sobranye in order to gain time for the restoration of Russian influence, and proceeded on an electoral tour through the country. The failure of his mission was followed by the withdrawal of the Russian representatives from Bulgaria. The Grand Sobranye, which assembled at Trnovo, offered the crown to Prince Valdemar of Denmark, brother-in-law of the Tsar, but the honour was declined, and an anxious period ensued, during which a deputation visited the principal capitals of Europe with the twofold object of winning sympathy for the cause of Bulgarian independence and discovering a suitable candidate for the throne.

Prince Ferdinand. On the 7th July 1887, the Grand Sobranye unanimously elected Prince Ferdinand of Saxe-Coburg-Gotha, a grandson, maternally, of King Louis Philippe. The new prince, who was twenty-six years of age, was at this time a lieutenant in the Austrian army. Undeterred by the difficulties of the international situation and the distracted condition of the country, he accepted the crown, and took over the government on the 14th August at Trnovo. His arrival, which was welcomed with enthusiasm, put an end to a long and critical interregnum, but the dangers which menaced Bulgarian independence were far from disappearing. Russia declared the newly-elected sovereign a usurper; the other Powers, in deference to her susceptibilities, declined to recognize him, and the grand vizier informed him that his presence in Bulgaria was illegal. Numerous efforts were made to disturb internal tranquillity, and Stambuloff, who became prime minister on the 1st September, found it necessary to govern with a strong hand. A raid led by the Russian captain Nabokoff was repulsed; brigandage, maintained for political purposes, was exterminated; the bishops of the Holy Synod, who, at the instigation of Clement, refused to pay homage to the prince, were forcibly removed from Sofia; a military conspiracy organized by Major Panitza was crushed, and its leader executed. An attempt to murder the energetic prime minister resulted in the death of his colleague, Beltchev, and shortly afterwards Dr Vlkovitch, the Bulgarian representative at Constantinople, was assassinated. While contending with unscrupulous enemies at home, Stambuloff pursued a successful policy abroad. Excellent relations were established with Turkey and Rumania, valuable concessions were twice extracted from the Porte in regard to the Bulgarian episcopate in Macedonia, and loans were concluded with foreign financiers on comparatively favourable terms. His overbearing character, however, increased the number of his opponents, and alienated the goodwill of the prince. In 1894 he resigned office; a ministry was formed under Dr Stoiloff, and Prince Ferdinand inaugurated a policy of conciliation towards Russia with a view to obtaining his recognition by the Powers. A Russophil reaction followed, large numbers of political refugees returned to Bulgaria, and Stambuloff, exposed to the vengeance of his enemies, was assassinated in the streets of Sofia (15th July 1895). The prince's plans were favoured by the death of the Tsar Alexander III. in November 1894, and the reconciliation was practically effected by the conversion of his eldest son, Prince Boris, to the orthodox faith (14th February 1896). The Powers having signified their assent, he was nominated by the Sultan prince of Bulgaria and governor-general of Eastern Rumelia (14th March). Russian influence now became predominant in Bulgaria, but the cabinet of St Petersburg wisely abstained from interfering in the internal affairs of the principality. In February 1896 Russia proposed the reconciliation of the Greek and Bulgarian churches and the removal of the exarch to Sofia. The project, which involved a renunciation of the exarch's jurisdiction in Macedonia, excited strong opposition in Bulgaria, and was eventually dropped. The death of Princess Marie-Louise of Bourbon Parma (30th January 1899), whom Prince Ferdinand had married in 1893, caused universal regret in the country.

Stamboluff.

Prince Ferdinand's reign has been marked by a great improvement in the material condition of Bulgaria. The completion of a network of railways has considerably benefited the agricultural population, on whose welfare the prosperity of the country depends. Education has progressed, perhaps too rapidly; the principal danger for the future lies in the growth of a class of educated office-seekers, whose intrigues distract the industrious rural population. Notwithstanding the dangers and difficulties which darkened its earlier years, the principality, in the short period of its existence, has made a rapid and striking advance, to which the sister states of the Peninsula cannot offer a parallel. The Bulgarians, a virile, laborious, thrifty, orderly, and persevering people, possess many qualities which will fit them to occupy an important position in the future political system of the Balkan Peninsula. The task which lies before them is to develop the resources of their country, to resist foreign interference, to await the future with confidence and patience, and eventually to include within their boundaries the unenfranchised portion of their race.

3. Language and Literature.

Language. The Bulgarian is at once the most ancient and the most modern of the languages which constitute the Slavonic group. In its groundwork it presents the nearest approach to the old ecclesiastical Slavonic, the liturgical language common to all the orthodox Slavs, but it has undergone more important modifications than any of the sister dialects in the simplification of its grammatical forms; and the analytical character of its development may be compared with that of the neo-Latin and Germanic languages. The introduction of the definite article, which appears in the form of a suffix, and the almost total disappearance of the ancient declensions, for which the use of prepositions has been substituted, distinguish the Bulgarian from all the other members of the Slavonic family. Notwithstanding these changes, which give the language an essentially modern aspect, its close affinity with the ecclesiastical Slavonic, the oldest written dialect, is regarded as established by several eminent scholars, such as Schafarik, Schleicher, Leskien, and Brugman, and by many Russian philologists. These authorities agree in describing the liturgical language as "Old Bulgarian." A different view, however, is maintained by Miklositch, Kopitar, and some others, who regard it as "Old Slovene." According to the more generally accepted theory, the dialect spoken by the Bulgarian population in the neighbourhood of Salonika, the birthplace of SS. Cyril and Methodius, was employed by the Slavonic apostles in their translations from the Greek, which formed the model for subsequent ecclesiastical literature. This view receives support from the fact that the two nasal vowels of the Church-Slavonic (the greater and lesser *ŭs*), which have been modified in all the cognate languages except Polish, retain their original pronunciation locally in the neighbourhood of Salonika and Kastoria; in modern literary Bulgarian the *rhinesmus* has disappeared, but the old nasal vowels preserve a peculiar pronunciation, the greater *ŭs* changing to *ŭ*, as in English "but," the lesser to *ĕ*, as in "bet," while in Servian, Russian, and Slovene the former becomes *ă* or *o*, the latter *e* or *ya*. The remnants of the declensions still existing in

Bulgarian (mainly in pronominal and adverbial forms) show a close analogy to those of the old ecclesiastical language.

The Slavonic apostles wrote in the 9th century (St Cyril died in 869, St Methodius in 885), but the original manuscripts have not been preserved. The oldest existing copies, which date from the 10th century, already betray the influence of the contemporary vernacular speech, but as the alterations introduced by the copyists are neither constant nor regular, it is possible to reconstruct the original language with tolerable certainty. The "Old Bulgarian," or archaic Slavonic, was an inflexional language of the synthetic type, containing few foreign elements in its vocabulary. The Christian terminology was, of course, mainly Greek; the Latin or German words which occasionally occur were derived from Moravia and Pannonia, where the two saints pursued their missionary labours. In course of time it underwent considerable modifications, both phonetic and structural, in the various Slavonic countries in which it became the liturgical language, and the various MSS. are consequently classified as "Servian-Slavonic," "Croatian-Slavonic," "Russian-Slavonic," &c., according to the different recensions. The "Russian-Slavonic" is the liturgical language now in general use among the orthodox Slavs of the Balkan Peninsula owing to the great number of ecclesiastical books introduced from Russia in the 17th and 18th centuries; until comparatively recent times it was believed to be the genuine language of the Slavonic apostles. Among the Bulgarians the spoken language of the 9th century underwent important changes during the next three hundred years. The influence of these changes gradually asserts itself in the written language; in the period extending from the 12th to the 15th century the writers still endeavoured to follow the archaic model, but it is evident that the vernacular had already become widely different from the speech of SS. Cyril and Methodius. The language of the MSS. of this period is known as the "Middle Bulgarian"; it stands midway between the old ecclesiastical Slavonic and the modern speech.

In the first half of the 16th century the characteristic features of the modern language became apparent in the literary monuments. These features undoubtedly displayed themselves at a much earlier period in the oral speech; but the progress of their development has not yet been completely investigated. Much light may be thrown on this subject by the examination of many hitherto little-known manuscripts and by the scientific study of the folk-songs. In addition to the employment of the article, the loss of the noun-declensions, and the modification of the nasal vowels above alluded to, the disappearance in pronunciation of the final vowels *yer-golêm* and *yer-malúk*, the loss of the infinitive, and the increased variety of the conjugations, distinguish the modern from the ancient language. The suffix-article, which is derived from the demonstrative pronoun, is a feature peculiar to the Bulgarian among Slavonic and to the Rumanian among Latin languages. This and other points of resemblance between these remotely related members of the Indo-European group are shared by the Albanian, the representative of the old Illyrian language, and have consequently been attributed to the influence of the aboriginal speech of the Peninsula. A demonstrative suffix, however, is sometimes found in Russian and Polish, and traces of the article in an embryonic state occur in the "Old Bulgarian" MSS. of the 10th and 11th centuries. In some Bulgarian dialects it assumes different forms according to the proximity or remoteness of the object mentioned. Thus *zhena-ta* is "the woman"; *zhena-va* or *zhena-sa*, "the woman close by"; *zhena-na*, "the woman yonder." In the borderland between the Servian and Bulgarian nationalities the local use of the article supplies the means of drawing an ethnological frontier; it is nowhere more marked than in the immediate neighbourhood of the Servian population, as, for instance, at Dibra and Prilep. The modern Bulgarian has admitted many foreign elements. It contains about 2000 Turkish and 1000 Greek words dispersed in the various dialects; some Persian and Arabic words have entered through the Turkish medium, and a few Rumanian and Albanian words are found. Most of these are rejected by the purism of the literary language, which, however, has been compelled to borrow the phraseology of modern civilization from the Russian, French, and other European languages. The dialects spoken in the principality may be classed in two groups—the eastern and the western. The main point of difference is the pronunciation of the letter *yedvoïno*, which in the eastern has frequently the sound of *ya*, in the western invariably that of *a* in "ate." The literary language began in the western dialect under the twofold influence of Servian literature and the church Slavonic. In a short time, however, the eastern dialect prevailed, and the influence of Russian literature became predominant. An anti-Russian reaction was initiated by Bogoroff (1818-92), and has been maintained by numerous writers educated in the German and Austrian universities. Since the foundation of the University of Sophia the literary language has taken a middle course between the ultra-Russian models of the past generation and the dialectic Bulgarian. Little uniformity, however, has yet been attained in regard to diction, orthography, or pronunciation.

The Bulgarians of pagan times are stated by the monk Khrabr, a contemporary of Tsar Simeon, to have employed a peculiar writing, of which inscriptions recently found near Kaspitchan may possibly be specimens. The earliest manuscripts of the "Old Bulgarian" are written in one or other of the two alphabets known as the glagolitic and Cyrillic. The former, which is supposed to have been derived from the cursive Greek of the 9th century, was probably the original alphabet devised by SS. Cyril and Methodius. It was used by Bulgarian writers concurrently with the Cyrillic down to the 12th century, and was maintained till recent times in the church literature of the Catholic Slavs in parts of Dalmatia and the Adriatic archipelago. The Cyrillic, which adopted the uncial Greek characters, is now believed to be of later date than the Slavonic apostles; it is, perhaps, to be attributed to St Clement or one of their other disciples who evangelized Bulgaria. While the glagolitic altered the Greek letters almost beyond recognition, the Cyrillic retained them with little change; both alphabets supplied several new characters to denote Slavonic sounds unknown to the Greek. Many of the oldest glagolitic and Cyrillic manuscripts have been edited by various scholars in recent times: they have been found, for the most part, in Russian libraries, but valuable specimens are preserved in the Vatican, in the monasteries of Rila and Mount Athos, and in Vienna, Agram, Lubliane, Prague, Berlin, and London. The sacred book of Reims, on which the French kings took the coronation oath, is written partly in the Cyrillic, partly in the glagolitic character. Among the orthodox Slavs the Cyrillic finally superseded the glagolitic; as modified by Peter the Great it became the Russian alphabet, which, with the revival of literature, was introduced into Servia and Bulgaria. Some Russian letters which are superfluous in Bulgarian have been abandoned by the native writers, and a few characters have been restored from the ancient alphabet.

Literature.

The ancient Bulgarian literature, originating in the works of SS. Cyril and Methodius and their disciples, consisted for the most part of theological works translated from the Greek. From the conversion of Boris down to the Turkish conquest the religious character predominates, and the influence of Byzantine literature is supreme. Translations of the gospels and epistles, lives of the saints, collections of sermons, exegetic religious works, translations of Greek chronicles, and miscellanies such as the *Sbornik* of St Sviatoslav, formed the staple of the national literature. In the time of Tsar Simeon, himself an author, considerable literary activity prevailed; among the more remarkable works of this period was the *Shestodnev*, or Hexameron, of John the exarch, an account of the creation. A little later the heresy of the Bogomiles gave an impulse to controversial writing. The principal champions of orthodoxy were St Kosmâs and the monk Athanas of Jerusalem; among the Bogomiles the *Questions of St Ivan Bogosloff*, a work containing a description of the beginning and the end of the world, was held in high esteem. Contemporaneously with the spread of this sect a number of apocryphal works, based on the Scripture narrative, but embellished with Oriental legends of a highly imaginative character, obtained great popularity. Together with these religious writings works of fiction, also of Oriental origin, made their appearance, such as the life of Alexander the Great, the story of Troy, the tales of *Stephanit and Ichnilat* and *Barlaam and Josaphat*, the latter founded on the biography of Buddha. These were for the most part reproductions or variations of the fantastical romances which circulated through Europe in the Middle Ages, and many of them have left traces in the national legends and folk-songs. In the 13th century, under the Asên dynasty, numerous historical works or chronicles (*létopisi*) were composed. State records appear to have existed, but none of them have been preserved. With the Ottoman conquest literature disappeared; the manuscripts became the food of moths and worms, or fell a prey to the fanaticism of the Phanariot clergy. The library of the patriarchs of Trnovo was committed to the flames by the Greek Metropolitan Hilarion in 1825.

The monk Païsii (born about 1720) and Bishop Sofronii (1739-1815) have already been mentioned as the precursors of the literary revival. The *Istoria Slaveno-Bolgarska* (1762) of Païsii, written in the solitude of Mount Athos, was a work of little historical value, but its influence upon the Bulgarian race was immense. An ardent patriot, Païsii recalls the glories of the Bulgarian tsars and saints, rebukes his fellow-countrymen for allowing themselves to be called Greeks, and denounces the arbitrary proceedings of the Phanariot prelates. The *Life and Sufferings of sinful Sofronii* (1804) describes in simple and touching language the condition of Bulgaria at the beginning of the 19th century. Both works were written in a modified form of the church Slavonic. The first printed work in the vernacular appears to have been a translation of sermons, also by Sofronii, published in 1806. The Servian and Greek insurrections quickened the patriotic sentiments of the Bulgarian refugees and merchants in Rumania, Bessarabia, and southern Russia, and Bucarest became the centre of their political and literary activity. A modest *bukvar*, or primer, published at Kronstadt by Berovitch in 1824, was the first product of the new movement. Translations of the Gospels, school reading-books, short histories, and various elementary treatises now appear, written with the object of conveying the simple rudiments of knowledge to the ignorant population. With the multiplication of books came the movement for establishing Bulgarian schools, in which the monk Neophyt Rilski (1793-1881) played a leading part. He was the author of a Bulgarian grammar and other educational works, and translated the New Testament into the modern language. Among the writers of the literary renaissance were George Rakovski (1818-67), a fantastic writer of the patriotic type, whose works did much to stimulate the national zeal, Liuben Karaveloff (1837-1879), journalist and novelist, Christo Botelf (1847-76), lyric poet, whose ode on the death of his friend Haji Dimitr, an insurgent leader, is one of the best in the language, and Petko Slaveïkoff (died 1895) whose poems, patriotic, satirical, and erotic, moulded the modern poetical language and exercised a great influence over the people. Gavril Krstovitch, formerly governor-general of Eastern Rumelia, and Marin Drinoff, a Slavist of high repute, have written historical works. Stambuloff, the statesman, was the author of revolutionary and satirical ballads; his friend Zacharia Stoyanoff (d. 1889), who began life as a shepherd, has left some interesting memoirs. The most distinguished Bulgarian man of letters is Ivan Vazoff (born 1850), whose epic and lyric poems and prose works form the best specimens of the modern literary language. His well-known novel *Under the Yoke* has been translated into several European languages. The best dramatic work is *Ivanko*, a historical play, by Archbishop Clement, who has also written some novels. With the exception of Zlatarski's geological treatises no original works on natural science have as yet been produced; a like dearth is apparent in the fields of philosophy, criticism, and fine art, but it must be remembered that the literature is still in its infancy. The ancient folk-songs have been preserved in several valuable collections; though inferior to the Servian in poetic merit, they deserve more scientific attention than they have yet received. Several periodicals and reviews have been founded in recent times. Of these the most important are the *Periodicheskoe Spisanie*, issued since 1869 by the Bulgarian Literary Society, and the *Sbornik*, a literary and scientific miscellany, carefully edited by Dr Shishmanoff, and published by the Government at irregular intervals. Bulgarian journalism is still in the crude stage of development; the numerous newspapers published in the capital and the provinces contain little more than polemical diatribes written in the interests of the various political leaders.

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(J. D. B.)

Bulgaria, Eastern, on the Volga, a powerful kingdom which existed from the 5th to the 15th century on the middle Volga, in the present territory of the provinces of Samara, Simbirsk, Saratov, and N. Astrakhan, perhaps extending also into Perm. The village Bolgary, near Kazañ, surrounded by numerous graves in which most interesting archæological finds have been made, occupies the site of one of the cities—perhaps the capital—of that extinct kingdom.

The history, *Tarikh Bulgar*, said to have been written in the 12th century by an Arabian cadi of the city Bolgary, has not yet been discovered; but the Arabian historians, Ibn Foslan, Ibn Hautal, Abul Hamid Andalusi, Abu Abdallah Harnati, and several others, who had visited the kingdom, beginning with the 10th century, have left descriptions of it. The Bulgars of the Volga were of Turkish origin, but may have assimilated Finnish and, later, Slavonian elements. In the 5th century they attacked the Russians in the Black Sea prairies, and afterwards made raids upon the Greeks. Ibn Foslan found them in 922 not quite nomadic, and already having some permanent settlements and houses in wood. Stone houses were built soon after that by Arabian architects. Ibn Dasta found amongst them agriculture besides cattle breeding. Trade with Persia and India, as also with the Khozars and the Russians, and undoubtedly with Biarmia (Urals), was, however, their chief occupation, their main riches being furs, leather, wool, nuts, wax, and so on. They accepted Islam in the 10th century, and after that time they began building forts, several of which are mentioned in Russian annals. Their chief town, Bolgary, or Velikij Gorod (Great Town) of the Russian annals, was often raided by the Russians. In the 13th century it was conquered by the Mongols, and became for a time the seat of the Khans of the Golden Horde. In the second half of the 15th century Bolgary became part of the Kazañ kingdom, lost its commercial and political importance, and was annexed to Russia after the fall of Kazañ.

(P. A. K.)

Bull, Ole Bornemann (1810-1880), Norwegian violinist, was born in Bergen, Norway, on 5th February 1810. At first a pupil of the violinist Paulsen, and subsequently self-taught, he was intended for the church, but failed in his examinations, and became a musician, directing the Philharmonic and Dramatic societies at Bergen. In 1829 he visited Spohr at Cassel, and afterwards proceeded to Paris, where he came under the influence of Paganini, and definitely adopted the career of a violin virtuoso, making his first appearance in company with Ernst and Chopin at a concert of his own in Paris, in 1832. Successful tours in Italy and England followed soon afterwards, and he was not long in obtaining European celebrity by his brilliant playing of his own pieces and arrangements. His first visit to the United States lasted from 1843 to 1845, and on his return to Norway he formed a scheme for the establishment of a Norse theatre in Bergen; this became an accomplished fact in 1850; but the harassing business complications which soon had to be faced were too much for him, and he went again to America in 1852. During this visit he bought 125,000 acres of land in Pennsylvania to found a Norwegian colony; but his title turned out to be fraudulent, and the troubles he went through in connexion with the undertaking were enough to affect his health very seriously, though not to hinder him for long from the exercise of his profession. Another attempt to found an academy of

music in Christiania had no permanent result, and, after his second marriage, with an American lady, in 1870, he confined himself to the career of a violinist. He died at Lysö, near Bergen, on 17th August 1880. Ole Bull's "polacca guerriera" and a host of other violin pieces, among them two concertos, are a good deal more interesting to the virtuoso than to the musician, and his fame rests upon his prodigious technique rather than upon any very remarkable attainments in the higher regions of art. The memoir published by his widow in 1886 contains many proofs of the interesting intercourse he enjoyed with a great number of the most eminent men of his time, not merely musicians; it gives a picture of a strong individuality, which often found expression in a somewhat boisterous form of practical humour. (J. A. F. M.)

Buller, Sir Redvers Henry (1839-——), British General, son of Mr J. W. Buller, M.P., of Crediton, Devonshire, was born in 1839, and educated at Harrow. He entered the army in 1858, and served with his regiment, the 60th Rifles, in the China campaign of 1860. In 1870 he became captain, and went on the Red River expedition, where he was first associated with Lord (then Sir Garnet) Wolseley, and in 1873-74 he accompanied the latter on the Ashantee campaign as head of the Intelligence Department, being slightly wounded at the battle of Ordabai. He was mentioned in despatches and made a C.B., besides being raised to the rank of major. In the Kaffir war of 1878-79 and the Zulu war of 1879 he was conspicuous as an intrepid and popular leader of cavalry, and built up a reputation for courage and dogged determination. In particular his conduct of the retreat at Inhlobana (28th March 1879) drew attention to these qualities, and he earned the V.C. for his assistance in rescuing Captain D'Arcy and Lieutenant Everitt on that occasion; he was given the C.M.G. and made lieutenant-colonel and A.D.C. to the Queen. In the Boer war of 1881 he was Sir Evelyn Wood's chief of the staff, thus adding to his experience of South African conditions of warfare. In 1882 he was head of the Field Intelligence Department in the Egyptian campaign, being present at Kassassin and Tel-el-Kebir, and was knighted for his services. Two years later he commanded an infantry brigade in the Sudan under Sir Gerald Graham, and was at the battles of El Teb and Tamai, being promoted major-general for distinguished service on the field. In the Sudan campaign of 1884-85 he was Lord Wolseley's chief of the staff, and was given the command of the desert column when Sir Herbert Stewart was wounded. He once more distinguished himself on this occasion by his conduct of the retreat from Gubat to Gakdul, and by his victory at Abu Klea Wells (16th, 17th February), and he was created K.C.B. In 1887 he was made quartermaster-general at the War Office, and in the same year was Under-Secretary for Ireland for a short period. From 1890 to 1897 he held the office of adjutant-general, attaining the rank of lieutenant-general in 1891. At the War Office his power of work, his quick mastery of detail, and trenchant criticism inspired those that came in contact with him with the belief that he was fitted for the highest command, and in 1895, when the duke of Cambridge was about to retire from the post of Commander-in-Chief, it was an open secret that the Rosebery Cabinet intended Sir Redvers Buller to be his successor, though it was reported that the conditions of the position were to be modified and the title changed to that of Chief of the Staff, as recommended by the Hartington Commission. On the eve, however, of this change being effected, the Government was defeated on Mr Brodrick's motion with reference to the alleged shortage of small-arm ammunition, and Lord Salisbury's Cabinet, on reconsidering the question of War Office reform as left to them by their predecessors, selected Lord Wolseley as the new Commander-in-Chief for a period of five years, Sir Redvers Buller remaining adjutant-general. In 1898 he took command of the troops at Aldershot, a five years' appointment, and when the Boer war broke out in 1899 he was selected with universal approval to take command of the South African Field Force (see TRANSVAAL, *War*), and landed at Cape Town on 31st October. Owing to the Boer investment of Ladysmith and the apparent helplessness of the generals sent to relieve the situation in Natal, he unexpectedly hurried off to Natal in order to supervise personally the rescue of Sir George White; but on 15th December his attempt to cross the Tugela at Colenso was repulsed with 1100 casualties and the loss of ten guns. The Government, alarmed at the situation and the tone of Sir Redvers Buller's messages, sent out Lord Roberts to supersede him in the chief command, Sir Redvers being left in subordinate command of the Natal force only. His second attempt to relieve Ladysmith (10th to 27th January) proved another failure, the result of the operations at Spion Kop (24th January) causing consternation in England. A third attempt (5th to 7th February) was again unsuccessful, and it was not till 28th February that, the important position of Hlangwane Hill having been occupied on 19th February and Pieter's Hill having been carried by General Hildyard on 27th February, the relief of Ladysmith was accomplished. Sir Redvers Buller remained in command of the Natal army till 24th October 1900, when he returned to England, having in the meanwhile slowly done a great deal of hard work in driving the Boers from the Biggarsberg (15th May), forcing Lang's Nek (12th June), and occupying Lydenburg (6th September); but though he still retained his reputation for dogged determination and was devotedly followed by his own rank and file, the verdict of military critics on his capacity for an important command in delicate and difficult operations had now become decidedly adverse. The continuance in 1901 of his appointment to the Aldershot command, which was the most important in the new army scheme, met with a storm of public criticism, in which the detailed objections taken to his conduct of the operations before Ladysmith (and particularly his heliogram hinting at the contingency of surrender) were given new prominence. On 10th October 1901, at a luncheon in London, Sir Redvers Buller made a speech in answer to these criticisms in terms which were held to be a breach of discipline and contrary to the king's regulations, and on 23rd October it was announced by the War Office that he had been relieved of his command and retired on half-pay.

Bull-fighting.—Bull-fighting is a survival of barbarism, the existence of which is fervently deplored by all but its devotees, whose delight in it is at the present time as keen as at any former period. The British idea of sport is that the creature pursued should have a chance of saving its life by its strength, speed, or natural cunning; the claim of bull-fighting to be regarded as sport is negatived by the fact that the bull is doomed from the moment of its entrance into the arena. But the main objection to the business in the eyes of persons of the most ordinary humanity lies in the atrocious slaughter of horses, which is a leading feature of the entertainment in Spanish eyes. The poor creatures are blindfolded and forced again and again in the bull's way, until, bleeding from many gores, and usually disembowelled, they drop in agony. That a brief description of bull-fighting should be

here given must not be accepted in any way as a token of approval or admiration. Bulls for the purposes of the ring are bred in various parts of Spain, chiefly in the plains of Las Cabezas, Lebrija, and Utrera. Sometimes during the first two years of their lives they are tormented with red cloths in order to teach them to charge, though many persons consider this not only unnecessary but a mistake. At the age of four they are considered ready for the ring, and are purchased by agents, at prices of from £30 to more than double that amount. The arena is some 70 yards in diameter, and the bulls destined for the day's work, usually some half-dozen in number, are confined in an enclosure from which they are driven one by one along a divided passage which leads to the ring. Two *matadors* or *espardos* are engaged in each day's fight, each of them having his own troop of six assistants, which make up what is described as a *cuadrilla*. Two of these subordinates are known as *picadores*, their business being to ride the wretched horses to slaughter; the others are called *banderilleros*, and conduct their operations on foot. The bull-ring at Madrid affords accommodation for over 12,000 people; elsewhere the rings are usually smaller. The spectacle is opened with a procession, and certain formalities also take place, the president at length throwing into the ring the key of the enclosure where the bulls are confined. When the victim is let into the arena his first instinct is usually to charge one of the *picadores*, who is armed with a lance which rarely proves of much service, the result being that the horse is cruelly wounded, and the man not seldom thrown to the ground. If he is unhurt and the horse has sufficient strength to stand, the man remounts to await another charge. It should here be said that in Portugal and also in South America this cruelty is not practised; expert riders, provided with good horses, do duty as *picadores*, and it is considered a disgrace if they do not save their horses from injury. In this latter species of fight the bull's horns are topped with wooden knobs, so that bloodshed is avoided. In Spain usually a dozen horses are killed during a day's fight; sometimes twice as many suffer. The *banderilleros*, known also as *chulos*, then proceed to make play, darting barbs, to which sometimes fireworks are attached, into the bull's body; and when the animal has reached a certain stage of exhaustion the matador makes ready to give the *coup de grâce*, after having delivered a brief speech, prefaced by trumpet calls, to the president, who is provided with a white and a red handkerchief, the exhibition of the former signifying approval and of the latter disapproval. The *matador* holds in his left hand a small red cloak known as a *muleta*, and in his right a sword. After inducing the bull to charge several times he endeavours to kill the animal with one thrust aimed at a vital spot in front of the withers. He may, of course, succeed or fail; some thrusts are recognized as good, some as passable, and others as bad. If the *matador* remains without moving, or rather moving only his body to avoid the stroke of the horns, the thrust is known as *recibiendo;* when bull and matador are approaching each other the thrust is called *a un tiempo;* if the matador advances and kills the bull when it is motionless the lunge is distinguished as *volapié* or *vuelapies*. These are all considered good strokes. The matador is very highly paid, as much as £50 being given to the most prominent men for killing a bull. (A. E. T. W.)

Bull Run, a small stream in North-Eastern Virginia, U.S.A., a branch of Occoquan Creek, which flows into Potomac river, 23 miles S. of Washington. The surrounding country is undulating, and dissected by sharp stream gorges. The first battle of Bull Run, in the early part of the Civil War, occurred on 21st July 1861, on the south-west bank near Manassas Junction, between the newly organized army of the Potomac under General M'Dowell and the hardly more experienced forces of the Confederate General Beauregard. It resulted in the total defeat and hasty retreat to Washington of the Federals, and brought the North to a realization of the magnitude of the struggle upon which it was entering. A second battle took place in almost the same position about a year later, on 29th August 1862. General Lee, with a portion of the combined armies of himself and Jackson, moved on Pope, who was established west of Manassas Junction, for the purpose of holding back Lee until M'Clellan's army could be withdrawn from the peninsula. One of the severest battles of the war ensued, in which the Federals were driven back. The main purpose, however, that of delaying Lee's advance on Washington, was achieved.

Bülow, Bernhard Heinrich Karl Martin von, Count (1849-——), German statesman, was born 3rd May 1849, at Kleinflottbech, in Holstein. His family is one very widely extended in North Germany, and many members have attained distinction in the civil and military service of Prussia, Denmark, and Mecklenburg. His great-uncle, Heinrich v. Bülow, was Prussian ambassador in England from 1827-40, and married a daughter of Wilhelm v. Humboldt. (See the letters of Gabrielle v. Bülow.) His father, Bernhard Ernst v. Bülow (1815-73), during his early years, held office under the Danish Government for Holstein; in 1862 he entered the service of Mecklenburg-Strelitz, and was representative of Mecklenburg in the Federal Council at Berlin; in 1873 he was invited by Bismarck, who had formed a high opinion of his abilities, to enter the imperial service as secretary of state for Foreign Affairs, and he was one of the German representatives at the Congress of Berlin. Bernhard, the son, after serving in the Franco-Prussian war, entered the Prussian civil service, and was then transferred to the diplomatic service. From 1884 he was first secretary to the embassy at St Petersburg, and acted as *chargé d'affaires*, in 1888 was appointed envoy at Bucharest, and in 1893 to the post of German ambassador at Rome. In 1897, on the retirement of Baron Marshall v. Bieberstein, he was appointed secretary of state for Foreign Affairs (the same office which his father had held) under Prince v. Hohenlohe, with a seat in the Prussian ministry. He was chiefly responsible for carrying out the policy of colonial expansion with which the emperor had identified himself, and in 1899, on bringing to a successful conclusion the negotiations by which Samoa was acquired by Germany, he was raised to the rank of Count. On the resignation of Hohenlohe in 1900, he was chosen to succeed him as chancellor of the empire and president of the Prussian ministry; and in the autumn of the year after the meeting of the Reichstag distinguished himself by the skill and ability with which he defended the policy of the Government and the emperor in China.

From him must be distinguished Otto v. Bülow (b. 1827), an official in the Prussian Foreign Office, who in 1882 was appointed German envoy at Bern, and from 1892 to 1898 was Prussian envoy to the Vatican.

Bülow, Hans Guido von (1830-1894), German pianist and conductor, was born of noble parents at Dresden, 8th January 1830. At the age of nine he began to study music under Friedrich Wieck and Eberwein, as part of a genteel education. It was only after an illness while studying law at Leipzig University in 1848 that he determined upon music as a career. At this time he was

a pupil of Hauptmann. In 1849 more or less revolutionary politics took possession of him. In the Berlin *Abendpost*, a democratic journal, the young aristocrat poured forth his opinions, which were strongly coloured by Wagner's *Art and Revolution*. Wagner's influence was musical no less than political, for a performance of *Lohengrin* under Liszt at Weimar in 1850 completed von Bülow's determination to abandon a legal career. From Weimar he went to Zürich, where the exile Wagner instructed him in the elements of conducting. But he soon returned to Weimar and Liszt; and in 1853 he made his first concert tour, which extended from Vienna to Berlin. Next he became principal professor of the piano at the Stern Academy, and married in his twenty-eighth year Liszt's daughter Cosima. For the following nine years von Bülow laboured incessantly in Berlin as pianist, conductor, and writer of musical and political articles. Thence he removed to Munich, where, thanks to Wagner, he had been appointed Hof-kapellmeister to Ludwig II., and chief of the Conservatorium. There, too, he organized model performances of *Tristan* and *Die Meistersinger*. In 1869 his marriage was dissolved, his wife subsequently marrying Wagner, an incident which, while preventing Bülow from revisiting Bayreuth, never dimmed his enthusiasm for Wagner's dramas. After a temporary stay in Florence, Bülow set out on tour again as a pianist, visiting most European countries as well as the United States of America, before taking up the post of conductor at Hanover, and, later, at Meiningen, where he raised the orchestra to a pitch of excellence till then unparalleled. In 1885 he resigned the Meiningen office, and conducted a number of concerts in Russia and Germany. At Frankfort he held classes on Liszt's lines for the higher development of piano-playing. He constantly visited England, for the last time in 1888, in which year he went to live in Hamburg. Nevertheless he continued to conduct the Berlin Philharmonic Concerts. He died at Cairo, on 13th February 1894. Bülow will long be remembered as a pianist of the highest order of intellectual attainment, an artist of remarkably catholic tastes, a passionate hater of humbug and affectation, and one of the greatest orchestral conductors the world has seen. He had a ready pen, and a biting, incisive, sometimes almost rude wit, yet of his kindness of heart and generosity countless tales were told. His compositions are few and unimportant; his arrangement of some of Wagner's dramas for the pianoforte are exceedingly difficult. (R. H. L.)

Bunbury, a seaport and municipality in Western Australia, in the county of Wellington, 112 miles by road S. by W. of Perth, with which it is connected by rail. The harbour, known as Koombanah Bay, is sheltered by a coral reef, on which a breakwater was begun by the Government in 1897. In 1900 it had a length of over 3200 feet. Tin, timber, sandal-wood, horses, and produce are shipped. Its population in 1891 was 572; in 1900 about 3000.

Bundaberg, a river port and municipality in Queensland, Australia, in the county of Cook, on the river Burnett, 10 miles from its mouth, 70 miles by rail N. of Maryborough on the line from Brisbane. A mile below the town, at Millaquin, is the largest sugar factory in the colony. There are numerous other sugar factories and mills in the district. The staple exports are sugar (about 35,000 tons annually), golden syrup, and timber. The climate is remarkably healthy. Population (1891), 3982; of town and district (1900), 14,000.

Bundelkhand, a tract of country in Central India, lying between the North-West and the Central Provinces. Historically it includes the five British districts of Hamirpur, Jalaun, Jhansi, Lalitpur, and Banda, which now form part of the Allahabad division of the North-West Provinces, but politically it is restricted to a collection of native states, under the Bundelkhand agency. These number about thirty in all, with a total area of 10,241 square miles; total population (1891), 1,508,053, being an average of 145 persons per square mile; (1901), 1,309,323, showing a decrease of 13 per cent., due to the effects of famine. The most important of the states are Orchha, Panna, Chatarpur, Datia, Charkhari, Bijawar, and Ajaigarh. Up to the present no railway traverses the country. A garrison of all arms is stationed at Nowgong, where also there is a Rajkumar college for training the sons of the chiefs according to the methods of an English public school, with 17 pupils in 1897-98.

Bundi, or BOONDEE, a native state of India, in the Rajputana agency, lying on the north-east of the river Chambal, in a hilly tract historically known as Haraoti. It has an area of 2245 square miles. In 1881 the population was 254,701; in 1891 it was 295,675, giving an average density of 133 persons per square mile; in 1901, 171,227, showing a decrease of 42 per cent., due to the effects of famine. The estimated gross revenue in 1897-98 was Rs.7,00,000; the tribute, Rs.1,20,000. There is no railway, but the metalled road from Kotah to the British cantonment of Deoli passes through the state. In 1897-98 the mint coined no less than Rs.3,17,686. The town of BUNDI had a population in 1891 of 22,544. A school for the education of boys of high rank was opened in 1897.

Bunsen, Robert Wilhelm von (1811-1898), German chemist, was born in Göttingen on 31st March 1811. He studied at the university in that town, becoming *privat docent* in 1833. Three years later he was appointed to succeed Wöhler in the chair of Chemistry at the Polytechnic School of Cassel, and in 1838 moved to Marburg, where he remained some thirteen years. Then, for a short time, he was professor of Chemistry at Breslau, and in 1852 accepted a similar position at Heidelberg, where he spent the rest of his days, in spite of an urgent invitation to migrate to Berlin as successor to Mitscherlich. He retired from active work in 1889, and died at Göttingen on 16th August 1898. The first research, by which attention was drawn to Bunsen's abilities, was concerned with the cacodyl compounds of arsenic. It was begun in 1837 at Cassel, and during the six years he spent upon it he not only lost the sight of one eye through an explosion, but nearly killed himself by arsenical poisoning. It represents almost his only excursion into organic chemistry, and apart from its accuracy and completeness it is of historical interest in the development of that branch of science as being the forerunner of the fruitful investigations on the organo-metallic compounds subsequently carried out by his English pupil, Edward Frankland. Simultaneously with his work on cacodyl, he was studying the composition of the gases given off from blast furnaces. He showed that in German furnaces nearly half the heat yielded by the fuel was being allowed to escape with the waste gases, and when he came to England, and in conjunction with Lyon Playfair investigated the conditions obtaining in English furnaces, he found the waste to amount to over 80 per cent. These researches marked a stage in the application of scientific principles to the manufacture of iron, and they led also to the elaboration of Bunsen's famous methods of measuring gaseous volumes, &c., which form the subject of the only book he ever published. In 1841 he invented the carbon-

zinc battery which is known by his name, and which conducted him to several important achievements. He first employed it to produce the electric arc, and showed that from 44 cells a light equal to 1170 candles could be obtained with the consumption of one pound of zinc per hour. To measure this light he designed another instrument, which in various modifications has come into extensive use—the grease-spot photometer. In 1852 he began to carry out electrolytical decompositions by the aid of the battery, thus foreshadowing what has become an important branch of chemical industry. By means of a very ingenious arrangement he obtained magnesium for the first time in the metallic state, and studied its chemical and physical properties, among other things demonstrating the brilliance and high actinic qualities of the flame it gives when burnt in air, in the way now familiar to every photographer. Another, and perhaps the best known, of the contrivances which the world owes to him is the Bunsen burner. When the new laboratory was built at Heidelberg in 1855, it became necessary to install apparatus to supply heat for the conduct of chemical operations. Bunsen was dissatisfied with all the contrivances that were brought to his notice, and finally set himself to devise a simple means of burning ordinary coal gas with a hot smokeless flame. The result of his labours was the well-known burner which is now employed by thousands for all sorts of purposes. Mention must also be made of another piece of work of a rather different character. Travelling was one of his favourite relaxations, and in 1846 he paid a visit to Iceland. There he investigated the phenomena of the geysers, the composition of the gases coming off from the fumaroles, their action on the rocks with which they came into contact, &c., and on his observations was founded a noteworthy contribution to geological theory. But the most far-reaching of his achievements was the elaboration, about 1859, jointly with Kirchhoff, of spectrum analysis, which has put a new weapon of extraordinary power into the hands both of chemists and astronomers. It led Bunsen himself almost immediately to the isolation of two new elements of the alkali group, cæsium and rubidium. Having noticed some unknown lines in the spectra of certain salts he was examining, he set to work to obtain the substance or substances to which these were due. To this end he evaporated large quantities of the Dürkheim mineral water, and it says much both for his perseverance and powers of manipulation that he dealt with 40 tons of the water to get about 17 grammes of the mixed chlorides of the two substances, and that with about one-third of that quantity of cæsium chloride was able to prepare the most important compounds of the element and determine their characteristics, even making goniometrical measurements of their crystals.

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Buoy, a floating body employed to mark the navigable limits of channels, their fairways, sunken dangers or isolated rocks, mined or torpedo grounds, telegraph cables, or the position of a ship's anchor after letting go; they are also used for securing a ship to in lieu of anchoring. They vary in size and construction from a log of wood to mooring steel buoys for battleships or a steel gas buoy. In 1882 a conference was held upon a proposal to establish a uniform system of buoyage. It was under the presidency of H.R.H. the duke of Edinburgh, and consisted of representatives from the various bodies interested. The questions of colour, visibility, shape, and size were considered, and any modifications necessary owing to locality. The committee proposed the following uniform system of buoyage, and it is now adopted by the general lighthouse authorities of the United Kingdom:—(1) The mariner when approaching the coast must determine his position on the chart, and note the direction of the main stream of flood tide. (2) The term "starboard-hand" shall denote that side which would be on the right hand of the mariner either going with the main stream of flood, or entering a harbour, river, or estuary from seaward; the term "port-hand" shall denote the left hand of the mariner in the same circumstances. (3)[1] Buoys showing the pointed top of a cone above water shall be called conical (Fig. 1) and shall always be starboard-hand buoys, as above defined. (4)[1] Buoys showing a flat top above water shall be called can (Fig. 2), and shall always be port-hand buoys as above defined. (5) Buoys showing a domed top above water shall be called spherical (Fig. 3), and shall mark the ends of middle grounds. (6) Buoys having a tall central

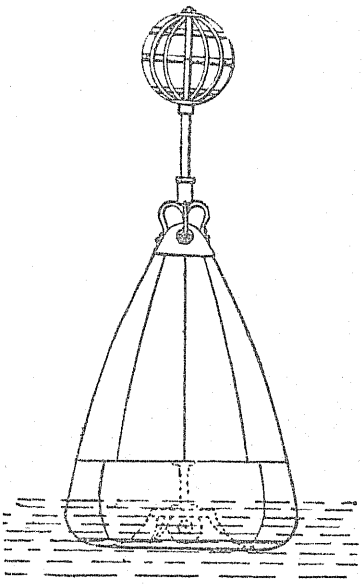
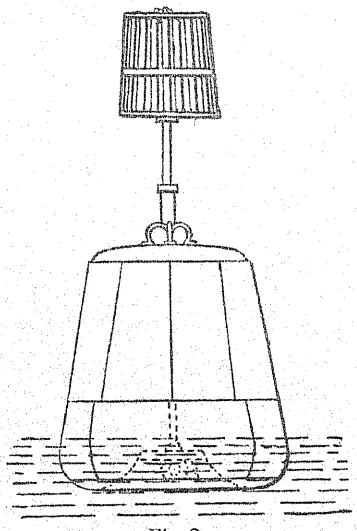


Fig. 1.



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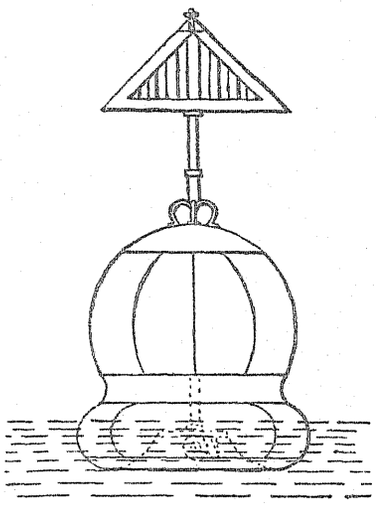


Fig. 3.

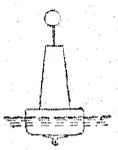


Fig. 4.

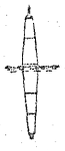


Fig. 5.

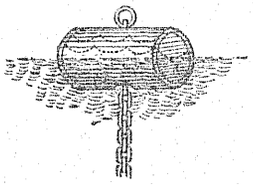


Fig. 6.

or letters, and where necessary by a staff surmounted with the appropriate beacon. (14) Buoys intended for moorings (Fig. 6) may be of shape or colour according to the discretion of the authority within whose jurisdiction they are laid, but for marking submarine telegraph cables the colour shall be green, with the word "Telegraph" painted thereon in white letters.

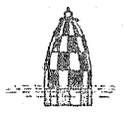
Buoying and Marking of Wrecks.—(15) Wreck buoys in the open sea, or in the approaches to a harbour or estuary, shall be coloured green, with the word "Wreck" painted in white letters on them. (16) When possible, the buoy should be laid near to the side of the wreck next to mid-channel. (17) When a wreck-marking vessel is used, it shall, if possible, have its top sides coloured green, with the word "Wreck" in white letters thereon, and shall exhibit by day, three balls on a yard 20 feet above the sea, two placed vertically at one end and one at the other, the single ball being on the side nearest to the wreck; in fog, bell and gong in quick succession at intervals not exceeding one minute (wherever practicable); by night, three white fixed lights similarly arranged, but not the ordinary riding lights. (18) In narrow waters or in rivers and harbours under the jurisdiction of local authorities, the same rules may be adopted, or, at discretion, varied as follows:—When a wreck-marking vessel is used she shall carry a cross-yard on a mast with two balls by day, placed horizontally not less than 6 nor more than 12 feet apart, and two lights by night similarly placed. When a barge or open boat only is used, a flag or ball may be shown in the daytime. (19) The position in which the marking vessel is placed with reference to the wreck shall be at the discretion of the local authority having jurisdiction. A uniform system by shape has been adopted by the Mersey Dock and Harbour Board, to assist a mariner by night, and, in addition, where practicable, a uniform colour; the fairway buoys are specially marked by letter, shape, and colour. British India has practically adopted the British system. United States and Canada have the same uniform system; in the majority of European maritime countries and China various uniform systems have been adopted. In Norway and Russia the compass system is used, the shape, colour, and surmountings of the buoys indicating the compass bearing of the danger from the buoy; this method is followed in the open sea by Sweden. An international uniform system of buoyage, although desirable, appears impracticable. Germany employs yellow buoys to mark boundaries of quarantine stations. The question of shape *versus* colour, irrespective of size, is a disputed one; the shape is a better guide at night and colour in the daytime. All markings (Figs. 8, 9, 10, and 11) should be subordinate to the main colour of the buoy; the varying backgrounds and atmospheric conditions render the question a complex one. Trinity House buoys are divided into five classes, their use depending on whether the spot to be marked is in the open sea, or in an otherwise exposed position, or is in a sheltered harbour, or according to the depth of water and weight of moorings, or the importance of the danger. Buoys are moored with specially tested cables (see CABLE); the eye at the base of the buoy is of wrought iron to prevent it becoming "reedy," and the cable is secured to blocks (see ANCHOR) or mushroom anchors according to the nature of the ground. Trinity House buoys are built of steel, with bulk-heads to lessen the risk of their sinking by collision, and with the exception of bell buoys, do not contain water ballast. In 1878 gas buoys, with fixed and occulting lights of 10 candle power, were introduced. In 1896 Mr T. Matthews, engineer-in-chief to the Trinity corporation, developed the present design (1901) (Fig. 12). It is of steel, the lower plates being $\frac{5}{8}$ in. and the upper $\frac{7}{16}$ in. in thickness, thus adding to the buoy's stability. The buoy holds 380 cubic feet of gas, and exhibits an occulting light for 2533 hours, 10 feet above the sea, and is visible 8

Single Colour

Fig. 8.

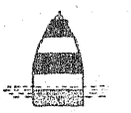
Vertical Stripes

Fig. 9.



Chequered

Fig. 10.



Horizontal Stripes

Fig. 11.

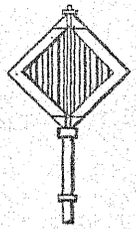


Fig. 7.

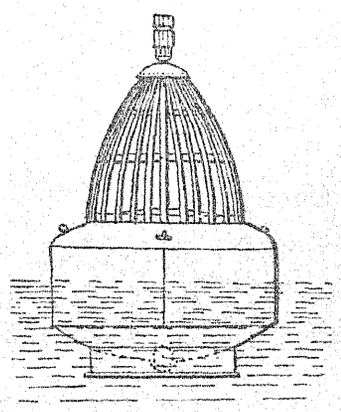


Fig. 12.

[1] Useful where floating ice is encountered.

[2] St George and St Andrew crosses are principally employed to surmount shore beacons.

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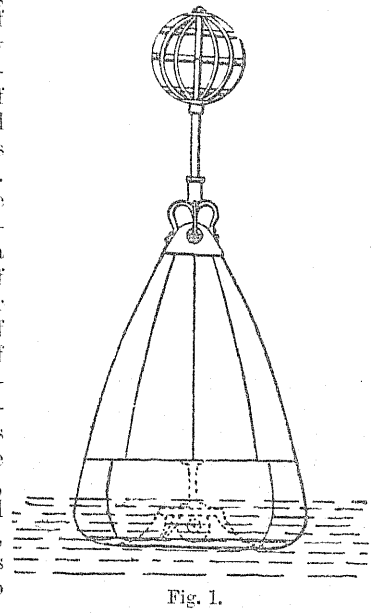

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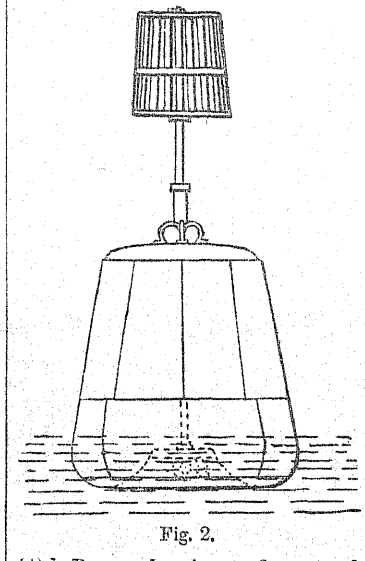

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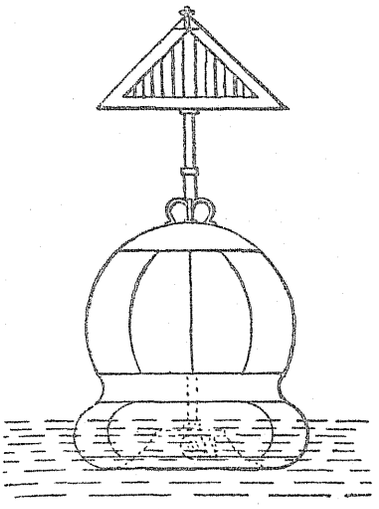


Fig. 3.

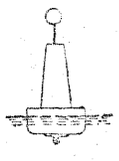


Fig. 4.

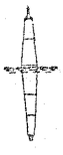


Fig. 5.

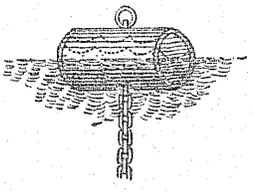


Fig. 6.

or letters, and where necessary by a staff surmounted with the appropriate beacon. (14) Buoys intended for moorings (Fig. 6) may be of shape or colour according to the discretion of the authority within whose jurisdiction they are laid, but for marking submarine telegraph cables the colour shall be green, with the word "Telegraph" painted thereon in white letters.

Buoying and Marking of Wrecks.—(15) Wreck buoys in the open sea, or in the approaches to a harbour or estuary, shall be coloured green, with the word "Wreck" painted in white letters on them. (16) When possible, the buoy should be laid near to the side of the wreck next to mid-channel. (17) When a wreck-marking vessel is used, it shall, if possible, have its top sides coloured green, with the word "Wreck" in white letters thereon, and shall exhibit by day, three balls on a yard 20 feet above the sea, two placed vertically at one end and one at the other, the single ball being on the side nearest to the wreck; in fog, bell and gong in quick succession at intervals not exceeding one minute (wherever practicable); by night, three white fixed lights similarly arranged, but not the ordinary riding lights. (18) In narrow waters or in rivers and harbours under the jurisdiction of local authorities, the same rules may be adopted, or, at discretion, varied as follows:—When a wreck-marking vessel is used she shall carry a cross-yard on a mast with two balls by day, placed horizontally not less than 6 nor more than 12 feet apart, and two lights by night similarly placed. When a barge or open boat only is used, a flag or ball may be shown in the daytime. (19) The position in which the marking vessel is placed with reference to the wreck shall be at the discretion of the local authority having jurisdiction. A uniform system by shape has been adopted by the Mersey Dock and Harbour Board, to assist a mariner by night, and, in addition, where practicable, a uniform colour; the fairway buoys are specially marked by letter, shape, and colour. British India has practically adopted the British system. United States and Canada have the same uniform system; in the majority of European maritime countries and China various uniform systems have been adopted. In Norway and Russia the compass system is used, the shape, colour, and surmountings of the buoys indicating the compass bearing of the danger from the buoy; this method is followed in the open sea by Sweden. An international uniform system of buoyage, although desirable, appears impracticable. Germany employs yellow buoys to mark boundaries of quarantine stations. The question of shape *versus* colour, irrespective of size, is a disputed one; the shape is a better guide at night and colour in the daytime. All markings (Figs. 8, 9, 10, and 11) should be subordinate to the main colour of the buoy; the varying backgrounds and atmospheric conditions render the question a complex one. Trinity House buoys are divided into five classes, their use depending on whether the spot to be marked is in the open sea, or in an otherwise exposed position, or is in a sheltered harbour, or according to the depth of water and weight of moorings, or the importance of the danger. Buoys are moored with specially tested cables (see CABLE); the eye at the base of the buoy is of wrought iron to prevent it becoming "reedy," and the cable is secured to blocks (see ANCHOR) or mushroom anchors according to the nature of the ground. Trinity House buoys are built of steel, with bulkheads to lessen the risk of their sinking by collision, and with the exception of bell buoys, do not contain water ballast. In 1878 gas buoys, with fixed and occulting lights of 10 candle power, were introduced. In 1896 Mr T. Matthews, engineer-in-chief to the Trinity corporation, developed the present design (1901) (Fig. 12). It is of steel, the lower plates being $\frac{5}{8}$ in. and the upper $\frac{7}{16}$ in. in thickness, thus adding to the buoy's stability. The buoy holds 380 cubic feet of gas, and exhibits an occulting light for 2533 hours, 10 feet above the sea, and is visible 8

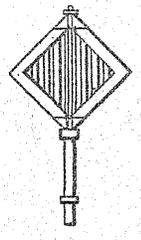
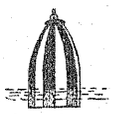


Fig. 7.

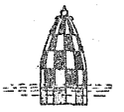
Single Colour

Fig. 8.



Vertical Stripes

Fig. 9.



Chequered

Fig. 10.

Horizontal Stripes

Fig. 11.

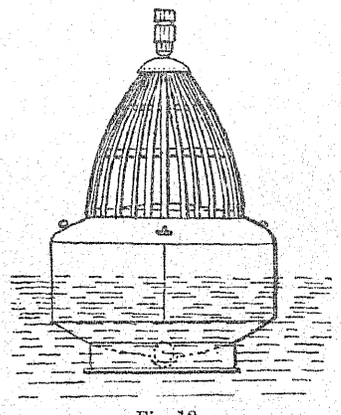


Fig. 12.

[1] Useful where floating ice is encountered.

[2] St George and St Andrew crosses are principally employed to surmount shore beacons.

miles, with an intensity of 50 candles. The light occults every ten seconds, seven seconds' visibility and three seconds' obscuration, the occultations being actuated by a double valve arrangement. In the body of the apparatus there is a gas chamber having sufficient capacity, in the case of an occulting light, for maintaining the flame in action for seven seconds, and by means of a by-pass a jet remains alight in the centre of the burner. During the period of three seconds' darkness the gas chamber is re-charged, and at the end of that period is again opened to the main burner by a tripping arrangement of the valve, and remains in action seven seconds. The gas chamber of the buoy, charged to five atmospheres, is replenished from a steamer fitted with a pump and transport receivers carrying indicating valves, the receivers being charged to ten atmospheres. Practically no inconvenience has resulted from saline or other deposit, the glazing (glass) of the lantern being thoroughly cleaned when re-charging the buoy. Electric light is exhibited from some buoys in the United States. In England an automatic electric buoy has been suggested, worked by the motion of the waves, which cause a stream of water to act on a turbine connected with a dynamo generating electricity, but at present gas is preferred by British authorities as an illuminant. Boat-shaped buoys are occasionally used for carrying a light or bell. The Courtenay whistling buoy (Fig. 13) is actuated by the undulating movement of the waves. A hollow cylinder extends from the lower part of the buoy to below the movement of the waves, ensuring the water inside keeping at mean level, whilst the buoy follows the movements of the waves. By a special apparatus the compressed air is forced through the whistle at the top of the buoy, and is replenished by two tubes at the upper part of the buoy. It is fitted with a rudder and secured in the usual manner. Automatic buoys cannot be relied on in calm days with a smooth sea. The nun buoy (Fig. 14) for indicating the position of an anchor after letting go, is secured to the crown of the anchor by a buoy rope. It is usually made of galvanized iron, and consists of two cones joined together at the base and is painted red for the port anchor and green for the starboard. A mooring buoy (Fig. 6) for a battleship is built of steel in four watertight compartments, and has sufficient buoyancy to keep afloat should a compartment be pierced; they are 13 ft. long with a diameter of 6½ ft. The mooring cable (bridle) passes through a watertight 16 in. trunk pipe, built vertically in the centre of the buoy, and is secured to a "rocking shackle" on the upper surface of the buoy. Large mooring buoys are usually protected by horizontal wooden battens and are fitted with life chains. (J. W. D.)

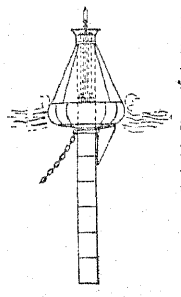


Fig. 13.

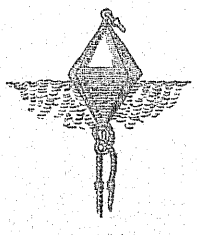


Fig. 14.

Burano, a town of the province of Venice, Venetia, Italy, on an island in the lagoon, 7 miles N.E. from Venice. The men are engaged in fishing, extracting salt, and making gondolas, whilst the women devote their time to lace-making. Population of island (1899), 4500.

Burauen, one of the four interior towns of Leyte, Philippine Islands, in latitude 10° 9′ N. Its most important export is hemp. Woven fabrics are produced by the women in some quantity. The language is Visayan. Population, 21,000.

Burckhardt, Jakob (1818-1897), Swiss writer, was born at Basel, 25th May 1818. He devoted himself to the study of history and of art, and was successively professor at Basel, at Zürich, and at Basel again. His first work of importance was published in 1842, and treated of the works of art in Flemish cities. In 1853 he produced *The Age of Constantine the Great*, a valuable study of the decay of ancient civilization. In 1855 appeared his *Cicerone*, a guide to objects of art and architecture in Italy which, by revision in numerous successive editions, has become indispensable to the æsthetic traveller. This labour naturally directed Burckhardt's attention to the renaissance, and he wrote *The Culture of the Renaissance*, 1860; and *The History of the Renaissance*, 1867. His latter years were principally devoted to the elaboration of his writings. He died at Basel, 8th August 1897.

Burdett-Coutts, Angela Georgina, Baroness (1814-——), British philanthropist, was born 25th April 1814, being the youngest daughter of Sir Francis Burdett, Bart., so famous in the early part of the 19th century as Liberal member for Westminster, and grand-daughter of Mr Thomas Coutts, the no less celebrated banker. Inheriting in 1837 a vast fortune from her grandfather, Lady Burdett-Coutts (who was raised to the peerage as a baroness in 1871), has devoted her life to works of public and private charity and beneficence. It has been her especial aim to benefit the working classes in ways involving no loss of independence or self-respect in the recipients of her bounty. She has sent destitute boys into the navy and mercantile service; provided means for the struggling to emigrate, and insured them a fair start in the colonies; created or restored fisheries on the Irish coast; founded and maintained schools, industrial and otherwise; erected and administered model dwellings, and established markets for the poor. She has been no less active in the promotion of moral reform by the foundation of refuges and reformatories for the criminal and abandoned of both sexes. She has endowed three colonial bishoprics, built and endowed several churches; her bounty has relieved the distresses of Bulgarian refugees; her helping hand has been stretched out to the Dyaks of Borneo and the aborigines of South Australia; and she has been indefatigable in lending her aid to support home and foreign church missions, and schemes for extending British civilization in tropical countries, and for developing the colonial estates of the British Empire. In 1881 she married Mr William Lehman Ashmead Bartlett, M.P. for Westminster since 1885, who assumed his wife's name by royal license.

Burdon-Sanderson, Sir John Scott, Bart. (1828-——), English physiologist, was born at Jesmond, near Newcastle, on 21st December 1828, and received his medical education at the university of Edinburgh. In 1856 he became medical officer of health for Paddington, and four years later physician to the Middlesex and the Brompton Consumption Hospitals. When diphtheria appeared in England in 1858 he was sent to investigate the disease at the different points of outbreak, and in subsequent years he carried out a number of similar inquiries, *e.g.*, on the cattle plague and on cholera in 1866. He became first principal of the Brown Institution at Lambeth in 1871, and three years afterwards succeeded Sharpey in the Jodrell professorship of physiology at University College, London. When the Waynflete chair of physiology was established at Oxford in 1883, he was chosen to be its first occupant, and immediately found himself the object of a furious anti-vivisectionist agitation. The proposal that the university should spend £10,000 in providing him with a suitable laboratory, lecture-rooms,

&c., in which to carry on his work, was strongly opposed, by some on grounds of economy, but largely because he was an upholder of the usefulness and necessity of experiments upon animals. It was, however, carried by a small majority (88 to 85), and in the same year the Royal Society awarded him a Royal medal in recognition, not only of his researches on the electrical phenomena exhibited by plants, and on the relations of minute organisms to disease, but also of the services he had rendered to physiology and pathology, and of his efforts to promote the study of those sciences in Great Britain. But his opponents at Oxford were not silenced by this adverse vote, and in 1885, after an unavailing effort in the preceding year, they had a third chance, Convocation being asked to vote £500 a year for three years for the purposes of the laboratory, which was then approaching completion. This proposal was fought with the utmost bitterness, and long circulars were issued by both sides, the signatories to that of the anti-vivisectionists including Freeman, Ruskin, and Bishop Mackarness of Oxford. Ultimately, in one of the most disorderly meetings of Convocation ever known, the money was granted by 412 to 244 votes, and the Oxford Medical School, for which Burdon-Sanderson has done so much, was saved from uselessness. In 1885 he was appointed regius professor of medicine at Oxford, and in 1899 he was created a baronet. His attainments, both in biology and medicine, have brought him many honours. He has delivered the Croonian lectures of the Royal Society, has been Harveian orator of the Royal College of Physicians (1878), has acted as president of the British Association (1893), and has served on three royal commissions—Hospitals (1883), Tuberculosis (1890), and University for London (1892-94).

Burdwan, or BARDWAN, a town of British India, in Bengal, which gives its name to a district and to a division. It is situated in 23° 14′ N. lat. and 87° 54′ E. long., and has a station on the East Indian railway, 67 miles N.W. from Calcutta. It had a population in 1891 of 34,777. The town owes its importance to the residence of the Maharaja of Burdwan, the premier nobleman of Lower Bengal, with a rent-roll of Rs.46,68,233. The palace is built and furnished after European fashion, and the grounds include a fine menagerie. A college, entirely supported by the estate, at an annual cost of Rs.8546, was attended in 1896-97 by 274 students. A good water-supply is derived from the river Banka. There are four printing-presses, one of which issues a vernacular newspaper. The town also contains a public library.

The district of BURDWAN lies along the right bank of the river Bhagirathi or Hooghly. It has an area of 2697 square miles. Population (1881), 1,394,220; (1891), 1,391,834, showing a slight decrease due to the prevalence of endemic fever; average density, 516 persons per square mile. Classified according to religion, Hindus numbered 1,117,743; Mahommedans, 267,224; aborigines, 5459; Christians, 1408, of whom 657 were Europeans. In 1901 the population was 1,534,113, showing an increase of 10 per cent. The land revenue and rates in 1897-98 were Rs.32,92,843; the number of police was 624; in 1896-97 the number of boys at school was 44,549, being 43·4 per cent. of the male population of school-going age; the registered death-rate in 1897 was 30 per thousand. There are 11 indigo factories. The district suffered from drought in 1896-97. The Eden canal, 20 miles long, has been constructed for irrigation. The weaving of silk is the chief native industry. As regards European industries, Burdwan takes the first place in Bengal. It contains the great coal-field of Raniganj, with 87 mines great and small, employing more than 30,000 men, women, and children, with an output of more than three million tons. The Barrakur ironworks produce pig-iron, which is reported to be as good as that of Middlesborough. During 1897-98 the total output was 19,719 tons. The value of the iron sold was Rs.12,34,080, being nearly threefold that of two years previously. Apart from Burdwan town and Raniganj, the chief places are the river-marts of Katwa and Kalna. The East Indian railway has two lines running through the district, with sixteen stations.

The division of BURDWAN comprises the six districts of Burdwan, Birbhum, Bankura, Midnapore, Hooghly, and Howrah, with a total area of 13,956 square miles, and a population in 1891 of 7,688,818, being an average density of 550 persons per square mile; the land revenue and rates were Rs.90,30,964; the number of police was 3628, being one policeman to every 3·8 square miles of area and to every 2126 of population. In 1896-97 the number of schools was 11,380, attended by 316,699 pupils, of whom 18,484 were girls.

Burgas, capital of a department in Bulgaria, and an important seaport, situated on a promontory on the Gulf of Burgas, 76 miles N.E. of Adrianople. For some time it threatened to rival Varna as the chief port of Bulgaria, but notwithstanding the completion by the *Société des Batignolles* of a splendid harbour in 1900, with a capacious quay, affording access to vessels of deep draught, the port may even yet decline in importance; the sudden change in its prospects being due partly to the recent cession of the Yamboh-Saramberg line to the Orient company, whose aim is to draw the trade to Dedeagatch and Constantinople, and partly to the opening of the Sofia-Varna line, which tends to attract a portion of the import trade to Sofia. The number of vessels that entered the port in 1897 was 519 of 569,432 tons, the number in 1899 being 599 of 356,192 tons. The value of the imports in 1899 was £248,600 and of the exports £200,500. The population is about 12,000.

Burgers, Thomas François (1834-1881), President of the Transvaal Republic, was born 15th April 1834, and was sent to be educated at Utrecht, where he took the degree of Doctor of Theology. On his return to South Africa he was ordained minister of the Dutch Reformed Church, and stationed at Hanover in Cape Colony, where he exercised his ministrations for eight years. In 1862 his preaching attracted attention, and two years later an ecclesiastical tribunal suspended him for heretical opinions. He appealed, however, to the Colonial Government which had appointed him, and obtained judgment in his favour, which was supported by the Privy Council of England on counter-appeal in 1865. On the resignation of Pretorius, on 1st July 1872, he was elected President by the Transvaal Boers, and in 1873 he endeavoured to persuade Montsioa to agree to an alteration in the boundary of the Barolong territory as fixed by the Keate award, but failed. In 1875 Burgers, leaving the Transvaal in charge of Acting-President Joubert, went to Europe mainly to promote the Delagoa Bay railway scheme. After meeting with refusals in London he managed to raise £90,000 in Holland, and bought a quantity of railway plant, which on its arrival at Delagoa Bay was mortgaged to pay freight, and this, so far as Burgers was concerned, was the end of the matter. In June 1876 he induced the Raad to declare war against Secocoeni. The campaign was unsuccessful, and with its failure the republic collapsed, and the Transvaal was annexed to Great Britain, 12th April 1877. Mr Burgers accepted a pension from the British Government, and settled down to farming in Hanover. He died at Rich-

mond, South Africa, on 9th December 1881, and in the following year a volume of short stories, *Tooneelen uit ons dorp*, originally written by him for the Cape *Volksblad*, was published at the Hague for the benefit of his family. A patriot, a fluent speaker both in Dutch and in English, and possessed of unbounded energy, the failure of Burgers was due to his fondness for large visionary plans, which he attempted to carry out with insufficient means.

Burgon, John William (1813-1888), British divine, was born at Smyrna, 21st August 1813, and was the son of a Turkey merchant, who was also a skilled numismatist, and afterwards became an assistant in the Antiquities Department of the British Museum. His mother was a Greek. In deference to his father's wish he resigned his preference for a life of study and entered his father's counting-house. In 1841, however, the elder Burgon was compelled to relinquish business, and his son was then enabled to give free course to his inclinations. In that same year he entered at Oxford. He afterwards gained the Newdigate Prize Poem, and took his degree in 1845. Among those who had influenced his life up to this time were his brother-in-law, Henry John Rose, the well-known scholar and theologian, not, however, to be confounded with his brother, Hugh James Rose, who was conspicuous in the movement which had culminated in the *Tracts for the Times*. Burgon made Oxford his head-quarters, while holding a living at some distance. In 1863 he was made vicar at St. Mary's. He had previously visited Rome and the East, and commenced his characteristic literary career. In 1860 appeared the famous *Essays and Reviews*, which Burgon vehemently attacked in a series of sermons afterwards published. In 1869 he protested against the elevation of Dr. Temple to the see of Exeter, on the ground of his having contributed to *Essays and Reviews*. In 1871 he published an able and learned defence of the genuineness of the twelve last verses of St. Mark's Gospel. In 1871 he commenced his attacks on the proposal for a new lectionary for the Church of England, based to a great extent upon his objections to the principles for determining the authority of MS. readings adopted by Westcott and Hort, which he assailed in a memorable article in the *Quarterly Review* for 1881. This, with his other articles, was reprinted in 1884 under the title of *The Revision Revised*. His biographical essays on Dean Mansel and others were also collected, and published under the title of *Twelve Good Men*, a highly entertaining book. Protests against the inclusion of Dr. Vance Smith among the Revisers, against the nomination of Dean Stanley to be select preacher in the University of Oxford, and against the address in favour of toleration in the matter of ritual, followed in succession. In 1875 Burgon was made Dean of Chichester. He died on the 4th August 1888. His life was written by Dean Goulburn. Vehement and almost passionate in his convictions, Burgon nevertheless possessed a warm and kindly heart. While the strength of his language not unfrequently caused irritation, it did not make him a single enemy, and his decided religious opinions, his profound erudition, his energy and courage, secured for him many friends. He may be described as a High Churchman of the type prevalent before the rise of the Tractarian School. His extensive collection of transcripts from the Greek Fathers, illustrating the text of the New Testament, was bequeathed to the British Museum. (J. J. L.*)

Burgos, a province in the north of Spain, including the distant county of Trevino, lying between Alava and Navarra. The population was 332,461 in 1877, 338,551 in 1887, and 340,001 in 1897, on an area of 5651 square miles. The province is divided into 12 administrative districts and 512 parishes. There has been for many years an excess of births over deaths, and the relatively small increase of population is attributed to emigration of the inhabitants to other parts of Spain. The northern and north-eastern districts are mountainous, and the central and southern form part of the vast and elevated plateau of Old Castile. Eastwards are the highest peaks of the province, with the Cerro de San Millan, 6995 feet high. Two ranges of mountains, running east and west of Pancorbo, leave a gap through which run the railway and roads connecting Castile with the valley of the Ebro, at a place that has oft been called the "Iron Gates of Castile," as a handful of men could hold the Pancorbo pass against an army. South of this spot begins the plateau, generally covered with snow in winter, swept by such cold winds that Burgos is considered, with Soria and Segovia, one of the coldest regions of the peninsula. As but little rain falls in summer in this province, the soil is poor, and most of it is devoted to the rearing of flocks; agriculture thrives only in some valleys, especially that of the Ebro. This river runs eastwards through the province for 62 miles, but is not navigable. The river Douro, too, enters the province, running W.N.W. for 37 miles, with less water than the Ebro; it also is unnavigable in its upper valley. The province has other important streams, the Pisuerga flowing south towards Palencia and Valladolid, and the Arlanzon, which flows in Burgos territory for over 75 miles. The variations of temperature are great, as from 9° to 20° of frost have frequently been recorded in winter, while the mean summer temperature is 64° (Fahrenheit). There are few industries worth mentioning; the chief features in this connexion are potteries, stone quarries, tanneries, and factories for the manufacture of linen and cotton of the coarsest description. The ancient cloth and woollen industries, for which Burgos was famous in days gone by, have almost disappeared. But the province is one of the richest in live stock, containing 736,730 head in all. This total includes 14,808 horses, 17,557 mules, 25,838 asses, 69,323 cattle, 514,747 sheep, 61,493 goats, and 32,964 pigs. 480,860 acres are devoted to the culture of wheat; 72,177 to barley, rye, and oats; 11,375 to pod fruits; 95,000 acres to vineyards. Only 10 mines are at work: 152 are registered as unproductive. Among the former are 2 coal mines, 1 kaolin, and 7 salt. Lack of proper railways, and even of good roads, is the principal drawback to the development of the mining interests. Some extensions have been made of late years in the railway system, but there are in all only 125 miles of lines in the province; 82 of these belong to the main northern line going from Madrid to the French frontier, and 25 to the direct line between Ariza and Valladolid.

Burgos, capital of the above province, 226 miles north of Madrid by rail. Population in 1897, 31,741. The town has not been much altered. A few streets in the new part have been embellished, and some official buildings, the residences of the governor, the town hall, clubs, and theatre have been improved. It is still a great mart for agriculture, but its local industries have decayed, especially the manufacture of linen and woollen stuffs; paper and leather goods, on the contrary, are exported in considerable quantities.

Burial and Burial Acts.—The main lines of the law of burial in England may be stated very shortly. Every person has the right to be buried in the churchyard or burial ground of the parish where he dies, with the exception of executed felons, who are buried in the precincts of the prison or in a place appointed by the Home Office. At common law the person under whose roof a death takes place has a duty to provide for the body being

carried to the grave decently covered; and the executors or legal representatives of the deceased are bound to bury or dispose of the body in a manner becoming the estate of the deceased, according to their discretion, and they are not bound to fulfil the wishes he may have expressed in this respect. The disposal must be such as will not expose the body to violation, or offend the feelings or endanger the health of the living; and cremation under proper restrictions is allowable. In the case of paupers dying in a parish house, or shipwrecked persons whose bodies are cast ashore, the overseers or guardians are responsible for their burial; and in the case of suicides the coroner has a similar duty. The expenses of burial are payable out of the deceased's estate in priority to all other debts. A husband liable for the maintenance of his wife is liable for her funeral expenses; the parents for those of their children, if they have the means of paying. Recent legislation has principally affected (1) places of burial, (2) mode of burial, (3) fees for burial, and (4) disinterment.

1. The overcrowded state of churchyards and burial grounds gradually led to the passing of a group of statutes known as the Burial Acts, extending from 1852 up to 1900. By these Acts a general system was set up, the aim of which was to remedy the existing deficiencies of accommodation by providing new burial grounds and closing old ones which should be dangerous to health, and to establish a central authority, the Home Office (now for most purposes the Local Government Board) to superintend all burial grounds with a view to the protection of the public health and the maintenance of public decency in burials. The Local Government Board thus has the power to obtain by Order in Council the closing of any burial ground it thinks fit, while its consent is necessary to the opening of any new burial ground; and it also has power to direct inspection of any burial ground or cemetery, and to regulate burials in common graves in statutory cemeteries, and to compel persons in charge of vaults or places of burial to take steps necessary for preventing their becoming dangerous or injurious to health. The vestry of any parish, whether a common law or ecclesiastical one, was thus authorized to provide itself with a new burial ground, if its existing one was no longer available; such ground might be wholly or partly consecrated, and chapels might be provided for the performance of burial service. The ground was put under the management of a burial board, consisting of ratepayers elected by the vestry, and the consecrated portion of it took the place of the churchyard in all respects. Disused churchyards and burial grounds in the metropolis may be used as open spaces for recreation, and only buildings for religious purposes can be built on them (1881, 1884, 1887). The Local Government Act, 1894, introduced a change into the government of burial grounds (consequent on the general change made in parochial government) by transferring, or allowing to be transferred, the powers, duties, property, and liabilities of the burial boards in urban districts to the district councils, and in rural parishes to the parish councils and parish meetings; and by allowing rural parishes to adopt the Burials Acts, and provide and manage new burial grounds by the parish council, or a burial board elected by the parish meeting.

2. The mode of burial is a matter of ecclesiastical cognizance; in the case of churchyards and elsewhere it is in the discretion of the owners of the burial ground. The Local Government Board now makes regulations for burials in burial grounds provided under the Burial Acts; for cemeteries provided under the Public Health Act, 1879. Private cemeteries and burial grounds make their own regulations. Burial may now take place either with or without a religious service in consecrated ground. Before 1880 no body could be buried in consecrated ground except with the service of the Church, which the incumbent of the parish or a person authorized by him was bound to perform; but the canons and prayer-book refused the use of the office for excommunicated persons, *majori excommunicatione*, for some grievous and notorious crime, and no person able to testify of his repentance, unbaptized persons, and persons against whom a verdict of *felo de se* had been found. But by the Burial Laws Amendment Act, 1880, the bodies of persons entitled to be buried in parochial burial grounds, whether churchyards or graveyards, may be buried there, on proper notice being given to the minister, without the performance of the service of the Church of England, and either without any religious service or with a Christian and orderly religious service at the grave, which may be conducted by any person invited to do so by the person in charge of the funeral. Clergymen of the Church of England are also by the Act allowed, but are not obliged, to use the burial service in any unconsecrated burial ground or cemetery, or building therein, in any case in which it could be used in consecrated ground. In cases where it may not be so used, and where such is the wish of those in charge of the service, the clergy may use a form of service approved by the bishop without being liable to any ecclesiastical or temporal penalty. Except as altered by this Act, it is still the law that "the Church knows no such indecency as putting a body into consecrated ground without the service being at the same time performed"; and nothing in the Act authorizes the use of the service on the burial of a *felo de se*, which, however, may now (1882) take place in any way allowed by the Act of 1880. The proper performance of the burial office is provided for by the Public Worship Regulation Act, 1874. Statutory provision is made by the criminal law in this Act for the preservation of order in burial grounds and protection of funeral services.

3. Fees are now payable by custom or under statutory powers on all burials. In a churchyard the parson must perform the office of burial for parishioners, even if the customary fee is denied, and it is doubtful who is liable to pay it. The custom must be immemorial and invariable. If not disputed, its payment can be enforced in the ecclesiastical court; if disputed, its validity must be tried by a temporal court. A special contract for the payment of an annual fee in the case of a non-parishioner can be enforced in the latter court. In the case of paupers and shipwrecked persons the fees are payable by the parish. In other parochial burial grounds and cemeteries the duties and rights to fees of the incumbents, clerks, and sextons of the parishes for which the ground has been provided are the same as in burials in the churchyard. Burial authorities may fix the fees payable in such grounds, subject to the approval of the Home Secretary; but the fees for services rendered by ministers of religion and sextons must be the same in the consecrated as in the unconsecrated part of the burial ground, and no incumbent of a parish or clerk may receive any fee upon burials except for services rendered by them (1900). On burials under the Act of 1880 the same fees are payable as if the burial had taken place with the service of the Church.

4. A corpse is not the subject of property, nor capable of holding property. If interred in consecrated ground, it is under the protection of the ecclesiastical court; if in unconsecrated, it is under that of the temporal court. In the former case it is an ecclesiastical offence, and in either case it is a misdemeanour, to disinter or remove it without proper authority, whatever the motive for such an act may be. Such proper authority is (1) a faculty from the ordinary, where it is to be removed from one consecrated place

of burial to another, and this is often done on sanitary grounds or to meet the wishes of relatives, and has been done for secular purposes, *e.g.*, widening a thoroughfare, by allowing part of the burial ground (disused) to be thrown into it; but it has been refused where the object was to cremate the remains, or to transfer them from a churchyard to a Roman Catholic burial ground; (2) a licence from the Home Secretary, where it is desired to transfer remains from one unconsecrated place of burial to another; (3) by order of the coroner, in cases of suspected crime. There has lately been considerable discussion as to the boundary-line of jurisdiction between (1) and (2), and whether the disinterment of a body from consecrated ground for purposes of identification falls within (1) only, or within both (1) and (2); and an attempt by the ecclesiastical court to enforce a penalty for that purpose without a license has been prohibited by the temporal court.

See also CREMATION.

AUTHORITIES.—BAKER. *Law of Burials*, 6th ed., by Thomas. London, 1898.—PHILLIMORE. *Ecclesiastical Law*, 2nd ed. London, 1895.—CRIPPES. *Law of Church and Clergy*, 6th ed. London, 1886. (G. G. P.*)

Burlington, capital of Des Moines county, Iowa, U.S.A., situated in 40° 49′ N. lat. and 91° 07′ W. long., at an altitude of 533 feet. It has a beautiful situation on the Mississippi river bluffs, which afford fine building sites. It is a railway centre of importance, being entered by the Chicago, Burlington, and Quincy; the Burlington, Cedar Rapids, and Northern; and the Toledo, Peoria, and Western railways. Its river traffic is considerable. The value of its manufactures was, in 1890, $5,413,000. They consisted principally of lumber, iron and steel, furniture, waggons and carriages. Population (1880), 19,450; (1890), 22,565; (1900), 23,201.

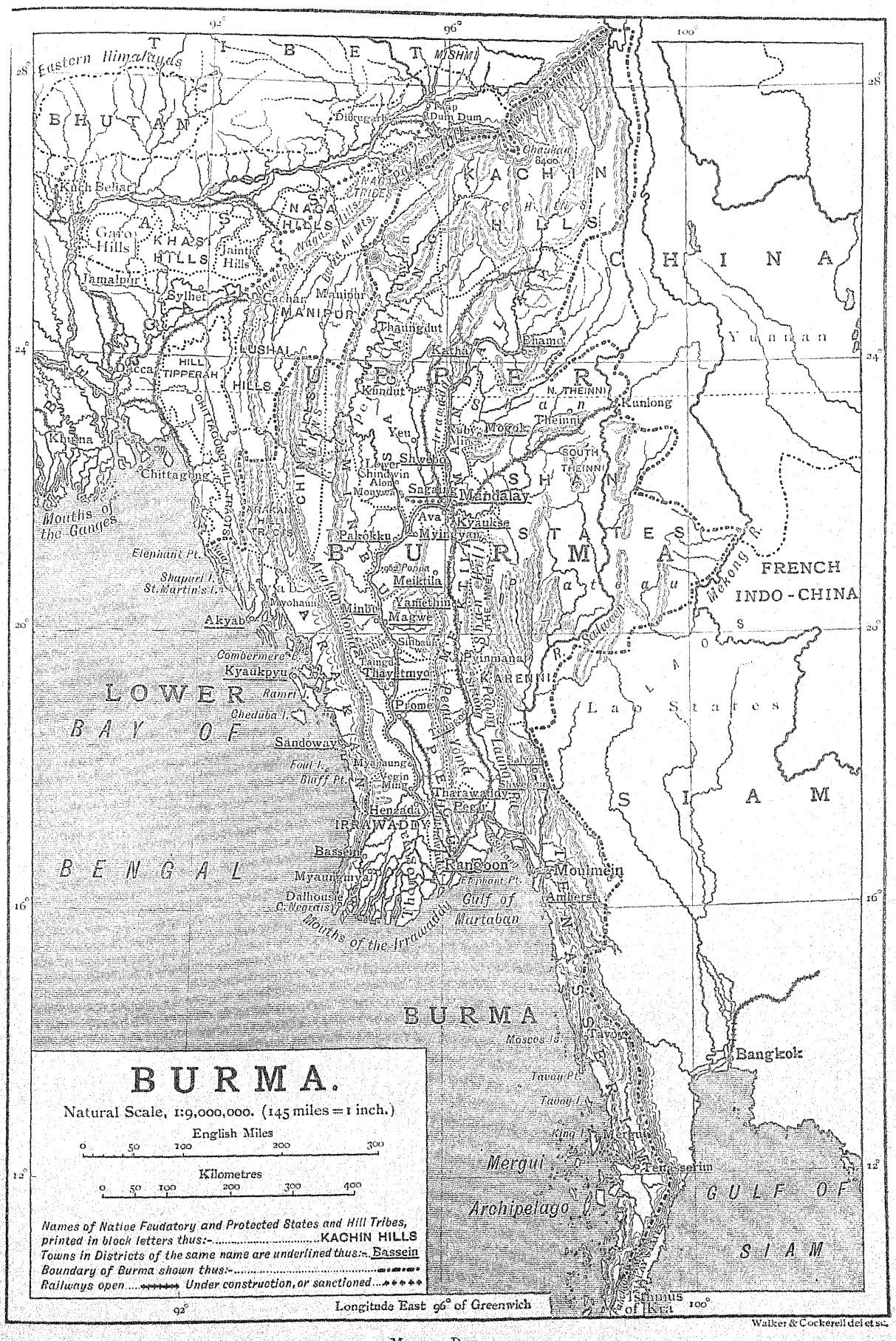
Burlington, a city of Burlington county, New Jersey, U.S.A., situated in 40° 05′ N. lat. and 74° 51′ W. long., on the east bank of Delaware river and on the Pennsylvania railway, about midway between Philadelphia and Trenton. Population (1880), 6090; (1890), 7264; (1900), 7392.

Burlington, capital of Chittenden county, Vermont, U.S.A., and the largest city in the state, situated on Lake Champlain, where an island and a breakwater make an excellent harbour. It has two railways, the Connecticut Valley and the Rutland. Here is situated the University of Vermont, which (including the State Agricultural College) had in 1900 a staff of 53 professors and instructors and 476 students. Its property is valued at about $1,000,000, and its income is not far from $75,000. Besides a large lake trade, principally in lumber, Burlington has extensive and varied manufactures, chiefly of cotton, wool, and wood, and there are fine marble quarries in the immediate neighbourhood. Population (1880), 11,365; (1890), 14,590; (1900), 18,640.

Burma, a lieutenant-governorship of British India, including the former kingdom of independent Burma, as well as British Burma, acquired by the British Indian Government in the two wars of 1826 and 1852. It is divided into Upper and Lower Burma, the former being the territory annexed on 1st January 1886. The province lies to the east of the Bay of Bengal, and covers a range of country extending from the Pakchan river in 9° 55′ north latitude to the Naga and Chingpaw, or Kachin hills, lying roughly between the 27th and 28th degrees of north latitude; and from the Bay of Bengal on the west to the Mékong river, the boundary of the dependent Shan States on the east, that is to say, roughly, between the 92nd and 100th degrees of east longitude. The extreme length from north to south is almost 1200 miles, and the broadest part, which is in about latitude 21° north, is nearly 480 miles from east to west. On the N. it is bounded by the dependent state of Manipur, by the Mishmi hills, and by portions of Chinese territory; on the E. by the Chinese Shan States, portions of the province of Yunnan, the French province of Indo-China, and the Siamese Shan, or Lao States and Siam; on the S. by the Siamese Malay States and the Bay of Bengal; and on the W. by the Bay of Bengal and Chittagong. The coast-line from Taknaf, the mouth of the Naaf, in the Akyab district on the north, to the estuary of the Pakchan at Maliwun on the south, is about 1200 miles. The area of Upper Burma is estimated at 83,473 square miles. This does not include the townships of Minhla, Taingda, and Sinbaungwè, which have been incorporated for administrative purposes with the Lower Burma district of Thayetmyo, and cover about 737 square miles. The area of Lower Burma before the annexation was returned at 87,220 square miles. Thus the total area now is about 87,957 square miles in Lower Burma and 83,473 square miles in Upper Burma, or 171,430 square miles for the whole province. The area of the northern and southern Shan States is computed to be a little over 40,000 square miles.

Physical features.

Since the removal of the artificial political boundary of Upper and Lower Burma the province is divided by its chief physical features. These are the mountain ranges which run north and south and divide the country longitudinally. They are the Arakan Yoma, the Pegu Yoma, the Paung Laung range, and the Shan hills. The last two ranges in reality form one series. The Arakan Yoma is a continuation of the mountain chain known as the Naga hills, which forms the eastern boundary of Assam, runs nearly due south, and divides the Arakan division from the basin of the Irrawaddy. The Pegu Yoma rises in the highland of Meiktila, south of Mandalay, and keeping parallel to the Arakan Yoma, divides the basin of the Irrawaddy from that of the Sittang. The Paung Laung range is an offshoot from the plateau of the Shan States, and divides the basin of the Sittang from that of the Salween. The Pegu Yoma is only of moderate height, but the Paung Laung range has many high peaks, one rising to about 8000 feet. It sinks away to the plain of Thatôn. The ranges which run fanwise from the high steppes of Tibet are at first almost as sharply defined as the deep gorges in which the rivers run. But as the ribs of a leaf fade away into the texture, so a space is gained, the ridges spread out and fall away. The Irrawaddy and the Mékong gain space for their basins at the expense of the Salween, so that not only is the river itself crushed up in its bed, but its watershed on each side is so compressed, that though it sinks steadily, there is no room to form a plain. This is what causes what is called the Shan plateau, which is properly only the country between the Salween and the Irrawaddy, marked on the west by the abrupt line of hills which begin about Bhamo and run southwards until they sink into the plains of Lower Burma. On the east the plateau is no less sharply defined by the deep narrow rift of the Salween. The average height of the plateau is between 2000 and 3000 feet, but it is seamed and ribbed by mountain ranges which split up and run into one another, leaving space here and there for broad rolling downs or flat-bottomed valleys. The highest peaks are in the north and the south. Loi Ling rises to 8842 feet, and in North Theinni there are many peaks of over 7000 feet, and the same heights are nearly reached in the hills of the Karen country on the south. The majority of the intermediate parallel ranges have an average of between 4000 and 5000 feet, with peaks rising to over 6000. The country east of the Salween is much less open and more hilly; instead


BURMA.
Natural Scale, 1:9,000,000. (145 miles = 1 inch.)
English Miles
0 50 100 200 300
Kilometres
0 50 100 200 300 400
Names of Native Feudatory and Protected States and Hill Tribes, printed in block letters thus:- KACHIN HILLS
Towns in Districts of the same name are underlined thus:- Bassein
Boundary of Burma shown thus:-
Railways open Under construction, or sanctioned
Longitude East 96° of Greenwich
Walker & Cockerell del et sc.
TIBET
BHUTAN
CHINA
Yunnan
KACHIN HILLS
NAGA HILLS
KHASI HILLS
MANIPUR
LUSHAI HILLS
HILL TIPPERAH
CHITTAGONG HILL TRACTS
ARAKAN HILL TRACTS
N. THEINNI
SOUTH THEINNI
SHAN STATES
Plateau
FRENCH INDO-CHINA
Lao States
SIAM
LOWER BURMA
BAY OF BENGAL
Gulf of Martaban
Mouths of the Irrawaddy
Mouths of the Ganges
Eastern Himalayas
Dihing
Dibrugarh
Sadiya
Dum Dum
Chaukan 8400
Kuch Behar
Garo Hills
Jaintia Hills
Jamalpur
Sylhet
Cachar
Manipur
Thaungdut
Kachin
Ehamo
Dacca
Kundut
Kunlong
Theinni
Khulna
Yeu
Ruby Mines
Mogok
Shwebo
Chittagong
Lower Chindwin
Alon
Monywa
Sagaing
Mandalay
Ava
Kyaukse
Myingyan
Palokku
Elephant Pt.
Shapuri I.
St. Martin's I.
Ponna
Meiktila
Mayohaung
Minbu
Yamethin
Magwe
Akyab
Combermere B.
Kyaukpyu
Thayetmyo
Pyinmana
KAREN NI
Ramri I.
Cheduba I.
Prome
Sandoway
Foul I.
Bluff Pt.
Myanaung
Negrais C.
Ming
Tharawaddy
Peegu
Henzada
IRRAWADDY R.
Bassein
Rangoon
Elephant Pt.
Moulmein
Amherst
Myaungmya
Dalhousie
Mergui
Mergui Archipelago
Tavoy
Tavoy Pt.
Tavoy I.
King I.
Victoria Pt.
Tenasserim
GULF OF SIAM
Bangkok
Isthmus of Kra
Salween R.
Mekong R.

MAP OF BURMA.

of a rolling plateau there is a mass of broken hills. Except in the north, as is the case also west of the Salween, the hills are clad with dense forest. Burma may, therefore, be divided conveniently, but with no great precision, into (*a*) Northern Burma, including the Chin and Kochin hills, with a thin and miscellaneous alien population; (*b*) Burma proper, which is practically the valley of the Irrawaddy after it ceases to be a gorge; and (*c*) the Shan tributary states. Burma proper is practically one great plain; the hills are comparatively mere undulations, and the one considerable peak, Pôppa, is volcanic. Still it is very different from the vast levels that stretch from the base of the Himalayas. It is rather a rolling upland interspersed with alluvial basins and sudden ridges of hills. The delta of the Irrawaddy begins near the village of Yegin Mingy, a few miles south of Myanaung. The sides of the delta measure 179 miles on the west and 126 miles on the east, and the base, measured from Elephant Point to Cape Negrais, is 137 miles in length, with an area of about 12,000 square miles. With the exception of the laterite hills near Myaungmya and the Eocene sandstone range near Thamandewa, in the same township, but more to the south, the whole of this area is a vast plain, gradually sloping down to the sea-shore. It is estimated that at least 2000 square miles, or one-sixth of this area, is below the level of the highest spring tides. This delta, together with the low-lying land to the east of the estuary of the Sittang, in the Pegu and Shwegyin districts, comprises what should from a physical point of view be considered as the lower province. The general aspect of these areas is the same. Till recent times they were covered with dense forest and bamboo jungle, and with water-logged swamps, clothed with elephant grass. The extension of cultivation and the draining of these swamps had changed the aspect of the country within the memory of persons living in 1901.

Climate.—The climate of the delta is cooler and more temperate than in Upper Burma, and this is shown in the fairer complexion and stouter physique of the people of the lower province as compared with the inhabitants of the drier and hotter upper districts as far as Bhamo, where there is a great infusion of other types of the Tibeto-Burman family. North of the apex of the delta and the boundary between the deltaic and inland tracts, the rainfall gradually lessens as far as Nimbu, where what was formerly called the rainless zone commences and extends as far as Katha. Northward of this the annual rainfall increases till at Bhamo the average is about 70 inches, which is almost identical with that of Yegin Mingy. The physical conditions of the country are so varied that to give the mean annual rainfall of Burma would be simply misleading. The table in the next column shows (amongst other things) the mean annual rainfall for ten years in Lower Burma and for five years in Upper Burma. The scanty rainfall in the central zone between the 20th and 22nd parallels is caused chiefly by the Arakan range which drains the clouds, but also in no small degree by the want of forests, which is noticeable in all except the southern districts of this zone.

The temperature varies almost as much as the rainfall. It is highest in the central zone, the mean of the maximum readings in such districts as Magwe, Myingyan, Kyauksè, Mandalay, and Shwebo in the month of May being close on 100° F., while in the littoral and sub-montane districts it is nearly ten degrees less. The mean of the minimum readings in December in the central zone districts is a few degrees under 60° F. and in the littoral districts a few degrees over that figure. In the hilly district of Mogôk (Ruby Mines) the December mean minimum is 36·8° and the mean maximum 79°. The climate of the Chin and Kachin hills and also of the Shan States is temperate. In the shade and off the ground the thermometer rarely rises above 80° F. or falls below 25° F. In the hot season and in the sun as much as 150° F. is registered, and on the grass in the cold weather ten degrees of frost are not uncommon. Snow is seldom seen either in the Chin or Shan hills, but there are snow-clad ranges in the extreme north of the Kachin country. In the narrow valleys of the Shan hills, and especially in the Salween valley, the shade maximum reaches 100° F. regularly for several weeks in April. The rainfall in the hills varies very considerably, but seems to range from about 60 inches in the broader valleys to about 100 inches on the higher forest-clad ranges.

Table showing Mean Annual Rainfall and the character of different districts.

Division.	District.	Mean Annual Rainfall.	Character of Country.
		Inches.	
Arakan.	Akyab	184·6	Littoral.
	Northern Arakan	127·49	Sub-montane.
	Kyaukpyu	196·8	Littoral.
	Sandoway	209·7	
Pegu	Rangoon Town	94·4	
	Hanthawaddy		
	Pegu	116·66	Deltaic.
	Tharrawaddy	87·5	
	Prome	43·9	Central.
Irrawaddy	Thôngwa	86·7	
	Bassein	110·3	Deltaic.
	Henzada	84·9	
	Thayetmyo	36·9	Central.
Tenasserim	Amherst	182·2	
	Tavoy	200·3	Littoral.
	Mergui	183·7	
	Toungoo	83·6	Central.
	Shwegyin	137·5	Deltaic.
	Salween	100·31	Sub-montane.
Mandalay	Mandalay	27·616	Central.
	Bhamo	70·106	Sub-montane.
	Katha	46·97	Central.
	Ruby Mines	83·88	Sub-montane.
Sagaïng.	Shwebo	30·289	
	Sagaing	26·97	Central.
	Lower Chindwin	28·347	
	Upper Chindwin	73·587	Sub-montane.
Minbu	Pakôkku	23·18	
	Minbu	24·134	Central.
	Magwe	34·956	
Meiktila	Kyauksè	22·70	
	Meiktila	29·968	Central.
	Myingyan	23·90	
	Yamèthin	42·213	

Geology.—The general parallelism of all the streams and hill-ranges gives an appearance of simplicity to the physical geology of the country, but owing to the prevalence of forest it has been found extremely difficult to determine the stratigraphy, and very little can be said to be actually known about the formations occurring. The Pegu Yoma consists entirely of the Miocene group, with beds of later Tertiary age, chiefly sandstone and shale, and the Arakan Yoma and the spurs to eastward and westward of the main range are chiefly of earlier Tertiary age, resting on Cretaceous and Triassic beds, which rise to the surface on the western face of the range. The Carboniferous limestone and its associated beds, together with the Mergui group, appear to run up the line of the Salween, and the main area of metamorphic rock lies to the east of all the other formations. The Burmese gneiss series consists of more or less granitoid gneiss, hornblendic gneiss, crystalline limestone, quartz and schists of various kinds. In many places the gneiss becomes a true granite. So far as is known there are two groups, the gneissose formation and limestone, which has been supposed to be of Lower Carboniferous age, but according to recent investigations more probably belongs to the Lower Silurian formations. Metamorphic rocks occupy a large but unexplored area in Upper Burma. They form all the higher ranges in the neighbourhood of Mandalay, and extend throughout a great portion of the country towards the Salween. Farther to the northward they extend from Bhamo to the neighbourhood of T'êng-yüeh (Momien) in Yunnan. The hills that skirt the Irrawaddy north of Mandalay are Silurian limestone, locally charged with crystalline limestone, which is the matrix of rubies, and metamorphic rocks composed of gneiss and hornblendic schist, and opposite Kyaukmyaung greenstone and basalt are found. The Irrawaddy below Ava turns to the west and flows through recent rock formations, while the crystallines continue to the southward, forming a great part of the Shan States and the Karen-ni country, and extending southwards into Tenasserim. The limestone, which is so conspicuous near Moulmein, extends northwards in large hills and ranges into Karen-ni and the Shan States. The abrupt cliffs, full of caves, characteristic of the formation, are very noticeable near Möng Nai (Mynè) and northwards in the same latitude. The same formation is found eastwards of the Salween in Kêngma, Kokang, Chênkang, and probably far northwards. It seems to belong to the Carboniferous series and to be identical, in part at least, with the limestone found in the Mergui archipelago. Until the fossils are better known it is impossible to say whether the Burma series exactly corresponds to the Carboniferous beds of the Himalayas and the

Punjab. They are certainly of the same approximate age. The occurrence of marine fossiliferous rocks of the Carboniferous period at the two extremities of the extra-peninsular area of British India, and the complete absence of any marine Palæozoic fossils within the peninsular region, afford the most striking illustration of the great divergence between the geological history of peninsular India and that of the surrounding countries. The main outcrop of nummulitic rocks extends from the north to the south-east of the Arakan and Chin hills and west of the Irrawaddy. The beds have a general dip to the eastward. There are occasional outcrops of serpentine. The surface rocks are generally shales and sandstone. Coal has been found, but hitherto has not paid for its working. The Irrawaddy valley from the old frontier to the neighbourhood of Ava, where the metamorphic area is entered, consists of the same Tertiary rocks as are traversed by the river in Pegu. About fifty miles N.N.E. of Yenangyaung the extinct volcano of Pôppa rises to a height of 3000 feet above the rolling country, composed of Pliocene sands and gravels. The peak consists of ash breccia, but lava flows, mostly trachytic, form the lower slopes and the surface round the base of the volcano. Amongst these floors are some of a beautiful porphyry with crystals of pyroxene. The volcano is supposed by Mr Blanford to have been in action during the Pliocene period. There is no important expanse of alluvial deposits in the valleys of the Burmese rivers. The beds of all immediately above the deltas are formed in places by older rocks, and there is no such continuous alluvial plain as is found along the courses of the Ganges and Indus. The delta of the Irrawaddy has been formed by elevation by subterranean forces, and not by the accumulation of fluviatile beds of recent origin. Some tracts of alluvium occur here and there, but the wide and undulating plains in the neighbourhood of the rivers in Upper Burma are composed, not of river alluvium, but of Pliocene fossil wood deposits, and the hills which bound the river on both sides are chiefly composed of sandstones and shales containing fossil wood and bones. The mud volcanoes, or salsettes, of Minbu appear never to be subject to the violent eruptions of those at Ramree, where stones have been ejected and flames are sometimes emitted.

Population.—In Lower Burma in 1881 there were only three divisions. There are now four, and the number of districts has also increased. The kingdom of Burma was annexed on the 1st January 1886, and the territory so acquired was divided into four commissionerships or divisions. This number has been retained, but the names have been changed, and the number of districts has been increased. The names are given in the tables below. The figures are those of the census of 1891. This was the third census taken in Lower Burma, but the first ever attempted in the Upper Province. The census of 1891 showed the total population of Upper and Lower Burma to be 7,770,914. The population of the Shan States was estimated at 375,961, which, however, is probably very much under the proper total. The figures for the whole province, however, amount under this estimate to 8,098,014 persons. The following statement shows how rapidly the population of Lower Burma has increased since the first census of 1872.

Table showing Increase of Population.

1872.	1881.	Increase.	Per cent.	1891.	Increase.	Per cent.
2,747,148	3,736,771	989,623	36·02	4,658,627	921,856	24·67

The annual rate of increase is 2·23 per cent., which corresponds to 24·67 per cent. for the decade. This means that if this rate of increase be maintained the population of Lower Burma will be doubled in 31·428 years. The area of the province, including the Upper Burma districts, but excluding the Shan States, is returned at 171,630 square miles. There thus are on an average 45·04 persons on each square mile throughout the province. In Lower Burma in 1872 there were only 31·5 persons to the square mile, while in 1881 the returns showed 42·8. In 1891 the density had risen to 52·96 persons to the square mile. The subjoined table gives more fully the return of density for each district in Upper and Lower Burma. It gives the administrative divisions as they have been rearranged in 1899, and not as they were in 1891. Survey meanwhile has reduced the estimated total area to 164,990 square miles.

Lower Burma.

Division.	Executive District.	No. of Judicial and Revenue Sub-divisions.	Area, sq. miles.	Population.	Chief Town with Population.	No. of Villages.	Land Revenue and Rates, 1898-99.
							Rs.
Arakan	Akyab	3	5,136	416,305	Akgab . . . 37,938	2,040	17,40,409
	Northern Arakan	...	5,233	14,628	...	317	
	Kyaukpyu	1	4,387	163,822	...	1,105	4,73,035
	Sandoway	...	3,784	78,425	...	552	1,69,962
	Total Arakan	4	18,540	673,190	...	4,014	23,83,406
Pegu	Rangoon Town	2	19	180,324	Rangoon . . . 180,324	...	3,82,730
	Hanthawaddy	3	3,023	396,887	...	1,313	31,99,729
	Pegu	2	4,276	237,594	Pegu . . . 10,762	782	17,61,123
	Tharrawaddy	2	2,851	339,240	...	1,458	13,15,648
	Prome	3	2,914	368,466	Prome . . . 30,022 Shwedaung . . 12,424 Paungdè . . . 10,233	1,848	7,55,672
	Total Pegu	12	13,083	1,522,511	...	5,401	74,14,902
Irrawaddy	Thôngwa	3	3,470	333,443	Yandoon . . . 20,235 Ma-ubin . . . 5,327	971	30,64,920
	Bassein	2	4,090	311,262	Bassein . . . 30,177 Ngathainggyaung 5,608	1,439	14,98,772
	Henzada	2	2,886	438,131	Zalun . . . 6,006 Henzada . . . 19,762 Lemyethna . . 5,614 Myanaung . . 5,489 Kyangin . . . 8,116	1329	15,06,834
	Myaungmya	2	3,005	217,878	Pantanaw . . . 6,030	844	15,41,719
	Total Irrawaddy	9	13,451	1,300,714	...	4,583	76,12,245
Tenasserim	Toungoo	3	6,172	211,784	Toungoo . . . 19,232	1,129	4,69,142
	Salween	...	2,666	31,439	...	229	...
	Thatôn	3	5,089	266,620	Thatôn . . . 9,683	922	15,36,381
	Amherst	3	7,062	233,539	Moulmein . . . 55,785	660	8,76,819
	Tavoy	...	5,308	94,921	Tavoy . . . 15,099	303	3,06,673
	Mergui	2	9,789	73,748	Mergui . . . 10,137	360	2,98,671
	Total Tenasserim	11	36,086	912,051	...	3,603	34,87,686

Upper Burma.

Division.	Executive District.	No. of Judicial and Revenue Sub-divisions.	Area, sq. miles.	Population.	Chief Town with Population.	No. of Villages.	Land Revenue and Rates, 1898-99.
							Rs.
Minbu	Thayetmyo	3	4,750	250,161	Thayetmyo 17,101; Allanmyo 9,012	939	4,03,504
	Pakôkku	3	6,210	311,959	Pakôkku 19,972	1,354	8,22,535
	Minbu	2	3,297	215,563	Minbu 7,270	1,043	5,99,866
	Magwe	2	2,913	219,190	Magwe 6,673	759	5,02,694
	Total Minbu	10	17,170	996,873	...	4,095	23,28,599
Mandalay	Mandalay	5	2,071	375,055	Mandalay 188,815	786	7,91,413
	Bhamo	2	4,146	41,939	Bhamo 8,048	254	1,26,055
	Myitkyina	2	10,640	51,021	Myitkyina 1,465; Mogaung 2,937	139	65,767
	Katha	3	6,995	139,389	Katha 2,596	1,578	5,59,152
	Ruby Mines	2	1,915	34,062	Mogôk 5,630	193	1,09,649
	Total Mandalay	14	25,767	641,466	...	2,950	16,52,036
Sagaing	Shwebo	3	5,634	230,799	Shwebo 9,368; Ye-u 3,173	1,200	5,29,292
	Sagaing	3	1,862	246,141	Sagaing 9,934	593	6,80,827
	Lower Chindwin	2	3,481	233,316	Mônywa 6,316	893	5,53,982
	Upper Chindwin	4	19,062	111.533	Kindat 2,423	980	3,22,057
	Total Sagaing	12	30,039	821,789	...	3,666	20,86,158
Meiktila	Kyauksè	2	1,274	126,622	Kyauksè 7,201	541	7,66,120
	Meiktila	2	2,183	217,280	Meiktila 4,685	1,066	4,67,190
	Yamèthin	2	4,258	206,557	Yamèthin 6,584; Pyinmana 12,936	1,098	4,37,826
	Myingyan	2	3,139	351,861	Myingyan 19,790	868	6,52,057
	Total Meiktila	8	10,854	902,320	...	3,573	23,23,193
	Grand total Burma	80	164,990	7,770,914	...	31,885	2,92,88.225
					Gross	Revenue	3,99,75,596

The density varies almost inversely with the size of the district. Upper Chindwin, with area of 19,000 square miles, a principality two and a half times as large as Wales, has only 5·14 inhabitants to the square mile. Henzada is the most densely populated district, with 195·54 to the square mile. Mandalay district is the most thickly populated in Upper Burma, with 178 to the square mile, but this includes Mandalay city. The rural tracts have only 91·6 to the square mile, whereas Sagaing has 135. Upper and Lower Burma, even if we exclude the Shan States, form the largest province of the Indian Empire, but, with the exception of Assam, they contain the fewest inhabitants, and are the least densely populated. Burma itself is as large as Great Britain together with two islands of the size of Ireland. The average size of a district in Burma, including the Rangoon district, the area of which is only 19 square miles, is 4761·94 square miles, that is to say, larger than the three counties of Kent, Sussex, and Hampshire. In the whole province, as well as in Lower Burma, by far the greater part of the population lives in villages containing less than 500 inhabitants; 57·9 per cent. lived in villages containing less than 200 inhabitants. Villages between 200 and 500 inhabitants number 38·4 per cent. of the total population. Of villages containing 1000 and less than 2000 inhabitants there were only 376 in 1891, and 202 of these were in Lower Burma. Of villages containing between two and three thousand inhabitants there were only 41 in all Burma, and 21 of these were in Lower Burma. Of towns and villages whose inhabitants number 3000 and more, and less than 5000, there were 21 with a total population of 76,565, or 1·006 per cent. of the total population. In 1891 the population of all towns containing upwards of 5000 inhabitants amounted to 540,672, or 11·6 per cent. of the total population; there were 25 of these in Lower Burma.

In 1891 there were 3,887,156 males and 3,740,412 females, or 962 females for every 1000 males. In Lower Burma the disparity between males and females is even more strongly marked, since there were only 891 females for every 1000 of the opposite sex. In Upper Burma the females outnumber the males, and we find 1084 women for every 1000 men. The average number of male births to 1000 female births was 1067. Lower Burma thus falls into the category of immigration countries.

Table showing Distribution of Population per 10,000 *of Total Population.*

Division.	Burmese.	Mon or Taliing.	Tai or Shan.	Karen (Pwo).	Karen (Sgau).	Karen-ni, Red Karen.	Chin.	Chinese.	Hindu Castes.	Mussulman Tribes.	Sikhs.	Chingpaw and Kachins.
Arakan	614·6	·03	·7	·1	·06	...	81·05	2·1	13·9	165·9	·001	...
Pegu	1408·5	112·5	84·1	33·3	62·3	·4	8·3	21·1	109·8	53·1	·6	·004
Irrawaddy	1516·8	39·9	6·8	235·6	159·1	·8	31·2	8·7	20·6	14·7	·02	..
Tenasserim	461·3	460·6	49·6	136·4	72·05	·9	·5	13·2	43·02	25·4	·07	·146
Total Lower Burma	4001·2	613·03	141·2	405·4	293·51	2·1	121·05	45·1	187·32	269·1	·691	·15
Mandalay	688·2	·9	54·9	·2	·1	·06	1·7	4·4	22·4	30·5	1·4	2·7
Sagaing	812·1	·7	27·5	·02	·001	·001	1·1	·3	4·2	3·6	·8	
Minbu	1397·6	·3	2·1	·1	·009	...	25·6	3·9	6·4	4·8	·3	
Meiktila	689·5	·03	10·5	2·4	·5	·003	·08	·8	5·1	11·8	·8	
Total Upper Burma	3587·4	1·93	95·0	2·72	·610	·064	28·48	9·4	38·1	50·7	3·3	2·7
Total Province	7588·6	614·96	236·2	408·12	294·120	2·164	149·53	54·5	225·42	319·8	3·99	2·85

The pastoral and agricultural classes comprise 6·415 out of every 10,000 persons of both sexes, and only a very small proportion of these are employed in stock-breeding. The next most important class is that of persons engaged in the preparation and supply of food. Of these, the fishermen, grain-dealers, fruit and vegetable sellers, are for the most part Burmese, the stock-breeders and butchers are chiefly Choliars or Chittagonians. Handicraftsmen, wood-carvers, lacquerers, makers of textile fabrics, boat-builders, workers in metal, potters, carpenters, form only a very small percentage of the total population. Of monks or pôngyiis there were in 1891 in Lower Burma 13,613, and in Upper Burma 11,894. Of upazins, or probationers, there were 6668 in Lower Burma, and 14,109 in Upper Burma. A Burman is a jack-of-all trades, and a very large number of them work at different times at all sorts of employments. There is no leisured class to speak of. There were no more than 652 males who could be taken to correspond with the leisured class of European countries.

The Malthusian maxim that population tends to outgrow the means of support does not yet apply to Burma. The soil is too rich, and there is too great a superabundance of culturable land. War and epidemic disease did not influence the country even in Upper Burma to any appreciable extent during the period 1880-1900. Famine has never been known in Lower Burma, and failure of crops and deficient rainfall in Upper Burma only tend to swell the tide of emigration to the more favoured districts of the lower province.

Turning now to consider the births and deaths, these in Lower Burma were as follows:—

	Births.			Deaths.			Net Increase.		Total Increase.
	Male.	Female.	Total.	Male.	Female.	Total.	Male.	Female.	
1881	38,012	35,742	73,754	31,966	26,170	58,136	6046	9,572	15,618
1885	48,059	45,163	93,222	40,539	32,133	72,672	7520	13,030	20,550
1890	43,918	40,851	84,769	36,091	27,500	63,591	7827	13,351	21,178

For the period of ten years the natural growth by excess of births over deaths was only 57,346, or an increase at the rate of 5·06 per cent. The registration of births and deaths is still only very partial in Upper Burma. In 1898-99 the average birth-rate throughout Lower Burma amounted to 34·11, and the death-rate to 26·13 in every thousand of the population. The proportion of deaths was practically the same as in the previous year, 26·26, while the number of births was greater than in any previous year, the 1897 figure being 31·82. The natural increment of the population only accounts for 21·9 of the total growth. The surplus of 101,433 shown (an increase of 2·77 per cent.) is caused by the excess of immigrants over emigrants. Between the years 1887 and 1891 the total number of immigrants was 558,123, and of emigrants 312,211, so that there was an average gain of 29,182 persons every year. The following table shows that this rate remains fairly constant in the number of immigrants and emigrants who pass through the principal ports of the province:—

	1897-98.		1898-99.	
	Emigrants.	Immigrants.	Emigrants.	Immigrants.
Akyab .	14,359	15,925	14,972	16,407
Rangoon	75,998	106,374	91,033	132,177
Moulmein .	847	644	743	596

Of the 4,658,627 people in Lower Burma, 3,391,590 are Burmese and Talaings, 630,700 are Karens, and 356,087 are races from India. Europeans and Eurasians number 15,333, Shans, 94,302; Chinese, 31,941. The increase in the number of Burmese and Talaings in ten years was 22·58 per cent., of Karens 21·7 per cent., of Europeans 20·2 per cent., and of Chinese 146 per cent. If we add the population of Upper Burma, there are in the whole province 6,129,182 Burmese and Talaings; 633,657 Karens; 95,571 Chins; 206,794 Shans; 432,639 natives of India; 37,407 Chinese; and 20,177 Europeans and Eurasians.

Government.

The province as a division of the Indian Empire is administered by a Lieutenant-Governor, first appointed 1st May 1897, with a legislative council of nine members, five of whom are officials. There are, besides, a chief secretary, revenue secretary, secretary and two under-secretaries, a public works department secretary with two assistants. The revenue administration of the province is superintended by a financial commissioner, assisted by two secretaries, and a director of land records and agriculture, with a land records departmental staff. There is a chief court for the province with a chief justice and three justices, established in May 1900. Other purely judicial officers are the judicial commissioner for Upper Burma, and the civil judges of Mandalay and Moulmein. There are four commissioners of revenue and circuit, and nineteen deputy commissioners in Lower Burma, and four commissioners and seventeen deputy commissioners in Upper Burma. There are two superintendents of the Shan States, one for the northern and one for the southern Shan States, and an assistant superintendent in the latter; a superintendent of the Arakan Hill tracts and of the Chin Hills, and a Chinese political adviser taken from the Chinese consular-service. The police are under the control of an inspector-general, with deputy inspector-general for civil and military police, and for supply and clothing. The Education Department is under a director of public instruction, and there are three circles—eastern, western, and Upper Burma, each under an inspector of schools.

The Burma forests are divided into three circles each under a conservator, with twenty-one deputy conservators. There are also a deputy postmaster-general, chief superintendent and four superintendents of telegraphs, a chief collector of customs, three collectors and four port officers, and an inspector-general of jails. At the principal towns benches of honorary magistrates, exercising powers of various degrees, have been constituted. There are forty-one municipal towns, fourteen of which are in Upper Burma. The commissioners of division are *ex officio* sessions judges in their several divisions, and also have civil powers, and powers as revenue officers. They are responsible to the lieutenant-governor, each in his own division, for the working of every department of the public service, except the military department, and the branches of the administration directly under the control of the supreme Government. The deputy commissioners perform the functions of district magistrates, district judges, collectors and registrars, besides the miscellaneous duties which fall to the principal district officer as representative of Government. Subordinate to the deputy commissioners are assistant commissioners, extra-assistant commissioners and myoôks, who are invested with various magisterial, civil, and revenue powers, and hold charge of the townships, as the units of regular civil and revenue jurisdiction are called, and the sub-divisions of districts, into which most of these townships are grouped. Among the salaried staff of officials, the township officers are the ultimate representatives of Government who come into most direct contact with the people. Finally, there are the village headmen, assisted in Upper Burma by elders, variously designated according to old custom. Similarly in the towns, there are headmen of wards and elders of blocks. In Upper Burma these headmen have always been revenue collectors. The system under which in towns headmen of wards and elders of blocks are appointed is of comparatively recent origin, and is modelled on the village system.

The Shan States.

The Shan States were declared to be a part of British India by notification in 1886. The Shan States Act of 1888 vests the civil, criminal, and revenue administration in the chief of the state, subject to the restrictions specified in the *sanad* or patent granted to him. The law to be administered in each state is the customary law of the state, so far as it is in accordance with justice, equity, and good conscience, and not opposed to the spirit of the law in the rest of British India. The superintendents exercise general control over the administration of criminal justice, and have power to call for cases, and to exercise wide revisionary powers. Criminal jurisdiction in cases in which either the complainant or the defendant is a European, or American, or a Government servant, or a British subject not a native of a Shan State, is withdrawn from the chiefs and vested in the superintendents and assistant-superintendents.

Neither the superintendents nor the assistant-superintendents have power to try civil suits, whether the parties are Shans or not. In the Myelat division of the southern Shan States, however, the criminal law is practically the same as the law in force in Upper Burma, and the Ngwekunhmus, or petty chiefs, have been appointed magistrates of the second class. The chiefs of the Shan States are of three classes:—1. Sawbwas; 2. Myosas; 3. Ngwekunhmus. The last are found only in the *Myelat*, or border country between the southern Shan States and Burma. There are fifteen Sawbwas, sixteen Myosas, and thirteen Ngwekunhmus in the Shan States proper. Two Sawbwas are under the supervision of the commissioner Mandalay division, and two under the commissioner of the Sagaing division. The states vary enormously in size, from the 12,000 square miles of the Trans-Salween State of Kêng Tung, to the 3·95 square miles of Nam Hkôm in the Myelat. The latter contained only 41 houses with 210 inhabitants in 1897. There are five states, all Sawbwaships, under the supervision of the superintendent northern Shan States, besides an indeterminate number of Wa States and communities of other races beyond the Salween river. The superintendent, southern Shan States, supervises thirty-nine, of which ten are Sawbwaships. The headquarters of the northern Shan States are at Lashio, of the southern Shan States at Taung-gyi.

The states included in eastern and western Karen-ni are not part of British India, and are not subject to any of the laws in force in the Shan States, but they are under the supervision of the superintendent southern Shan States.

The northern portion of the Karen Hills is at present dealt with on the principle of political as distinguished from administrative control. The tribes are not interfered with as long as they keep the peace. What is specifically known as the Kachin Hills, the country taken under administration in the Bhamo and Myit-Kyina districts, is divided into forty tracts. Beyond these tracts there are many Kachins in Katha, Mông Mit, and the northern Shan States, but though they are often the preponderating, they are not the exclusive population. The country within the forty tracts may be considered the Kachin Hills proper, and it lies between 23° 30′ and 26° 30′ N. lat., and 96° and 98° E. long. Within this area the petty chiefs have appointment orders, the people are disarmed, and the rate of tribute per household is fixed in each case. Government is regulated by the Kachin Hills regulation. Since 1894 the country has been practically undisturbed, and large numbers of Kachins are enlisted, and ready to enlist in the military police, and seem likely to form as good troops as the Gurkhas of Nepal.

The Chin Hills were not declared an integral part of Burma until 1895, but they now form a scheduled district. The chiefs, however, are allowed to administer their own affairs, as far as may be, in accordance with their own customs, subject to the supervision of the superintendent of the Chin Hills.

Religion.—Buddhists make up more than 90 per cent.; Mussulmans, 3·125; spirit-worshippers and Hindus about 2·25; and Christians, about 1·25 per cent. of the total population of Upper and Lower Burma. The large nominal proportion of Buddhists is deceptive. The Burmese are really as devoted to demonolatry as the hill-tribes who are labelled plain spirit-worshippers. The actual figures of the various religions, according to the census of 1891, are as follows:—

Buddhists .	6,888,075	Sikhs . .	3164
Spirit-worshippers.	168,449	Jews . .	351
Hindus . .	171,577	Parsees . .	96
Mussulmans .	253,031	Not returned .	49
Christians . .	120,768		

An analysis shows that not quite two in every thousand Burmese profess Christianity, and there are about the same number of Mahommedans among them. It is admitted by the missionaries themselves that Christianity has progressed very slowly among the Burmese in comparison with the rapid progress made amongst the Karens. It is amongst the Sgaw Karens that the greatest progress in Christianity has been made, and the number of spirit-worshippers among them is very much smaller. The number of Burmese Christians is considerably increased by the inclusion among them of the Christian descendants of the Portuguese settlers of Syriam deported to the old Burmese Tabayin, a village now included in the Ye-u subdivision of Shwebo. These Christians returned themselves as Burmese. The forms of Christianity which make most converts in Burma are the Baptist and Roman Catholic faiths.

Education.—Compared with other Indian provinces, and even with some of the countries of Europe, Burma takes a very high place in the returns of those able both to read and write. Taking the sexes apart, though women fall far behind men in the matter of education, still women are better educated in Burma than in the rest of India. The average number of each sex in Burma per thousand is: literates, male, 450; female, 29; illiterates, male, 550; female, 971. The number of literates in Bengal is: male, 47; female, 1. The proportion is reduced by the number of immigrants from India, who are mostly illiterate. The degree of education prevailing amongst every thousand persons of each sex who profess one of the five chief religions of the province shows Burma still more favourably.

Religion.	Illiterate.		Learning.		Literate.	
	Male.	Fem.	Male.	Fem.	Male.	Fem.
Buddhist . . .	443	970	74	5	483	25
Spirit-worshippers . .	922	997	6	1	72	2
Hindus	757	960	13	8	230	32
Mussulmans . . .	746	961	25	9	229	30
Christians . . .	471	723	79	51	450	226

The fact that in Upper Burma the proportion of literates is nearly as high as, and the proportion of those under instruction even higher than, that of the corresponding classes in Lower Burma, is a clear proof that in primary education, at least, the credit for the superiority of the Burman over the native of India is due to indigenous schools. If we take the numbers of those of 25 years and over, the proportion per thousand is more clear and just. The numbers for Lower Burma were: literates, male, 602; female, 34; illiterates, male, 398; female, 966. For Upper Burma: literates, male, 627; female, 16; illiterates, male, 373; female, 984. It was not till 1890 that the Education department took action in Upper Burma. It was then ascertained that there were 684 public schools with 14,133 pupils, and 1664 private schools with 8685 pupils. It is worthy of remark that of these schools 29 were Mahommedan, and that there were 176 schools for girls in which upwards of 2000 pupils were taught. There are three circles—Eastern, Central, and Upper Burma. For the special supervision and encouragement of indigenous primary education in monastic and in lay schools, each circle of inspection is divided into sub-circles corresponding with one or more of the civil districts, and each sub-circle is placed under a deputy-inspector or a sub-inspector of schools. There are nine standards of instruction, and the classes in schools correspond with these standards. In Upper Burma all educational grants are paid from Imperial funds; there is no cess as in Lower Burma. Grants-in-aid are given according to results. There is only one college, which is affiliated to the Calcutta University. The number of students at this Rangoon college was 25 in 1890-91. There were 70 undergraduates in 1897-98, and 95 in 1898-99. In the latter year the college produced seven B.A.'s (one with honours in English) out of eight candidates. There are three normal schools and two survey schools, one in Upper and one in Lower Burma. There are 44 Government scholarships divided between the various school and university standards, besides special scholarships for students of medicine, open to both men and women, tenable in Madras or Calcutta. There are missionary schools amongst the Chins, Kachins, and Shans, and a school for the sons of Shan chiefs at Taung-gyi in the southern Shan States. A *Patamabyan* examination for marks in the Pali language was first instituted in 1896 and is held annually. The number of candidates has not hitherto been large.

Finance.—The gross revenue of Lower Burma from all sources in 1871-72 was Rs.1,36,34,520, of which Rs.1,21,70,530 was from Imperial taxation, Rs.3,73,200 from provincial services, and Rs.10,90,790 from local funds. The land revenue of the province was Rs.34,45,230. In Burma the cultivators themselves continue to hold the land from Government, and the extent of their holdings averages about five acres. The land tax is supplemented by a poll-tax on the male population from 18 to 60 years of age, with the exception of immigrants during the first five years of their residence, religious teachers, schoolmasters, Government servants, and those unable to obtain their own livelihood. In 1890-91 the revenue of Lower Burma had risen to Rs.2,08,38,872 from imperial taxation, Rs.1,55,51,897 for provincial services, and Rs.12,14,596 from incorporated local funds. The expenditure on the administration of Lower Burma in 1870-71 was Rs.49,70,020. In 1890-91 it was Rs.1,58,48,041. In 1897-98 the gross revenue had risen to Rs.3,87,05,972, and in 1898-99 to Rs.4,26,05,080. In Upper Burma the chief source of revenue is the *Thathameda*, a tithe or income tax which was instituted by King Mindôn, and was adopted by the British very much as they found it. For the purpose of the assessment every district and town is classified according to its general wealth and prosperity. As a rule the basis of calculation was 100 rupees from every ten houses, with a 10 per cent. deduction for those exempted by custom. When the total amount payable by the village was thus determined, the village itself settled the amount to be paid by each individual householder. This was done by *Thamadis*, assessors, usually appointed by the villagers themselves. Other important sources of revenue are the rents from State lands, forests, and miscellaneous items such as fishery, revenue, and irrigation taxes. In 1886-87, the year after the annexation, the amount collected in Upper Burma from all

sources was twenty-two lakhs of rupees. In the following year it had risen to fifty lakhs. Much of Upper Burma, however, remained disturbed until 1890. The figures for 1890-91, therefore, show the first really regular collection. The amount then collected was Rs.87,47,020. In 1893-94 the total collections were Rs.1,05,01,914. In 1896-97 the gross receipts were Rs.1,31,26,451, and in 1898-99 Rs.1,39,43,991. The following statement exhibits the gross receipts and expenditure of the province during the years 1897-98 and 1898-99, distributed between imperial, provincial, incorporated local, excluded local, and municipal funds. These include the transactions of the Rangoon municipality and the Rangoon Port Trust, although these funds do not bank with Government.

	1897-98.		1898-99.	
	Receipts.	Expenditure.	Receipts.	Expenditure.
	Rs.	Rs.	Rs.	Rs.
Imperial .	3,02,02,197	84,51,802	3,38,45,001	86,64,995
Provincial .	3,16,02,179	2,99,07,823	3,41,28,971	3,00,14,084
Incorporated Local .	20,28,696	19,47,947	21,45,511	21,07,037
Excluded Local .	23,59,059	20,54,133	26,31,022	27,16,160
Municipal .	22,67,945	22,70,066	24,34,175	24,73,718
	6,84,60,076	4,46,31,771	7,51,84,680	4,59,75,994

Defence.—In 1871, 5016 fighting men, Europeans and natives, were maintained at a total cost of Rs.27,62,000, and the strength of the police in the same year was 5319. In 1898-99 the strength of the troops in Burma was: Europeans 4234, and natives 6493—a total of 10,727 men. These were nearly equally divided between the Rangoon and the Mandalay district commands, with 1262 natives in the southern Shan States command. Besides these there were 14,941 military police, whose cost was Rs.48,46,448. The civil police amounted to 15,558 civil constables. There were besides 2530 volunteers, 366 of whom were cadets. They consisted of the Rangoon Port Defence volunteers, comprising artillery, naval, and engineer corps, the Moulmein artillery, the Moulmein, Rangoon, Railway, and Upper Burma rifles. Four Indian marine vessels ply on the Irrawaddy and the Chindwin rivers, and the provincial marine consists of 28 launches in Lower Burma and 30 in Upper Burma. These carry troops, specie, cattle, ammunition, and stores. Their cost was Rs.1,48,485 in Lower Burma, and Rs.2,45,163 in Upper Burma. There is a battery for the defence of the harbour at Monkey Point at the junction of the Sittang with the Rangoon river.

Minerals and Mining.—The tin mines in Lower Burma remain in much the same condition as they were in 1880. They are still worked by natives, but a company is being formed to work the mines in the Maliwun township of Mergui by European methods. The chief mines and minerals are in Upper Burma. The jade mines of Upper Burma are now practically the only source of supply of that mineral, which is in great demand over all China. The mines are situated beyond Kamaing, north of Mogaung in the Myitkyina district. The miners are all Kachins, and the right to collect the jade duty of 33⅓ is farmed out by Government to a lessee, who has hitherto always been a Chinaman. The amount obtained has varied considerably. In 1887-88 the rent was Rs.50,000. This dwindled to Rs.36,000 in 1892-93, but the system was then adopted of letting for a term of three years, and in 1898 Rs.41,100 was obtained. The amount extracted varies from 2000 to 3000 cwts. The value varies enormously according to colour, which should be a particular shade of dark green. Semi-transparency, brilliancy, and hardness are, however, also essentials. The old river mines produced the best quality. The quarry mines on the top of the hill near Tawmaw produce enormous quantities, but the quality is not so good.

The most important ruby-bearing area is the Mogôk stone tract, in the hills about 60 miles east of the Irrawaddy and 90 miles N.N.W. of Mandalay. The right to mine for rubies by European methods and to levy royalties from persons working by native methods was leased to the Burma Ruby Mines Company, Limited, in 1889, and the lease was renewed in 1896 for 14 years at a rent of Rs.3,15,000 a year plus a share of the profits. The rent was reduced permanently in 1898 to Rs.2,00,000 a year, but the share of the profits taken by Government was increased from 20 to 30 per cent. The value of the rubies found in 1898 was Rs.8,69,252, and a dividend of 5 per cent was then paid for the first time. There are other ruby mines at Nanyaseik in the Myitkyina district and at Sagyin in the Mandalay district, where the mining is by native methods under license-fees of Rs.5 and Rs.10 a month. They are, however, only moderately successful. Gold is found in most of the rivers in Upper Burma, but the gold-washing industry is for the most part spasmodic in the intervals of agriculture. There is a gold mine at Kyaukpazat in the Mawnaing circle of the Kaltra district, where the quartz is crushed by machinery and treated by chemical processes. Work was begun in 1895, and the yield of gold in that year was 274 oz., which increased to 893 oz. in 1896-97, and to 1120 oz. in 1898-99. Coal is found in several fields in the Shan States, on the Upper Chindwin, and at Mergui, but it is of no very high quality. The principal seats of the petroleum industry are Yenangyaung in the Magwe, and Yenangyat in the Pakôkku districts. The yield of the former wells in 1898 was 15,484,301 gallons, and of the Yenangyat field 6,036,088 gallons. The latter field is extending rapidly. In the Akyab district 58,025 gallons were produced, and in Kyaukpyu 106,549 gallons. The wells have been worked for a little over a century by the natives of the country. The Burma Oil Company since 1889 has worked by drilled wells on the American or cable system. The output continues steadily to increase, and there are no signs of exhaustion, but, on the other hand, there seems no prospect of the discovery of flowing wells.

Amber is extracted by Kachins in the Hukawng valley beyond the administrative border, but the quality of the fossil resin is not very good. The amount exported varies considerably. In 1897 it was valued at Rs.2,330, in 1898 at Rs.4,990, and in 1899 at Rs.15,915. Tourmaline, or rubellite, is found on the borders of the Ruby Mines district and in the Shan State of Möng Lông. Steatite to the amount of 19 tons, valued at Rs.7,995, was extracted in 1899 from the Arakan hill quarries. Salt is manufactured at various places in Upper Burma, notably in the lower Chindwin, Sagaing, Shwebo, Myingyan, and Yamèthin districts, as well as at Mawhkio in the Shan State of Thibaw. Iron is found in many parts of the hills, but is so far only worked by inhabitants of the country. A good deal is extracted and manufactured into native implements at Pang Lông in the Lêgya (Laihka) Shan State. Lead is extracted by a Chinese lessee from the mines at Bawzaing (Maw-sön) in the Myelat, southern Shan States. The ore is rich in silver as well as in lead.

Agriculture.—Rice continues to be the staple product of the province both in Upper and Lower Burma. In 1871-72 there were 1,836,021 acres devoted to its cultivation in Lower Burma. In 1898-99 the area cropped in Lower Burma was 6,478,339 acres, of which 6,098,956 acres were under paddy. Maize covered 11,707 acres, and other food-grains, including pulse, 34,781 acres. Tilseed covered 24,822 acres; sugar-cane, 10,020 acres; cotton, 12,078 acres; tobacco, 29,328 acres; orchard and garden produce covered 356,777. In all of these, except cotton, there was an increase. In Upper Burma rice is also the chief crop, but the proportion to other crops is not nearly so overwhelming. The total area cropped was 3,419,703 acres in 1899, and of this 1,502,736 acres were under rice; wheat, 12,638 acres; millet (cholum or jowar), 713,531 acres; millet (cumbu or bajra), 30,843 acres; maize, 75,926 acres; grain (pulse), 56,129; other food-grains, including pulse, 169,627; tilseed, 404,884 acres; condiments and spices, 19,007 acres; sugar, 4847 acres; cotton, 134,243 acres; tea, 1221 acres; tobacco, 34,988 acres; fodder crops, 22,445 acres; orchards and garden produce, 44,943 acres; other crops were barley, sago or mandua, linseed and other oil-seeds, various fibres, indigo and other dye crops, and miscellaneous food and non-food crops, the last covering 167,410 acres. The total area cultivated in Lower Burma by irrigation from canals, tanks, wells, and other sources in 1899 was 5005 acres. In Upper Burma in the same year it amounted to 684,189 acres, of which 126,773 acres were in the Kyauksè district, and 112,701 acres in the Magwe district. Other districts largely dependent on irrigation were Meiktila, Yamèthin, Minbu, Mandalay, and Sagaing. The old national irrigation system has been largely repaired and extended since the annexation. Of the total area of Lower Burma, 53,476,480 acres, the area cropped in 1899 was 6,478,339 acres, the area not available for cultivation was 25,828,221 acres; 4,813,995 acres were covered with forests, and the cultivable area, other than fallow, amounted to 15,765,976 acres. The total area of Upper Burma is 54,395,395 acres. Of this 3,901,140 acres are in feudatory and tributary states, and for 2,644,713 acres no returns exist. Of the remaining 47,849,642 acres the net area cropped in 1899 was 3,419,702 acres; forests covered 4,836,138 acres; 28,945,014 acres were not available for cultivation; the cultivable waste, other than fallow, amounted to 9,197,905 acres. The current fallow was 1,703,452 acres. Of agricultural stock there were in 1898-99 in Lower Burma 566,312 bulls and bullocks, 302,119 cows, 272,588 bull buffaloes, 228,383 cow buffaloes, 560,017 young stock, 2310 sheep, 35,672 goats, 12,144 horses and ponies, 463,122 ploughs, and 195,207 carts. In Upper Burma there were 639,175 bulls and bullocks, 611,203 cows, 78,404 bull buffaloes, 96,206 cow buffaloes, 599,871 young stock, 4044 sheep, 27,817 goats, 21,076 horses and ponies, 2104 mules and donkeys, 53 camels, 565,518 ploughs, and 222,580 carts.

Forests.—In 1870-71 the State reserved forests covered only 163 square miles, all in the Rangoon division. The total receipts from the forests then amounted to Rs.7,72,400. In 1889-90 the total area of reserved forests in Lower Burma was 5574 square miles, and the gross revenue was Rs.31,34,720, and the expenditure was Rs.13,31,930. The work of the forest department did not begin in

Upper Burma till 1891. At the end of 1892 the reserved forests in Upper Burma amounted to 1059 square miles. On 30th June 1896 the reserved area amounted to 5438 square miles. At the close of 1899 the area of the reserved forests in the whole province amounted to 15,669 square miles, 962 square miles being the addition made during 1898-99. The revenue in 1898-99 amounted to Rs.83,50,888, and the charges to Rs.23,62,055, showing a surplus of Rs.59,88,833. The receipts for the previous year had been Rs.72,15,257, and the average receipts for the preceding five years had been Rs.61,02,382. The proportion of the surplus to the gross revenue for that period showed a percentage of 67·48.

Fisheries.—The gross demand of fishery revenue in Lower Burma in 1898-99 was Rs.18,77,933, an increase of Rs.1,37,875 over the figures of the preceding year. To this total fishery leases contributed Rs.16,52,227, an advance of Rs.1,43,713, and licenses for fishing implements Rs.2,25,706, or Rs.5,838 less than in 1897-98. In the Irrawaddy division, where most fishing is done, the revenue rose by over a lakh of rupees, and in the Pegu division by Rs.37,405. In Upper Burma the gross revenue derived from fisheries increased from Rs.3,02,216 to Rs.3,05,372.

Manufactures.—There were in 1871-72 twenty-six steam rice-mills in the province. Five years earlier there were only three. The total number of factories in 1889-90 was 125. In 1898-99 there were 136. The mechanical power in every case is steam, and the factories are mostly either rice or timber mills, and in some cases both combined. In 1898-99 two new rice mills were opened in the Toungoo district, and one each in Hanthawaddy, Henzada, and Rangoon town. Saw-mills were established in Toungoo, Bassein, Rangoon, and Hanthawaddy, an iron and brass factory at Moulmein, and a cotton factory in the Thayetmyo district. The average daily number of operatives in 1899 was 16,181, of whom only 110 were females. The manufacture locally of silk and cotton stuffs is steadily dying out, and aniline is superseding the old natural dyes. Silver work of peculiar and delicate workmanship is perhaps extending, and the pottery, brass, and copper work and lacquer work remain stationary.

Commerce.—The following table shows the progressive value of the trade of Burma since 1871-72:—

Year.	Imports.	Exports.	Total.
	Rs.	Rs.	Rs.
1871-72	3,15,79,860	3,78,02,170	6,93,82,030
1881-82	6,38,49,840	8,05,71,410	14,44,21,250
1891-92	10,50,06,247	12,67,21,878	23,17,28,125
1898-99	11,68,08,404	16,46,67,442	28,14,75,846

Of the total sea-borne trade of the province 76·5 per cent. passed through Rangoon in 1898-99, as compared with 78·5 in 1897-98. Rice and timber are by far the most important articles of sea-borne exports. The contributions made by the various kinds of country produce were in 1898-99 in the following proportions:—

Rice	82·04	Raw cotton	1·20
Teak	7·79	Jade-stone	·54
Cutch	1·09	Rice-bran	2·09
Raw hides	1·17	Other articles	3·28
Raw caoutchouc	·80		

The chief articles of import are cotton twist and yarn, cotton, silk and woollen piece goods, crockery, hardware, gunny bags, sugar, tobacco, and liquors.

The system of inland trade registration was in a more or less experimental and progressive state until 1892, when it was thoroughly revised. In the year 1898-99 there were twenty registration stations in Upper Burma, and nine in Lower Burma. The total trade registered at these stations had an aggregate value of Rs.2,89,23,907, which showed the slight increase on the previous year of Rs.46,304. A review of the trade returns of the previous six years, however, shows that the trade was expanding. The value of the total trade during the three years ending with March 1899 was 35·07 per cent. in excess of that registered in the three years ending with March 1896. Of this increase exports advanced more rapidly than imports, and the expansion under both heads was greater in Upper Burma than in Lower Burma—that is, more with the Shan States and Western China than with Siam and Karen-ni. The value of the trade with Western China in 1898-99 was Rs.36,68,610, showing an increase of 2·8 per cent. over 1897-98, but considerably less than in 1896-97, when Rs.39,57,936 was registered. Trade with the northern Shan States showed a growth during the year from Rs.64,29,744 to Rs.72,96,789. In the southern Shan States the figures were Rs.94,60,636 for 1898-99, against Rs.93,59,613 for the preceding year.

Shipping and Navigation.—The number of vessels engaged in the sea-borne trade in 1898-99 was 6435, with a tonnage of 3,360,045. Vessels entered, 2619; tonnage, 1,016,373; vessels cleared, 2469; tonnage, 1,011,880. The traffic to and from Burma through the Suez Canal was:—Vessels entered, 49; tonnage, 62,618; vessels cleared, 169; tonnage, 245,017. In 1898-99 the number of vessels and the aggregate tonnage engaged in the sea-borne trade was: Vessels, 6344; tonnage, 4,133,436. These were distributed in the following proportions:—

Port.	Entered.		Cleared.	
	Vessels.	Tonnage.	Vessels.	Tonnage.
Rangoon	1225	1,417,373	1235	1,431,773
Akyab	290	167,158	282	166,752
Bassein	40	78,123	42	78,058
Moulmein	674	263,089	712	270,413
Smaller ports	922	130,477	922	130,220

376 steamers with tonnage aggregating 625,030 tons, and 130 sailing vessels with a total tonnage of 98,918, entered; and 428 steamers with a tonnage of 739,246, and 139 sailing vessels with a tonnage of 110,702, cleared.

Internal Communications.—In 1871-72 there were 814 miles of road in Lower Burma, but the chief means of internal communication was by water. Steamers plied on the Irrawaddy as far as Thayetmyo. The vessels of the Irrawaddy Flotilla Company now ply to Bassein and to all points on the Irrawaddy as far north as Bhamo, and in the dry weather to Myitkyina, and also on the Chindwin as far north as Kinpat, and to Homalin during the rains. The length of roads has not greatly increased in Lower Burma, where there are now about 70 miles of navigable canals, but there has been a great deal of road construction in Upper Burma. At the end of the year 1898-99 there were in the whole province 6032 miles of road, 1322 of which were metalled and 1179 unmetalled, but bridged and drained, and the remainder partially bridged and drained. But the chief advance in communications has been in railway construction. The first railway from Rangoon to Prome, 161 miles, was opened in 1877, and that from Rangoon to Toungoo, 166 miles, was opened in 1884. Since the annexation of Upper Burma this has been extended to Mandalay, and the Mu Valley railway has been constructed from Sagaing to Myitkyina, a distance of 752 miles from Rangoon. The Mandalay-Kunlông railway is under construction, and trains run from Mandalay to Nawnghkio, a distance of 72 miles. The Sagaing-Mônya-Alû branch and the Meiktila-Myingyan branch were opened to traffic during 1900, so that the length of line now approaches 1200 miles. The Mandalay-Kunlông railway will be carried at least as far as Lashio, 180 miles, and branches between Bassein and Henzada and Tharrawaddy and Henzada are being surveyed, as is also the bridge over the Irrawaddy at Sagaing, where there is now a steam ferry.

Posts and Telegraphs.—There were, in 1899, 34 head post offices, 88 sub-offices, and 64 branch offices, a total of 186 imperial post offices for the province, besides 1 district sub-office and 89 branch offices, making 276 in all. There were 176 post offices doing savings bank business, with 47,652 accounts. In all 17,417,670 postal articles, including parcels, were delivered in the year. Of the articles received for delivery 18 per cent. were addressed in Burmese and Chinese. There were 238 telegraph offices open for paid telegrams in 1898-99. The length of telegraph lines in the province was 5296 miles, and the total length of wire 12,148 miles.

History.—In 1862 the province of British Burma, the present Lower Burma, was formed with Sir Arthur Phayre as chief commissioner. In 1867 a treaty was concluded at Mandalay providing for the free intercourse of trade and the establishment of regular diplomatic relations. King Mindôn died in 1878, and was succeeded by his son King Thibaw. Early in 1879 he excited much horror by executing a number of the members of the Burmese royal family, and relations became much strained. The British resident was withdrawn in October 1879. The government of the country rapidly became bad. Control over many of the outlying districts was lost, and the elements of disorder on the British frontier were a standing menace to the peace of the country. The Burmese court, in contravention of the express terms of the treaty of 1869, created monopolies to the detriment of the trade both of England and Burma; and while the Indian Government was unrepresented at Mandalay, representatives of Italy and France were welcomed, and two separate embassies were sent to Europe for the purpose of contracting new and, if possible, close alliances with sundry European powers. Matters were brought to a crisis towards the close of 1885, when the Burmese Government imposed a fine of £230,000 on the Bombay-Burma Trading Corporation, and refused to comply with a suggestion of the Indian Government that the cause of complaint should be investigated by an impartial arbitrator. An ultimatum was therefore despatched on 22nd October 1885. On 9th November a reply was received in Rangoon amounting to an unconditional refusal. The king on 7th November issued a proclamation calling upon his subjects to drive the British into the sea. On 14th November 1885 the British field force crossed the frontier, and advanced to Mandalay without incurring any serious resistance (see BURMESE WAR). It reached Ava on 26th

November, and an envoy from the king signified his submission. On 28th November the British occupied Mandalay, and next day King Thibaw was sent down the river to Rangoon, whence he was afterwards transferred to Ratnagiri on the Bombay coast. Upper Burma was formally annexed on 1st January 1886, and the work of restoring the country to order and introducing settled government commenced. This was a more serious task than the overthrow of the Burmese Government, and occupied four years. This was in part due to the character of the country, which was characterized as one vast military obstacle, and in part to the disorganization which had been steadily growing during the six years of King Thibaw's reign. By the close of 1889 all the larger bands of marauders were broken up, and since 1890 the country has enjoyed greater freedom from violent crime than the province formerly known as British Burma. The boundary with Siam was demarcated in 1893, and that with China was completed in 1900.

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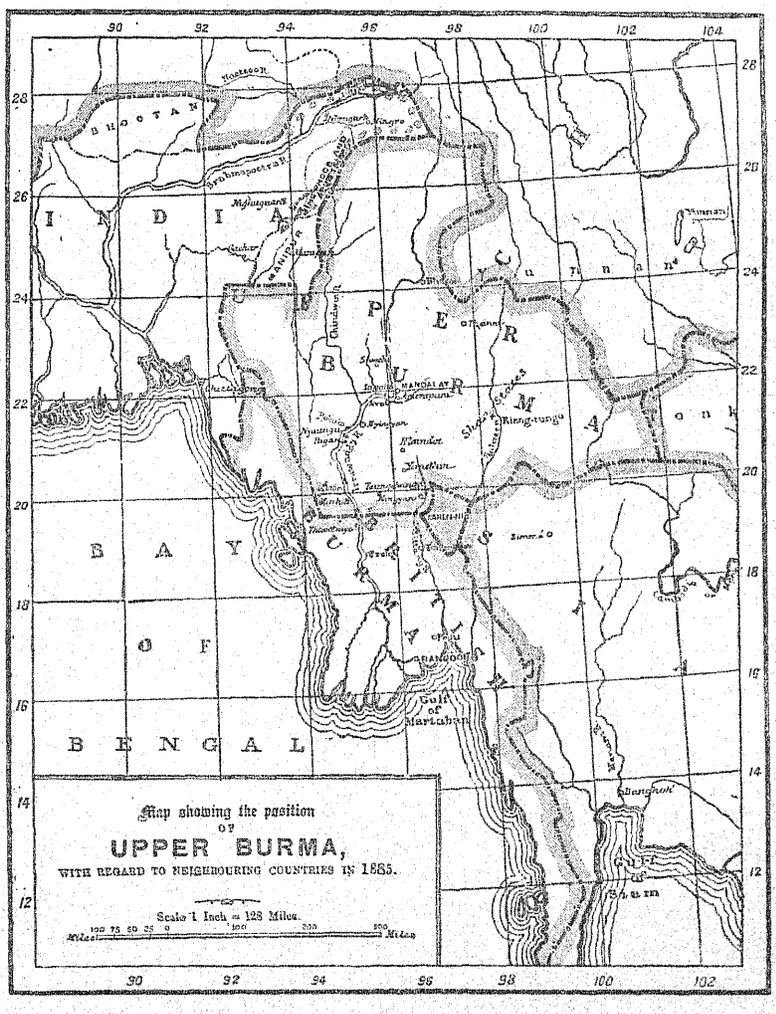


Burmese War of 1885.—The causes which led to this war, and the consequent annexation of Upper Burma, may be briefly narrated. Relations between the British and Burmese Governments had for some years been considerably strained, but it was not till the accession of Thibaw to the throne in 1878 that matters became really serious. This potentate opened his reign by a series of more than usually cold-blooded massacres of his nearest male relatives, and it soon became evident that the position of a British envoy at the Court of Ava was no longer either a desirable or dignified one. In 1879, therefore, Great Britain ceased to be represented in Mandalay, and matters went from bad to worse. Thibaw lent himself more and more to foreign intrigues; and finally, in the summer of 1885, matters came to a crisis over a dispute that had arisen between the king and a large British mercantile firm, called the Bombay-Burma Trading Company, which for years had been engaged in the export of timber from the great teak forests of the king's dominions. The imposition of an impossible fine on this company, coupled with the threat of confiscation of all their rights and property in case of non-payment, led to the British ultimatum of 22nd October 1885; and by 9th November a practical refusal of the terms having been received at Rangoon, the occupation of Mandalay and the dethronement of the king were determined upon.

At this time, beyond the fact that the country was one of dense jungle, and therefore most unfavourable for military operations, little was known of the interior of Upper Burma; but British steamers had for years been running on the great river highway of the Irrawaddy, from Rangoon to Mandalay, and it was obvious that the quickest and most satisfactory method of carrying out the British campaign was an advance by water direct on the capital. Fortunately a large number of light-draught river steamers and barges (or "flats"), belonging to the Irrawaddy Flotilla Company, were available at Rangoon, and the local knowledge of the company's officers of the difficult river navigation was at the disposal of the Government. Major-General, afterwards Sir H. N. D. Prendergast, V.C., K.C.B., R.E., was placed in command of the expedition. As was only to be expected in an enterprise of this description, the navy as well as the army was called in requisition; and as usual the services rendered by the seamen and guns were most important. It may be noticed here that strong opposition to the advance of the flotilla was expected from the forts and guns known to exist on the river banks, and some at least of the redoubts had been constructed on scientific principles under European supervision. The following is an abstract of the force detailed:—3 brigades of infantry each of 1 British and 2 native battalions; 6 batteries of artillery (1 field, 2 garrison, 3 mountain); 1 pioneer regiment (native); 6 companies of sappers and miners (native); 1 naval brigade with 26 guns from H.M. ships on the station. The bulk of the native troops were from Madras, and it will be noticed that no mounted troops were in the first instance necessary. It was, nevertheless, foreseen that mounted infantry would be valuable as soon as the river work was completed, and General Prendergast applied for permission to form a company to go with the expedition. The total effective of the force was 9034 fighting men, 2810 native followers, and 67 guns; and, for river service, 24 machine guns. The river fleet which conveyed the troops and stores was composed of a total of no less than 55 steamers, barges, launches, &c.

Thayetmyo was the British post on the river nearest to the frontier,

and here, by 14th November, five days after Thibaw's answer had been received, practically the whole expedition was assembled. On the same day General Prendergast received instructions to commence operations. There is not the slightest doubt that the Burmese king and his country were taken completely by surprise by the unexampled rapidity of the advance. There had been no time for them to collect and organize for the stubborn resistance of which the river and its defences were undoubtedly capable. They had not even been able to block the river by sinking steamers, &c., across it, for, on the very day of the receipt of orders to advance, the armed steamers, the *Irrawaddy* and *Kathleen*, engaged the nearest Burmese batteries, and brought out from under their guns the king's steamer and some barges which were lying in readiness for this very purpose. On the 16th the batteries themselves on both banks were taken by a land attack, the enemy being evidently unprepared and making no resistance. On 17th November, however, at Minhla, on the right bank of the river, the Burmans in considerable force held successively a barricade, a pagoda, and the palace and redoubt of Minhla. The attack was pressed home by a brigade of native infantry on shore, covered by a bombardment from the river, and the enemy were defeated with a loss of 170 killed and 276 prisoners, besides many more drowned in the attempt to escape by the river. The advance was continued next day and the following days, the naval brigade and heavy artillery leading and silencing in succession the enemy's river defences at Nyoungu, Pokoko, and Myingyan. On 26th November, when the flotilla was approaching the ancient capital of Ava, envoys from King Thibaw met General Prendergast with offers of surrender; and on the 27th, when the ships were lying off that city and ready to commence hostilities, the order of the king to his troops to lay down their arms was received. There were three strong forts here, full at that moment of thousands of armed Burmans, and though a large number of these filed past and laid down their arms by the king's command, still many more were allowed to disperse with their weapons; and these, in the time that followed, broke up into "dacoit" or guerilla bands, which became the scourge of the country and prolonged the war for years. Meanwhile, however, the surrender of the king of Burma was complete; and on 28th November, in less than a fortnight from the declaration of war, Mandalay had fallen, and the king himself was a prisoner, while every strong fort and town on the river, and all the king's ordnance (1861 pieces), and thousands of rifles, muskets, and arms had been taken. Much valuable and curious "loot" and property was found in the palace and city of Mandalay, which, when sold, realized about 9 lakhs of rupees (£60,000). A grant of money was divided among the troops as "prize money."

From Mandalay, General Prendergast made a bold stroke and seized Bhamo on 28th December. This was a very important move, as it forestalled the Chinese, who were preparing to claim the place. But unfortunately, although the king was dethroned and deported, and the capital and the whole of the river in the hands of the British, the bands of armed soldiery, unaccustomed to conditions other than those of anarchy, rapine, and murder, took advantage of the impenetrable cover of their jungles to continue a desultory armed resistance. Reinforcements had to be pressed into the country, and it was in this phase of the campaign, lasting several years, that the most difficult and most arduous work fell to the lot of the troops. It was in this jungle warfare that the losses from battle, sickness, and privation steadily mounted up; and the troops, both British and native, proved once again their fortitude and courage.

Various expeditions followed one another in rapid succession, penetrating to the remotest corners of the land, and bringing peace and protection to the inhabitants, who, it must be mentioned, suffered at least as much from the "dacoits" as did the troops. The final, and now completely successful, pacification of the country was only brought about by an extensive system of small protective posts scattered all over the country, and small lightly-equipped columns moving out to disperse the enemy whenever a gathering came to a head, or a pretended prince or king appeared.

No account of the third Burmese war would be complete without a reference to the first, and perhaps for this reason most notable, land advance into the enemy's country. This was carried out in November 1885 from Tounghoo, the British frontier post in the east of the country, by a small column of all arms under Colonel W. P. Dicken, 3rd Madras Light Infantry, the first objective being Ningyan. The operations were completely successful, in spite of a good deal of scattered resistance, and the force afterwards moved forward to Yamethin and Hlaindet. As inland operations developed, the want of mounted troops was badly felt, and several regiments of cavalry were brought over from India, while mounted infantry was raised locally. It was found that without these most useful arms it was generally impossible to follow up and punish the active enemy.

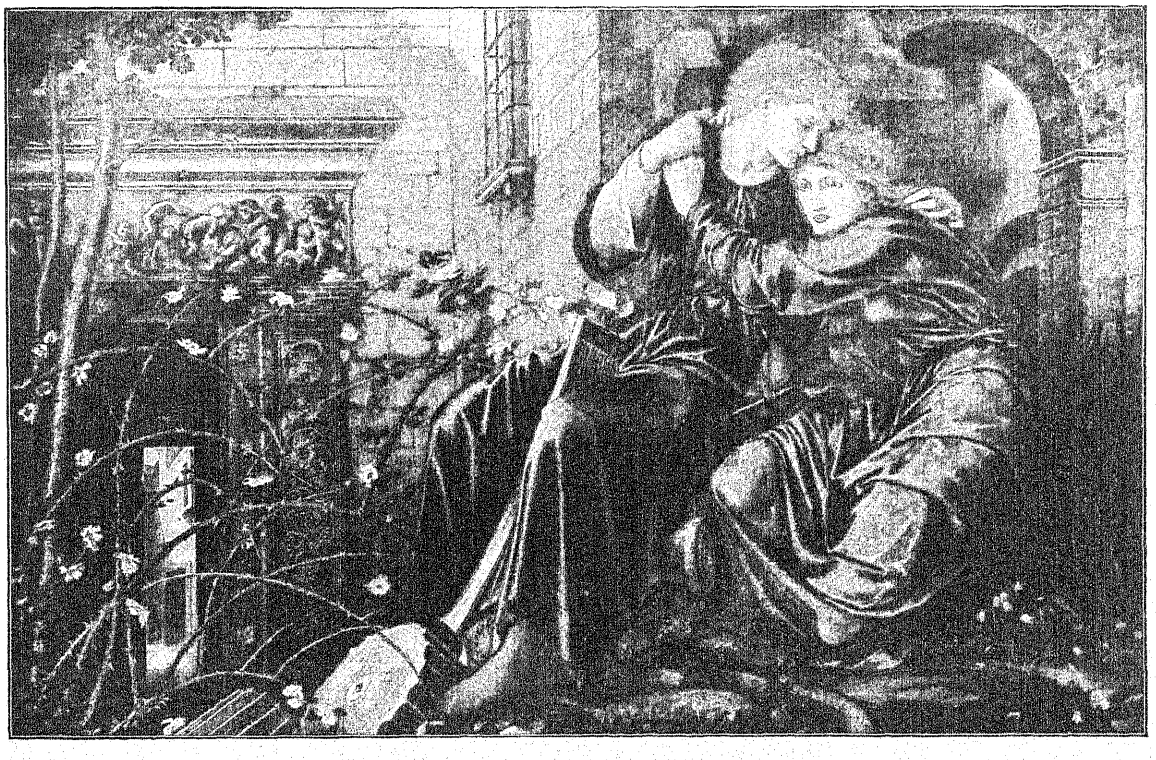
(E. P.)

Burnaby, Frederick Gustavus (1842-1885), English traveller and soldier, was born on 3rd March 1842, at Bedford, and was the son of a clergyman. Having been educated at Harrow and in Germany, he entered the Horse Guards (Blue) in 1859. During a period of peace that followed, his spirit of adventure found outlets in balloon-ascents and in travels through Spain and Russia. In the summer of 1874 he accompanied the Carlist forces as correspondent of the *Times*, but before the end of the war he was transferred to Africa to report on General (then Colonel) Gordon's expedition to the Soudan. This took Burnaby as far as Khartum. Returning to England in March 1875, he matured his plans for a journey on horseback to Khiva through Russian Asia, which had just been closed to travellers by the Government. His accomplishment of this task, in the winter of 1875-76, described in his book *A Ride to Khiva*, brought him immediate fame. His next leave of absence was spent in another adventurous journey on horseback, through Asia Minor, from Scutari to Erzerum, with the object of observing the Russian border, an account of which he afterwards published. In the Russo-Turkish war of 1877, Captain (or, as he soon became, Lieutenant-Colonel) Burnaby acted as travelling agent to the Stafford House (Red Cross) Committee, but had to return to England before the campaign was over. At this point began his active interest in politics, and in 1880 he made a vain attempt to win a seat at Birmingham in the Tory-Democrat interest. In 1882 he distinguished himself by crossing the Channel in a balloon. Having been disappointed of active service in the Egyptian campaign of 1882, he participated in the Sudan campaign of 1884 without official leave, and was wounded at El Teb. This did not deter him from a similar course when a fresh expedition started in 1885. He was given a post by Lord Wolseley, and met his death in the battle of Abu Klea (17th January).

Burne-Jones, Sir Edward Burne, BART. (1833-1898), English painter and designer, was born 28th August 1833 at Birmingham. His father was of Welsh descent, and the idealism of his nature and art has been attributed to this Celtic strain. An only son, he was educated at King Edward's School, Birmingham, and destined for the Church. He retained through life an interest in classical studies, but it was the mythology of the classics which fascinated him. He went into residence as a scholar at Exeter College, Oxford, in January 1853. On the same day William Morris entered the same college, having also the intention of taking orders. The two were thrown together, and grew close friends. Their similar tastes and enthusiasms were mutually stimulated. Burne-Jones resumed his early love of drawing and designing. With Morris he read *Modern Painters* and the *Morte d'Arthur*. He studied the Italian pictures in the University galleries, and Dürer's engravings; but his keenest enthusiasm was kindled by the sight of two works by a living man, Rossetti. One of these was a woodcut in Allingham's poems, "The Maids of Elfinmere"; the other was the water-colour, "Dante drawing an Angel," then belonging to Mr Coombe, of the Clarendon Press, and now in the University collection. Having found his true vocation, Burne-Jones, like his friend Morris, determined to relinquish his thoughts of the Church and to become an artist. Rossetti, although not yet seen by him, was his chosen master; and early in 1856 he had the happiness, in London, of meeting him. At Easter he left college without taking a degree. This was his own decision, not due (as often stated) to Rossetti's persuasion; but on settling in London, where Morris soon joined him at 17 Red Lion Square, he began to work under Rossetti's friendly instruction and encouraging guidance.

As Burne-Jones once said, he "found himself at

"The Mirror of Venus." By Sir E. Burne-Jones.



"Love among the Ruins." By Sir E. Burne-Jones.

(From Photographs by F. Hollyer, London.)

five-and-twenty what he ought to have been at fifteen." He had had no regular training as a draughtsman, and lacked the confidence of science. But his extraordinary faculty of invention as a designer was already ripening; his mind, rich in knowledge of classical story and mediæval romance, teemed with pictorial subjects; and he set himself to complete his equipment by resolute labour, witnessed by innumerable drawings. The works of this first period are all more or less tinged by the influence of Rossetti; but they are already differentiated from the elder master's style by their more facile though less intensely felt elaboration of imaginative detail. Many are pen-and-ink drawings on vellum, exquisitely finished, of which the "Waxen Image" is one of the earliest and best examples; it is dated 1856. Although subject, medium,

Sir Edward Burne-Jones.
(From a photograph by Elliott and Fry, London.)

and manner derive from Rossetti's inspiration, it is not the hand of a pupil merely, but of a potential master. This was recognized by Rossetti himself, who before long avowed that he had nothing more to teach him. Burne-Jones's first sketch in oils dates from this same year, 1856; and during 1857 he made for Bradfield College the first of what was to be an immense series of cartoons for stained glass. In 1858 he decorated a cabinet with the "Prioress's Tale" from Chaucer, his first direct illustration of the work of a poet whom he especially loved and who inspired him with endless subjects. Thus early, therefore, we see the artist busy in all the various fields in which he was to labour.

In the autumn of 1857 Burne-Jones joined in Rossetti's ill-fated scheme to decorate the walls of the Oxford Union. None of the painters had mastered the technique of fresco, and their pictures had begun to peel from the walls before they were completed. In 1859 Burne-Jones made his first journey to Italy. He visited Florence, Pisa, Siena, and other places, and appears to have found the gentle and romantic Sienese more attractive than any other school. Rossetti's influence still persisted; and its impress is visible, more strongly perhaps than ever before, in the two water-colours "Sidonia von Bork" and "Clara von Bork," painted in 1860. These little masterpieces have a directness of execution rare with the artist. In powerful characterization, combined with a decorative motive, they rival Rossetti at his best. In June of this year Burne-Jones was married to Miss Georgiana Macdonald, and settled in Bloomsbury. Five years later he moved to Kensington Square, and shortly afterwards to the Grange, Fulham, an old house with a garden, where he resided till his death. In 1862 the artist and his wife accompanied Ruskin to Italy, visiting Milan and Venice.

In 1864 he was elected an associate of the Society of Painters in Water-colours, and exhibited, among other works, "The Merciful Knight," the first picture which fully revealed his ripened personality as an artist. The next six years saw a series of fine water-colours at the same gallery; but in 1870, owing to a misunderstanding, Burne-Jones resigned his membership of the society. He was re-elected in 1886. During the next seven years, 1870-77, only two works of the painter's were exhibited. These were two water-colours, shown at the Dudley Gallery in 1873, one of them being the beautiful "Love among the Ruins," destroyed twenty years later by a cleaner who supposed it to be an oil painting, but afterwards reproduced in oils by the painter (see Plate). This silent period was however, one of unremitting production. Hitherto Burne-Jones had worked almost entirely in water-colours. He now began a number of large pictures in oils, working at them in turn, and having always several on hand. The "Briar Rose" series, "Laus Veneris," the "Golden Stairs," the "Pygmalion" series, and "The Mirror of Venus" (see Plate), are among the works planned and completed, or carried far towards completion, during these years. At last, in May 1877, the day of recognition came, with the opening of the first exhibition of the Grosvenor Gallery, when the "Days of Creation," the "Beguiling of Merlin," and the "Mirror of Venus" were all shown. Burne-Jones followed up the signal success of these pictures with "Laus Veneris," the "Chant d'Amour," "Pan and Psyche," and other works, exhibited in 1878. Most of these pictures are painted in gay and brilliant colours. A change is noticeable next year, 1879, in the "Annunciation" and in the four pictures called "Pygmalion and the Image"; the former of these, one of the simplest and most perfect of the artist's works, is subdued and sober; in the latter a scheme of soft and delicate tints was attempted, not with entire success. A similar temperance of colour marks the "Golden Stairs," first exhibited in 1880. In 1884, following the almost sombre "Wheel of Fortune" of the preceding year, appeared "King Cophetua and the Beggar Maid," in which Burne-Jones once more indulged his love of gorgeous colour, refined by the period of self-restraint. This masterpiece is now in the National collection. He next turned to two important sets of pictures, "The Briar Rose" and "The Story of Perseus," though these were not completed for some years to come. In 1886, having been elected A.R.A. the previous year, he exhibited for the only time at the Royal Academy "The Depths of the Sea," a mermaid carrying down with her a youth whom she has unconsciously drowned in the impetuosity of her love. This picture adds to the habitual haunting charm a tragic irony of conception, and a felicity of execution which give it a place apart among Burne-Jones's works. He resigned his Associateship in 1893. One of the "Perseus" series was exhibited in 1887, two more in 1888, with "The Brazen Tower," inspired by the same legend. In 1890 the four pictures of "The Briar Rose" were exhibited by themselves, and won the widest admiration. The huge tempera picture, "The Star of Bethlehem," painted for the corporation of Birmingham, was exhibited in 1891. A long illness for

some time checked the painter's activity, which, when resumed, was much occupied with decorative schemes. An exhibition of his work was held at the New Gallery in the winter of 1892-93. To this period belong several of his comparatively few portraits. In 1894 Burne-Jones was made a baronet. Ill-health again interrupted the progress of his works, chief among which was the vast "Arthur in Avalon." In 1898 he had an attack of influenza, and had apparently recovered, when he was again taken suddenly ill, and died on 17th June. In the following winter a second exhibition of his works was held at the New Gallery, and an exhibition of his drawings (including some of the charmingly humorous sketches made for children) at the Burlington Fine Arts Club.

Burne-Jones's influence has been exercised far less in painting than in the wide field of decorative design. Here it has been enormous. His first designs for stained glass, 1857-61, were made for Messrs Powell, but after 1861 he worked exclusively for Morris and Co. Windows executed from his cartoons are to be found all over England; others exist in churches abroad. For the American Church in Rome he designed a number of mosaics. Reliefs in metal, tiles, gesso-work, decorations for pianos and organs, and cartoons for tapestry represent his manifold activity. In all works, however, which were only designed and not carried out by him, a decided loss of delicacy is to be noted. The colouring of the tapestries (of which the "Adoration of the Magi" at Exeter College is the best known) is more brilliant than successful. The range and fertility of Burne-Jones as a decorative inventor can be perhaps most conveniently studied in the sketch-book, 1885-95, which he bequeathed to the British Museum. The artist's influence on book-illustration must also be recorded. In early years he made a few drawings on wood for Dalziel's Bible and for *Good Words;* but his later work for the Kelmscott Press, founded by Morris in 1891, is that by which he is best remembered. Besides several illustrations to other Kelmscott books, he made eighty-seven designs for the *Chaucer* of 1897.

Burne-Jones's aim in art is best given in some of his own words, written to a friend: "I mean by a picture a beautiful, romantic dream of something that never was, never will be—in a light better than any light that ever shone—in a land no one can define or remember, only desire—and the forms divinely beautiful—and then I wake up, with the waking of Brynhild." No artist was ever more true to his aim. Ideals resolutely pursued are apt to provoke the resentment of the world, and Burne-Jones encountered, endured, and conquered an extraordinary amount of angry criticism. In so far as this was directed against the lack of realism in his pictures, it was beside the point. The earth, the sky, the rocks, the trees, the men and women of Burne-Jones are not those of this world; but they are themselves a world, consistent with itself, and having therefore its own reality. Charged with the beauty and with the strangeness of dreams, it has nothing of a dream's incoherence. Yet it is a dreamer always whose nature penetrates these works, a nature out of sympathy with struggle and strenuous action. Burne-Jones's men and women are dreamers too. It was this which, more than anything else, estranged him from the age into which he was born. But he had an inbred "revolt from fact" which would have estranged him from the actualities of any age. That criticism seems to be more justified which has found in him a lack of such victorious energy and mastery over his materials as would have enabled him to carry out his conceptions in their original intensity. Representing the same kind of tendency as distinguished his French contemporary, Puvis de Chavannes, he was far less in the main current of art, and his position suffers accordingly. Often compared with Botticelli, he had nothing of the fire and vehemence of the Florentine. Yet, if aloof from strenuous action, Burne-Jones was singularly strenuous in production. His industry was inexhaustible, and needed to be, if it was to keep pace with the constant pressure of his ideas. Invention, a very rare excellence, was his pre-eminent gift. Whatever faults his paintings may have, they have always the fundamental virtue of design; they are always pictures. His fame might rest on his purely decorative work. But his designs were informed with a mind of romantic temper, apt in the discovery of beautiful subjects, and impassioned with a delight in pure and variegated colour. These splendid gifts were directed in a critical and fortunate moment by the genius of Rossetti. Hence a career which shows little waste or misdirection of power, and, granted the aim proposed, a rare level of real success.

AUTHORITIES.—*Catalogue to Burlington Club Exhibition of Drawings by Burne-Jones*, with Introduction by COSMO MONKHOUSE. 1899.—*Sir E. Burne-Jones: a Record and a Review.* By MALCOLM BELL. 1892.—*Sir E. Burne-Jones, his Life and Work.* By JULIA CARTWRIGHT (Mrs. Ady). 1894. *The Life of William Morris.* By J. W. MACKAIL. 1899. (L. B.)

Burnley, a poor-law township, municipal, county (1888), and parliamentary borough, and market town of Lancashire, England, on the Brun, where it is joined by the Calder, 213 miles N.W. of London by rail. In 1889 the boundaries of the borough were extended, and the borough was then distributed into 12 wards, all which in 1894 were united into one civil parish. The corporation consists of a mayor, 12 aldermen, and 36 councillors. By Act of Parliament 1890, the future rector of Burnley will be suffragan bishop of the diocese of Manchester, with the title of Bishop of Burnley. The Mechanics' Institution and School of Science (1852) was enlarged in 1888. Modern erections are 10 Established, 2 Roman Catholic, and numerous Nonconformist churches, a handsome town hall, a municipal technical school, a Victoria Hospital and infirmary (£28,000), a sanatorium for infectious diseases, a market hall, public abattoirs and cold stores, and baths. The Queen's Park (1893) measures 28, and the Scott Park (1895) 18 acres. There are, besides, 11 recreation grounds. The neighbourhood abounds in coal, and coal-mining constitutes one of the industries of Burnley. The principal industries are cotton-weaving, iron-founding, coal-mining, brick-burning, and the making of sanitary wares. The census of 1891 gives 12,240 males and 15,211 females engaged in the manufacture of cotton goods; 2087 persons engaged in coal-mining. Area of municipal and county borough, 4015 acres; population (1881), 63,339; (1891), 87,016; (1901), 97,044.

Burnside, Ambrose Everett (1824-1881), American soldier, was born at Liberty, Indiana, on 23rd May 1824, of Scottish pedigree, his American ancestors settling first in South Carolina, and next in the north-west wilderness, where his parents, who were very poor, lived in a rude log cabin. He was appointed to the United States military academy through casual favour, and graduated in 1847, when war with Mexico was nearly over. In 1852 he resigned his commission, and took up in Rhode Island the manufacture of a breech-loading rifle of his own invention. Afterwards he was engaged in railway duties. When the Civil War broke out he took command of a Rhode Island regiment of three months' militia, on the summons of Governor Sprague, hastened to the relief of the national capital, and commanded a brigade in the battle of Bull Run. On 6th August 1861 he was commissioned a brigadier-general of volunteers, and placed in charge of the expeditionary force which sailed on 12th January 1862 under sealed orders for the North Carolina coast. The victories of Hatteras Inlet, Roanoke Island, Newbern, and the neighbouring forts (February-March) furnished one of the earliest substantial achievements of the Union arms during the war. Promoted major-general on 18th May 1862, he was transferred with his corps to the army of the Potomac, and fought at South Mountain and Antietam in September. His patriotic spirit, with modest and amiable manners, made him highly popular, and upon McClellan's final displacement from the army of the Potomac, President Lincoln chose him as successor. Burnside reluctantly accepted the trust, and, after being disastrously defeated in the assault of Fredericksburg on 13th December 1862, was led to resign the command in January 1863. Transferred to Cincinnati in April 1863, he caused the arrest and court-martial of Mr Vallandigham, lately an Opposition member of Congress, for an alleged disloyal speech; then starting southwards in August with a column for the relief of loyalists in East Tennessee, he entered Knoxville, to which the Confederate general Longstreet unsuccessfully laid

siege. In April 1864 Burnside returned to the east, and was attached once more to the army of the Potomac in a subordinate command; but, after long and bloody campaigns, he was blamed for the failure of a mine assault before Petersburg, July 1864, and relieved. Resigning from the army, April 1865, he was chosen governor of Rhode Island in 1866, and twice annually re-elected. In January 1875 he was chosen to the United States Senate, and re-elected in 1880. He died at Bristol, Rhode Island, on 13th September 1881.

Burntisland, a royal, parliamentary (Kirkcaldy group), and police burgh of Fifeshire, Scotland, on the northern shore of the Firth of Forth, 5¼ miles S.W. of Kirkcaldy by rail. Since the opening of the Forth Bridge, Burntisland has ceased to be the terminus of the railway ferry traffic with the south, but having good wet docks it has still a considerable shipping trade. Population of parliamentary and police burgh (1881), 4099; of the royal burgh, 3197; of the royal, parliamentary, and police burgh (1891), 4962; (1900), 5000.

Burriana, a town of Spain, province of Castellon, on the river Bechi, near the sea, in a broad fertile plain. Population, 12,154. The river Mijares is used to irrigate the country, where wine, cereals, fruit, and especially oranges, are abundant. The port is annually visited by about 300 vessels, engaged in the coasting trade. The trade, however, declined in 1898 and 1897, owing to the damage done to the orange crop by a new insect pest. Burriana was the scene of hard fighting in the earliest wars of the 19th century.

Burrillville, a town of Providence county, Rhode Island, U.S.A. It is one of the largest towns of New England, having an area of 53 square miles. Its surface is rolling, with many small hills and ponds, and, while most of its population is rural, it contains several small villages. Population (1890), 5492; (1900), 6317.

Burroughs, John (1837———), American writer on nature and natural history, was born in Roxbury, Delaware county, New York, 3rd April 1837. In his earlier years he engaged in various pursuits—teaching, journalism, banking, farming, and fruit-raising, and for nine years was a clerk in the Treasury department at Washington. After publishing a monograph on the poetry and personality of Walt Whitman, he began in 1871, with *Wake-Robin*, that series of books on birds, flowers, and rural scenes which has made him the successor of Thoreau as a popular essayist on the plants and animals environing human life. His later writings have shown a more philosophic mood and a greater disposition towards literary or meditative allusion than their predecessors, but the general theme and method have been the same. His chief books, in addition to *Wake-Robin*, are *Birds and Poets* (1877), and *Signs and Seasons* (1886). *Winter Sunshine* (1875), and *Fresh Fields* (1884) are sketches of travel in England, Ireland, and France. A complete uniform edition of his works was issued in 1895 in ten volumes.

Burslem, a municipal borough (1878) and market town of Staffordshire, England, 20 miles N. by W. of Stafford, by rail, on the Grand Trunk Canal. Before 1885 part of the parliamentary borough of Stoke-upon-Trent, it now forms part of that of Hanley. Modern structures are two church mission rooms, two Methodist chapels, a market building, a charity hospital, a miners' hall, and public baths. The Wedgwood Memorial Institute has been extended and a public park of 22 acres opened (1894). Population (1881), 27,551; (1891), 31,999; (1901), 38,766.

Burton, Sir Frederick William (1816-1900), British painter and art connoisseur, the third son of Mr Samuel Burton of Mungret, county Limerick, was born in Ireland in 1816. He was educated in Dublin, where his artistic studies were carried on with marked success under the direction of Mr Brocas, an able teacher, who foretold for the lad a distinguished career. That this estimate was not exaggerated was proved by Burton's immediate success in his profession. He was elected an associate of the Royal Hibernian Academy at the age of twenty-one and an academician two years later; and in 1842 he began to exhibit at the Royal Academy. A visit to Germany and Bavaria in 1851 was the first of a long series of wanderings in various parts of Europe, which gave him a profound and intimate knowledge of the works of the Old Masters, and prepared him admirably for the duties that he undertook in 1874 when he was appointed director of the British National Gallery in succession to Sir W. Boxall, R.A. During the twenty years that he held this post he was responsible for many important purchases, among them Leonardo da Vinci's "Virgin of the Rocks," Raphael's "Ansidei Madonna," Holbein's "Ambassadors," Van Dyck's equestrian portrait of Charles I, and the "Admiral Pulido Pareja," by Velasquez; and he added largely to the noted series of Early Italian pictures in the gallery. The number of acquisitions made to the collection during his period of office amounts to not fewer than 500. His own work, most of which was in water-colour, may be said to have had more attraction for experts than for the general public. It was always serious and deeply considered, and in style was akin to that of the Pre-Raphaelites. He was elected an associate of the Royal Society of Painters in Water-Colours in 1855, and a full member in the following year. He resigned in 1870, and was re-elected as an honorary member in 1886. A knighthood was conferred on him in 1884, and the degree of LL.D. of Dublin in 1889. In his youth he had strong sympathy with the "Young Ireland Party," and was a close associate with some of its members. He died at his house in Kensington on 16th March 1900. (A. L. B.)

Burton, John Hill (1809-1881), Scottish historical writer and man of letters, was the son of an officer in the army, and was born at Aberdeen on 22nd August 1809. After studying at the university of his native city, he removed to Edinburgh to practise as an advocate; but his progress was slow, and he eked out his narrow means by miscellaneous literary work, much of which cannot now be identified. His *Manual of the Law of Scotland* (1839) brought him into notice; he joined Bowring in editing the works of Jeremy Bentham, and for a short time was editor of the *Scotsman*, which he committed to the cause of free trade. In 1846 he achieved high reputation by his *Life of David Hume*, based upon extensive and unused MS. material. In 1847 he wrote his biographies of Lord Lovat and Duncan Forbes, and in 1849 prepared for Chambers's Series manuals of political and of social economy, and of emigration. In the same year he lost his wife, and never again mixed freely with society, though after some years he married again. He devoted himself mainly to literature, contributing largely to the *Scotsman* and *Blackwood*, writing *Narratives from Criminal Trials in Scotland* (1852), *Treatise on the Law of Bankruptcy in Scotland* (1853), and publishing in the latter year the first volume of his *History of Scotland*, which was completed in 1870. Some of the more important of his contributions to *Blackwood* were embodied in two delightful volumes, *The Book Hunter* (1860) and *The Scot Abroad* (1862). He had in 1854 been appointed secretary to the Prison Board,

an office which gave him entire pecuniary independence, and the duties of which he discharged most assiduously, notwithstanding his literary pursuits and the pressure of another important task assigned to him after the completion of his history, the editorship of the *National Scottish Registers*. Two volumes were published under his supervision. His last work, *The History of the Reign of Queen Anne* (1880), is very inferior to his *History of Scotland*. He died on 10th August 1881. Burton was pre-eminently a jurist and economist, and may be said to have been guided by accident into the path which led him to celebrity. It was his great good fortune to find abundant unused material for his *Life of Hume*, and to be the first to introduce the principles of historical research into the history of Scotland. All previous attempts had been far below the modern standard in these particulars, and Burton's history will always be memorable as marking an epoch, even if it should one day be superseded by a more picturesque and more animated narrative. His chief defects as a historian are want of imagination, involving feebleness of historical portraiture, and an undignified familiarity of style, which, however, at least preserves his history from the dulness by which lack of imagination is usually accompanied. His dryness is associated with a fund of dry humour exceedingly effective in its proper place, as in *The Book Hunter*. As a man he was loyal, affectionate, philanthropic, and entirely estimable. (R. G.)

Burton, Sir Richard Francis (1821-1890), British consul, explorer, and orientalist, was born at Barham House, Herts, England, on 19th March 1821. He came of the Westmoreland Burtons of Shap, but his grandfather, the Rev. Edward Burton, settled in Ireland as rector of Tuam, and his father, Lieutenant-Colonel Joseph Netterville Burton, of the 36th Regiment, was an Irishman by birth and character. His mother was descended from the MacGregors, and he was proud of a remote drop of Bourbon blood piously believed to be derived from a morganatic union of the Grand Monarque. There were even those, including some of the Romany themselves, who saw gipsy written in his peculiar eyes as in his character, wild and resentful, essentially vagabond, intolerant of convention and restraint. His irregular education strengthened the inherited bias. A childhood spent in France and Italy, under scarcely any control, fostered the love of untrammelled wandering and a marvellous fluency in Continental vernaculars. Such an education so little prepared him for academic proprieties, that when he entered Trinity College, Oxford, in October 1840, a criticism of his military moustache by a fellow-undergraduate was resented by a challenge to a duel, and Burton in various ways distinguished himself by such eccentric behaviour that rustication inevitably ensued. Nor was he much more in his element as a subaltern in the 18th Regiment of Bombay Native Infantry, which he joined at Baroda in October 1842. Discipline of any sort he abhorred, and the one recommendation of the East India Company's service in his eyes was that it offered opportunities for studying Oriental life and languages. He had begun Arabic without a master at Oxford, and worked in London at Hindustani under Forbes before he went out; in India he laboured indefatigably at the vernaculars, and his reward was an astonishingly rapid proficiency in Gujarati, Marathi, Hindustani, as well as Persian and Arabic. His appointment as an assistant in the Sind survey enabled him to mix with the people, and he frequently passed as a native in the bazaars and deceived his own *munshi*, to say nothing of his colonel and messmates. His wanderings in Sind were the apprenticeship for the pilgrimage to Mecca, and his seven years in India laid the foundations of his unparalleled familiarity with Eastern life and customs, especially among the lower classes. Besides Government reports and contributions to the Asiatic Society, his Indian period produced four books, published after his return home: *Scinde, or the Unhappy Valley* (1851), *Sindh and the Races that Inhabit the Valley of the Indus* (1851), *Goa and the Blue Mountains* (1851), and *Falconry in the Valley of the Indus* (1852). None of these achieved popularity, but the account of Sind is remarkably vivid and faithful.

The pilgrimage to Mecca in 1853 made Burton famous. He had planned it whilst mixing disguised among the Muslims of Sind, and had laboriously prepared for the ordeal by study and practice. No doubt the primary motive was the love of adventure, which was his strongest passion; but along with the wanderer's restlessness marched the zest of exploration, and whilst wandering was in any case a necessity of his existence, he preferred to roam in untrodden ways where mere adventure might be dignified by geographical service. There was a "huge white blot" on the maps of Central Arabia where no European had ever been, and Burton's scheme, approved by the Royal Geographical Society, was to extend his pilgrimage to this "empty abode," and remove a discreditable blank from the map. War among the tribes curtailed the design, and his journey went no farther than Medina and Mecca. The exploit of accompanying the Muslim Hajj to the holy cities was not unique, nor so dangerous as has been imagined. Several Europeans have accomplished it before and since Burton's visit without serious mishap. Passing himself off as an Indian Pathan covered any peculiarities or defects of speech. The pilgrimage, however, demands an intimate proficiency in a complicated ritual, and a familiarity with the minutiæ of Eastern manners and etiquette; and in the case of a stumble, presence of mind and cool courage may be called into request. There are legends that Burton had to defend his life by taking others'; but he carried no arms, and confessed, rather shamefastly, that he had never killed anybody at any time. The actual journey was less remarkable than the book in which it was recorded, *The Pilgrimage to Al-Medinah and Meccah* (1855). Its vivid descriptions, pungent style, and intensely personal "note" distinguish it from books of its class; its insight into Semitic modes of thought and its picture of Arab manners give it the value of an historical document; its grim humour, keen observation, and reckless insobriety of opinion, expressed in peculiar, uncouth, but vigorous language, make it a curiosity of literature.

Burton's next journey was more hazardous than the pilgrimage, but created no parallel sensation. In 1854 the Indian Government accepted his proposal to explore the interior of the Somali country, which formed a subject of official anxiety in its relation to the Red Sea trade. He was assisted by Lieutenant Speke and two other young officers, but accomplished the most difficult part of the enterprise alone. This was the journey to Harar, the Somali capital, which no white man had entered. Burton vanished into the desert, and was not heard of for four months. When he reappeared he had not only been to Harar, but had talked with the king, stayed ten days there in deadly peril, and ridden back across the desert, almost without food and water, running the gauntlet of the Somali spears all the way. Undeterred by this experience he set out again, but was checked by a skirmish with the tribes, in which one of his young officers was killed, Captain Speke was wounded in eleven places, and Burton himself had a javelin thrust through his jaws. His *First Footsteps in East Africa* (1856), describing these adventures, is one of his most exciting and most

characteristic books, full of learning, observation, and humour.

After serving on the staff of Beatson's Bashibazouks at the Dardanelles, but never getting to the front in the Crimea, Burton returned to Africa in 1856. The Foreign Office, moved by the Royal Geographical Society, commissioned him to search for the sources of the Nile, and, again accompanied by Speke, he explored the lake regions of equatorial Africa. They discovered Lake Tanganyika in February 1858, and Speke, pushing on during Burton's illness and acting on indications supplied by him, lighted upon Victoria Nyanza. The separate discovery led to a bitter dispute, but Burton's expedition, with its discovery of the two lakes, was the incentive to the later explorations of Speke and Grant, Baker, Livingstone, and Stanley; and his report in volume xxxiii. of the *Proceedings of the Royal Geographical Society*, and his *Lake Regions of Equatorial Africa* (1860), are the true parents of the multitudinous literature of "darkest Africa." Burton was the first Englishman to enter Mecca, the first to explore Somaliland, the first to discover the great lakes that feed the Nile. His East African pioneering coincides with areas which have since become peculiarly interesting to the British Empire; and three years later he was exploring on the opposite side of Africa, at Dahomey, Benin, and the Gold Coast, regions which have also entered among the imperial "questions" of the day. Before middle age Burton had compressed into his life, as Lord Derby said, "more of study, more of hardship, and more of successful enterprise and adventure, than would have sufficed to fill up the existence of half a dozen ordinary men."

Since 1849 his connexion with the Indian army had been practically severed; in 1861 he definitely entered the service of the Foreign Office as consul at Fernando Po, whence he was shifted successively to Santos in Brazil (1865), Damascus (1869), and Trieste (1871), holding the last post till his death on 20th October 1890. Each of these posts produced its corresponding books: Fernando Po led to the publishing of *Wanderings in West Africa* (1863), *Abeokuta and the Cameroons* (1863), *A Mission to Gelele, king of Dahomé* (1864), and *Wit and Wisdom from West Africa* (1864). The *Highlands of the Brazil* (1869) was the result of four years' residence and travelling; and *Letters from the Battlefields of Paraguay* (1870) relate to a journey across South America to Peru. Damascus suggested *Unexplored Syria* (1872), and might have led to much better work, since no consulate in either hemisphere was more congenial to Burton's taste and linguistic studies; but he mismanaged his opportunities, got into trouble with the Foreign Office, and was removed to Trieste, where his Oriental prepossessions and prejudices could do no harm, but where, unfortunately, his Oriental learning was thrown away. He did not, however, abandon his Eastern studies or his Eastern travels. Various fresh journeys or revisitings of familiar scenes are recorded in his later books, such as *Zanzibar* (1872), *Ultima Thule* (1875), *Etruscan Bologna* (1876), *Sind Revisited* (1877), *The Land of Midian* (1879), and *To the Gold Coast for Gold* (1883). None of these had more than a passing interest. Burton had not the charm of style or imagination which gives immortality to a book of travel. He wrote too fast, and took too little pains about the form. His blunt, disconnected sentences and ill-constructed chapters were full of information and learning, and contained not a few thrusts for the benefit of Government or other people, but they were not "readable." There was something ponderous about his very humour, and his criticism was personal and savage. By far the most celebrated of all his books is the translation of the "Arabian Nights" (*The Thousand Nights and a Night*, 16 vols., privately printed, 1885-88), which occupied the greater part of his leisure at Trieste. As a monument of his Arabic learning and his encyclopaedic knowledge of Eastern life this translation was his greatest achievement. It is open to criticism in many ways; it is not so exact in scholarship, nor so faithful to its avowed text, as might be expected from his reputation; but it reveals a profound acquaintance with the vocabulary and customs of the Muslims, with their classical idiom as well as their vulgarest "Billingsgate," with their philosophy and modes of thought as well as their most secret and most disgusting habits. Burton's "anthropological notes," embracing a wide field of pornography, apart from questions of taste, abound in valuable observations based upon long study of the manners and the writings of the Arabs. The translation itself is often marked by extraordinary resource and felicity in the exact reproduction of the sense of the original; Burton's vocabulary was marvellously extensive, and he had a genius for hitting upon the right word; but his fancy for archaic words and phrases, his habit of coining words, and the harsh and rugged style he affected, detract from the literary quality of the work without in any degree enhancing its fidelity. With grave defects, but sometimes brilliant merits, the translation holds a mirror to its author. He was, as has been well said, an Elizabethan born out of time; in the days of Drake his very faults might have counted to his credit. Of his other works, *Vikram and the Vampire, Hindu Tales* (1870), a translation of *The Lusiads of Camoens* (1880), and a history of his favourite arm, *The Book of the Sword* (vol. i. 1884, unfinished), may be mentioned. A manuscript translation of the "Scented Garden," from the Arabic, was burnt by his widow, acting in what she believed to be the interests of her husband's reputation. Burton married Isabel Arundell in 1861, and owed much to her courage, sympathy, and passionate devotion. Her romantic and exaggerated biography of her husband, with all its faults, is one of the most pathetic monuments which the unselfish love of a woman has ever raised to the memory of her hero. Another monument is the Arab tent of stone and marble which she built for his tomb at Mortlake.

Besides Lady Burton's *Life of Sir Richard F. Burton*, 2 vols., 1893, 2nd edition, condensed, edited, with a preface, by W. H. Wilkins, 1898, there are *A Sketch of the Career of R. F. Burton*, by A. B. Richards, Andrew Wilson, and St Clair Baddeley (1886); *The True Life of Captain Sir Richard F. Burton*, by his niece, G. M. Stisted (1896); and a brief sketch by the present writer prefixed to Bohn's edition of the *Pilgrimage to Al-Medinah and Meccah* (1898), from which some sentences have here been by permission reproduced. (S. L.-P.)

Burton-upon-Trent, a municipal (1878) and county borough (1901) in the Burton parliamentary division of Staffordshire, and the Southern parliamentary division of Derbyshire, England, on the Midland, London and North-Western, North Staffordshire, and Great Northern railways. Recent structures are two Established churches, new buildings for the Roman Catholic church, Wesleyan and Baptist chapels, a bridge over the Trent, constructed at Lord Burton's expense, and a market hall. The municipal buildings have been presented by Lord Burton to the corporation, which has purchased the ferry rights over the Trent. There are eight recreation grounds. At Burton there are about twenty firms of brewers, representing nearly one-tenth of the brewing trade of the United Kingdom. The premises of Bass's brewery extend over 500 acres, and contain 17 miles of railway directly connected with outer railway systems. The brewery at Burton employs about 3500 men and boys. The total annual barrelage for 1901 exceeded a million and a half, of which the largest part was pale

ale. Allsopp's breweries, cooperages, maltings, &c., at Burton, cover an area of 43 acres, exclusive of land for water-beds, and they employ about 1300 hands. Area, 4025 acres. Population (1881), 39,288; (1891), 46,047; (1901), 50,386; of parliamentary division (1891), 58,640; (1901), 61,787.

Burtscheid, a town of Prussia, in the Rhine province. See AIX-LA-CHAPELLE.

Buru (Dutch, *Boeroe* or *Boeloe*), an island of the East Indian archipelago, belonging to the residency of Amboyna, between 3° 4′ and 3° 50′ S. lat., and 125° 58′ and 127° 15′ E. long. Area, 3396 square miles. The chief geological formations are crystalline slate near the north coast, and more to the south Mesozoic sandstone and chalk, deposits of rare occurrence in the archipelago. Lake Wakolo, altitude 2200 feet, is not a crater lake, but is situated at the junction of the sandstone and slate, where the water, having worn away the former, was accumulated by the latter. The lake has no affluents and only one outlet, the Wai Nibe to the north. The island is divided into two districts. Timber is the only export in addition to cajeput oil. The total population is estimated at 10,000.

Burujird, a province of Persia, bounded on the W. by Luristán, on the N. by Nehávend and Maláyir, on the E. by Irák, and on the S. by Isfahán. It is divided into the following administrative divisions, town of Burújird with villages in immediate neighbourhood; Silákhor (upper and lower); Jápalak (with Sar-lek and Burbarúd); nomad Bakhtiári. It has a population of about 250,000 or 300,000, and pays a yearly revenue of about £16,000. It is very fertile and produces much wheat, barley, and rice, also some opium. With improved means of transport, which would allow the growers to export, the produce of cereals could easily be trebled. BURÚJIRD, the capital, is situated in the fertile Silákhor plain on the river Tahíj, a tributary of the Dizful or Ab i Diz (which flows to the Persian Gulf), in 33° 55′ N. lat. and 48° 55′ E. long, at an elevation of 5315 feet. It is 70 miles by road from Hamadan, and 212 miles from Isfahán. It has a population of about 25,000, and manufactures various cotton stuffs (coarse prints, carpet covers) and felts (principally saucepan-shaped hats for Lurs and Bakhtiári), of which considerable quantities are exported. It has telegraph and post offices.

Bury, a civil parish, municipal (1876), county (1888), and parliamentary borough, and market town of Lancashire, England, on the Irwell, about 2 miles from its confluence with the Roach, 188 miles by rail N.N.W. of London. It is situated on the Manchester, Bury, and Bolton Canal. The corporation consists of a mayor, 10 aldermen, and 30 councillors. Modern erections include an Established church, a Roman Catholic church, the town hall, an art gallery and public library, a hospital, a technical school (£22,000), the Textile Operatives' Hall, a theatre, new markets and abattoirs. There are 5 recreation grounds, formed since 1886. Electric lighting has been introduced. In 1891 there were 3466 males and 7240 females engaged in the manufacture of cotton goods; 698 males and 131 females in calico printing, dyeing, and bleaching; 1377 males and 3 females in the iron and steel manufacture. Area of municipal and county borough, 5836 acres; population (1881), 54,717; (1891), 57,212; (1901), 58,028.

Bury St Edmunds, a municipal and parliamentary borough—coextensive and now returning one member—of Suffolk, England, 26 miles N.W. of Ipswich by rail, on the river Lark and the Great Eastern railway. New grammar-school buildings have been erected and the Lathbury Institute has been established. The Church Schools Company has a good school here. The corporation owns the waterworks, which have recently been extended. The town is well lighted by electricity. Area, 2394 acres; population (1881), 16,111; (1901), 16,255.

Busch, Julian Hermann Moritz (1821-1900), German writer, was born in Dresden. He studied theology in Leipzig, being destined for the ministry, but from 1847 devoted himself entirely to journalism and literature. After the revolution he went to America, but soon returned to Germany, and published an account of his travels. During the next years he travelled extensively in the East, writing numerous books on Egypt, Palestine, &c. From 1856 he was employed on the *Grenzboten*, one of the most influential German periodicals, which, under the editorship of Gustav Freytag, had become the organ of the Nationalist party. In 1864 he became closely connected with the Augustenburg party in Schleswig-Holstein, but after 1866 he transferred his services to the Prussian Government, and was employed in a semi-official capacity in the newly-conquered province of Hanover. From 1870 onwards he was one of Bismarck's press agents, and was at the chancellor's side in this capacity during the whole of the campaign of 1870-71. In 1878 he published the first of his works on Bismarck—a book called *Bismarck und seine Leute*, in which, under the form of extracts from his diary, he gave an account of the chancellor's life during the war. The vividness of the descriptions and the cleverness with which the conversations were reported insured a success, and the work was translated into several languages. This was followed in 1885 by another book, *Unser Reichskanzler*, chiefly dealing with the work in the Foreign Office in Berlin. After Bismarck's death there appeared, this time in England, a work entitled, *Bismarck: some Secret Pages of his History*, in which was reprinted the whole of the earlier works, but which contains in addition a considerable amount of new matter, passages from the earlier works which had been omitted because of the attacks they contained on people in high position, records of later conversations, and some important letters and documents which had been entrusted to him by Bismarck. Many passages were of such a nature that it could not be safely published in Germany, but in 1899 a German edition appeared differing considerably from the English editions.

Buschtiehrad, a market town in Bohemia, Austria, about 10 miles N.W. of Prague, the centre of extensive coal-fields, formerly the private property of the emperor of Austria. There is also an imperial brewery, which produces about 20,000 hectolitres of beer annually, and an imperial chateau. Population (Czech) (1890), 3267; (1900), 3510.

Bush.—This term is Anglicized from the French word *bouche*, and is used in mechanics for designating the internal pipe or lining frequently used in connexion with a wheel or pulley; or it may be used with reference to a pipe inserted in a plate frame or cast bracket, in order to form a bearing for a shaft to rotate in.

Bushes are employed because it is found that frictional surfaces, if made of dissimilar metals, work together with less loss in friction and with much less risk of abrasion. Mild steel plate is now in very general use for structural purposes, and spindles and shafting used in connexion therewith are similarly made of mild steel. This material, however, abrades very readily; and it is the invariable custom with good work to bush or line the holes forming bearings with bronze or other metal than mild steel. In the case of wheels and axles, the wheels are bushed with a metal liner dissimilar to that of which the axle is made; and hard cast steel, cast iron, hard or soft bronzes, or white metal are variously used in cases where the

axle is of mild steel or wrought iron. White metal or Babbitt's metal (an alloy of tin, copper, and antimony, with a large percentage of tin) is used for bushing; it has a low melting-point, and may be cast about the shaft of which it is to form a bearing.

Bushire, or BANDER BUSHIRE, a town of Persia, on the coast of Fars, situated in 28° 59′ N. lat. and 50° 49′ E. long. The name should be pronounced Boosheer and not Bew-shire; modern Persians write it Búshehr, and, yet more incorrectly, Abúshehr, and translate it as "father of the city," but it is most probably a contraction of Bokht-ardashír, the name given to the place by the first Sassanian monarch in the 3rd century (*vide* Noeldeke's translation of Ardashir Papakán's *Karnamek*). In a similar way Rív-ardashir has become Rishire (Reesheer). In the first half of the 18th century, when Bushire was an unimportant fishing village, it was selected by Nadir Shah as the southern port and dockyard of the navy which he aspired to create in the Persian Gulf, and soon afterwards the British commercial factory of the East India Company, established at Gombrún, the modern Bander Abbási, was transferred to it. At the beginning of the 19th century it had a population of 6000 to 8000, and it is now the most important port in the Persian Gulf, with a population of about 25,000. It used to be a port of Fars, but it is now the seat of the governor of the Persian Gulf ports, who is responsible to the central Government, and has under his jurisdiction all the ports of the Gulf and the districts along the coast. The following table shows the value of the exports and imports from and to Bushire in thousands of pounds, and the shipping entered and cleared at the port in thousands of tons, as given in British consular reports:—

Year.	Exports.		Imports.		Total Tonnage.		British Tonnage.	
	Total.	British.	Total.	British.	Entered.	Cleared.	Entered.	Cleared.
1885	586	204	791	728	113	111	102	100
1890	720	298	1268	1183	114	114	109	108
1895	529	226	1017	928	189	182	173	164
1896	440	183	788	624	166	144	135	126
1897	393	173	1145	982	114	113	100	98
1898	427	188	843	632	112	97	99	85
1899	529	174	917	667	149	131	124	108

Bushmen, or BOSJESMANS.—Some of the statements made in the earlier article on these aborigines of South Africa (*Ency. Brit.* vol. iv. pp. 575-6) require to be supplemented in the light of recent research. Ethnologists no longer speak of any resemblance to the Mongolians, except perhaps in the prominence of the cheek-bones, and the yellowish or yellowish-brown colour of the skin. In all other respects the difference between the two races is fundamental, while the complexity of the physical and mental characters seems rather to point to an original connexion between the under-sized Bushmen and the distinctly dwarfish Negritoes scattered in small groups over the forest tracts of the Congo and Ogowe basins. Dr Ludwig Wolf (*Im innern Afrikas*, pp. 258-61), one of the latest and most careful observers, has little doubt that both groups are surviving fragments of a primeval pigmy Negroid stock, which is to be regarded as the true autochthonous element in equatorial and South Africa. Whatever differences are now observable may readily be explained by the different environments—hot, moist woodlands in the north; hot, dry steppe lands in the south. This generalization is supported by the now established former widespread diffusion of the Bushman race, which has been traced as far north as the Nyasa and Tanganyika basins, where the Bushman and Negrito domains must have been contiguous in prehistoric times. "It would seem," writes Sir H. H. Johnston (*British Central Africa*, p. 52), "as if the earliest known race of man inhabiting what is now British Central Africa was akin to the Bushman-Hottentot type of negro. Rounded stones with a hole through the centre, similar to those which are used by the Bushmen in the south for weighting their digging-sticks (the *graaf stock* of the Boers), have been found at the south end of Lake Tanganyika." Nor is any difficulty presented by the character of the tufted woolly hair of the Bushmen, which has no intermediate bald spaces, as was formerly supposed, but is evenly distributed over the scalp, like that of the Negritoes, and is also invariably of the same intensely black colour. The assumed "peppercorn" type of hair growing in isolated tufts is based on a misconception; and although it has been made a racial character by Fr. Müller and some other distinguished anthropologists, more careful observation has shown that it is not found amongst any known races.

A transition between the Bushmen and the Congo Negritoes seems to be presented by the hitherto little known *Vaalpens*, who still survive in small groups about the middle Limpopo river, the Zoutpansberg, and perhaps some other districts of North Transvaal. More degraded even than the lowest of the Bushmen, the Vaalpens are so called by the Boers from the dusty look of their bodies, due to their habit of crawling like burrowing animals into their underground dwellings. But the true colour is a pitch black, apparently of a deeper shade than that of the Wolofs or any other negro race. In height the men average about 4 feet, *i.e.*, somewhat less than the shortest Bushmen, and a little more than the shortest Negritoes described by Wolf and Emin Pasha. Socially the Vaalpens, who are the "dogs," or "carrion-birds," of the surrounding Bantu peoples, occupy a lower position perhaps even than the Fuegians, or the extinct Tasmanians. A feeble, harmless folk, they are described as the very dregs of humanity, living in holes, caves, or rock-shelters, without clothes except the kaross, or implements of any kind beyond those procured from others in exchange for skins, ivory, or ostrich feathers. In return for menial services rendered to the Boers, they are thankful for the offal of the game or other animals they may have helped to skin. They form small family groups of thirty or forty under a chief or patriarch, whose functions are purely domestic, as must be the case where there are no arts, industries, or religion of any kind, nothing but a knowledge of fire with which to cook their meals, often consisting of the aged or infirm members of the family circle. Intercourse with the surrounding populations is carried on by signs, nobody having any knowledge of their speech, which would appear to be scarcely articulate, or at least so full of clicks as to be incapable of expression by any clear phonetic system. Hence it is impossible to say whether the Vaalpens possess any folklore or other oral literature analogous to that of their more advanced Bushman neighbours. Some idea of the astonishing wealth of this Bushman literature may be formed from the fact that the materials collected by Bleek, and now preserved in Sir George Grey's library at Cape Town, form eighty-four stout MS. volumes of 3600 pages. They comprise myths, fables, legends, and even poetry, with tales about the sun and moon, the stars, the crocodile, and other animals; legends of peoples who dwelt in the land before the Bushmen arrived from the north; songs, charms, and even prayers, or at least incantations; histories, adventures of men and animals; tribal customs, traditions, superstitions, and genealogies. It is largely owing to this copious folklore literature, taken in connexion with their astonishing power of pictorial delineation, that the Bushmen are often regarded as a race which, owing to adverse circumstances, has fallen from a higher cultural plane, whereas the Vaalpens represent, on the contrary, a state of arrested development analogous to that of the Samangs and other Negritoes of the Malay Peninsula.

See MARK HUTCHINSON. "Bushman Drawings," in *Jour. Anthrop. Instit.* 1882, p. 464.—Rev. J. MACKENZIE. *Blue Book*, 1885, p. 63.—Sir H. H. JOHNSTON. *Jour. Anthrop. Inst.* 1883, p. 468.—Dr H. WELCKER. *Archiv. f. Anthrop.* xvi.—G. BERTIN. "The Bushmen and their Language," *Jour. R. Asiat. Soc.* xviii. Part I.—GUSTAV FRITSCH. *Die Eingeborenen Süd-afrikas*. Breslau, 1872.—W. H. J. BLEEK. *Bushman Folklore*, 1875.—J. L. P. ERASMUS. *The Wild Bushman*, MS. note, 1899.

(A. H. K.)

Busk, George (1808-1886), British surgeon and biologist, was born at St Petersburg in 1808. He studied surgery in London, both at St Thomas's and St Bartholomew's hospitals, and was an excellent operator. He was appointed assistant-surgeon to the Greenwich Hospital in 1832, and served as naval surgeon first in the *Grampus*, and afterwards for many years in the *Dread-*

nought; but subsequently, on retiring from active work in this capacity with the highest reputation, he devoted himself to the study of biology. Sir William MacCormac, in his volume on the *Centenary of the College of Surgeons* (1900), declared that the progress of biology and anthropology in the 19th century must ever be connected to a large extent with the name of Busk. From 1856 to 1859 he was Hunterian professor of Comparative Anatomy and Physiology, and after occupying other important posts in the Royal College of Surgeons he became president in 1871. He was a fellow of all the principal scientific societies, and president of several; and he received the Royal Society's Royal medal and the Geological Society's Wollaston and Lyall medals. Among his literary contributions the most notable were his valuable papers on *Extinct Elephants in Malta*, and *Teeth of Ungulates;* and he was joint translator of Kölliker's *Manual of Histology*, and Wall's *Rudiments of Pathological Histology*. He was also first Government inspector under the Vivisection Act, and held the post till 1885, performing its duties with conspicuous tact and impartiality. He was a patient and cautious investigator, full of knowledge, and unaffectedly simple in character. He died on 12th August 1886.

Busken-Huet, Conrad (1826-1886), Dutch literary critic, was born at the Hague on the 28th December 1826. He was trained for the Church, and, after studying at Geneva and Lausanne, was appointed pastor of the Walloon Chapel in Haarlem in 1851. In 1863 conscientious scruples obliged him to resign his charge, and Busken-Huet, after attempting journalism, went out to Java in 1868 as the editor of a newspaper. Before this time, however, he had began his career as a polemical man of letters, although it was not until 1872 that he was made famous by the first series of his *Literary Fantasies*, a title under which he gradually gathered in successive volumes all that was most durable in his work as a critic. His one novel, *Lidewijde*, was written under strong French influences. Returning from the East Indies, Busken-Huet settled for the remainder of his life in Paris, where he died in April 1886. For the last quarter of a century he had been the acknowledged dictator in all questions of Dutch literary taste. Perfectly honest, desirous to be sympathetic, widely read, and devoid of all sectarian obstinacy, Busken-Huet introduced into Holland the light and air of Europe. He made it his business to break down the narrow prejudices and the still narrower self-satisfaction of his countrymen, without endangering his influence by a mere effusion of paradox. He was a brilliant writer, who would have been admired in any language, but whose appearance in a literature so stiff and dead as that of Holland in the 'fifties was dazzling enough to produce a sort of awe and stupefaction. The posthumous correspondence of Busken-Huet has been published, and adds to our impression of the vitality and versatility of his mind. (E. G.)

Bussa. See NIGERIA.

Bute, an insular county of S.W. Scotland, situated in the Firth of Clyde, between Ayrshire on the E. and Argyllshire on the N. and W. There are seven islands —Bute, Arran, the two Cumbraes, Holy Isle, Pladda, and Inchmarnock.

Area and Population.—According to the last official estimate, the area of the county is 140,307 acres, or about 220 square miles (of the island of Arran alone, 163 square miles). The population was in 1881, 17,666; in 1891, 18,404, of whom 8211 were males and 10,193 females; in 1901 it was 18,786. Taking the land area only (139,432 acres, or 217·9 square miles), the number of persons per square mile in 1891 was 84, and the number of acres to the person 7·6. In the registration county the increase of population between 1881 and 1891 was 4·3 per cent. Between 1881 and 1891 the excess of births over deaths was 688, and the increase of the resident population 747. The following table gives particulars of births, deaths, and marriages in 1880, 1890, and 1899:—

Year.	Deaths.	Marriages.	Births.	Percentage of Illegitimate.
1880	353	93	471	7·0
1890	370	85	387	6·20
1899	341	105	388	5·7

The birth-rate and marriage-rate are below, and the death-rate is above, the rates for Scotland. The following table gives the birth-rate, death-rate, and marriage-rate per thousand of the population for a series of years:—

	1880.	1881-90.	1890.	1891-98.	1899.
Birth-rate . .	26·79	24·25	21·10	20·39	20·43
Death-rate . .	20·08	20·43	20·17	18·57	17·95
Marriage-rate .	5·29	4·73	4·63	4·44	5·53

The number of Gaelic-speaking persons in the county in 1891 was 3482, of whom 29 spoke Gaelic only, and there were 7 foreigners. Valuation in 1889-90, £67,821; 1899-1900, £74,489.

Administration.—The county returns a member to parliament. Rothesay (9323) is the only royal burgh, but its constituency is merged in that of the county. There are 6 civil parishes forming the Bute Combination, and the number of paupers and dependants in September 1899 was 323. Bute forms a sheriffdom with Renfrewshire, and there is a resident sheriff-substitute at Rothesay, who sits also at Millport and Brodick periodically.

Education.—Six school boards manage 20 schools, with an average attendance of 2277 in 1898-99, and there is one Roman Catholic school with an average attendance of 172. The only secondary school is Rothesay Academy. The county council subsidizes technical education in agriculture both at Glasgow and at Kilmarnock, and supports itinerant lecturers on the subject.

Agriculture.—In 1898, 18·3 per cent. of the land was under cultivation; 3806 acres were under wood in 1895. Oats are the staple corn crop, and potatoes are grown on a considerable scale. The following table gives the principal acreages at intervals of five years from 1880:—

Year.	Area under Crops.	Corn Crops.	Green Crops.	Clover.	Permanent Pasture.	Fallow.
1880	25,214	5794	2904	6284	10,206	26
1885	25,115	5402	2656	6651	10,357	49
1890	25,513	5406	2484	9460	5,991	134
1895	25,605	5395	2606	8662	8,763	116
1899	25,728	5223	2614	8305	9,407	96

The following table gives particulars of the live stock during the same years:—

Year.	Total Horses.	Total Cattle.	Cows or Heifers in Milk or Calf.	Sheep.	Pigs.
1880	1177	7652	3230	42,425	620
1885	1073	8454	3343	40,343	859
1890	1251	9347	3683	50,449	906
1895	1443	9539	3838	49,219	887
1899	1277	9751	3857	47,897	621

At the date of the last return there were 604 holdings in the county, of an average size of 42 acres; 17·05 per cent. did not exceed 5 acres, 61·76 per cent. were between 5 and 50 acres, and 21·19 above 50. There were 51 farms between 50 and 100 acres, 68 between 100 and 300, only 7 between 300 and 500, and 2 above 500. According to the census of 1891 there were 1395 men and 141 women in the county engaged in agriculture.

Industries and Trade.—Seed-growing is an extensive and growing industry, and the only other industry is fishing. The Rothesay fishery district includes all the creeks of Bute and a few in Argyll and Dumbarton, while the Cumbraes are included in the Greenock district. The following table gives particulars of the Rothesay district:—

Year.	Boats.			Value of Gear.	Resident Fishermen and Boys.	Total Value of all Fish.
	No.	Tons.	Value.			
1890	232	912	£4213	£6353	430	£17,288
1898	228	532	3262	3169	268	6,113
1899	226	529	3241	3102	298	8,605

The herring fishing begins in June, and white fishing is prose

cuted at one or other of the creeks all the year round. Many of the fishermen find employment during the season on the Clyde yachts, Rothesay being one of the chief centres of this sport. An export and import trade in agricultural produce and fish and miscellaneous goods respectively is carried on between the Bute ports of Rothesay, Millport, Brodick and Lamlash, and Greenock, Gourock, Wemyss Bay and Ardrossan on the mainland, and there is regular steamer communication between these ports all the year round, the traffic reaching enormous dimensions in summer.

See J. Wilson. *Account of Rothesay and Bute.* Rothesay, 1848. —John E. Reid. *History of the County of Bute.* Glasgow, 1864. —J. K. Hewison. *History of Bute.* 1894-95.—*Bute in the Olden Time.*—J. Roger. *Ancient Monuments in the Church of St Mary, Rothesay.* Soc. of Antiq. Edinb., 1848.—J. Thoms. *Rothesay Castle.* Rothesay, 1870. (W. Wa.)

Butler, a borough of Pennsylvania, U.S.A., capital of Butler county, situated 31 miles N. of Pittsburg, at an altitude of 1008 feet. It is entered by three railways —the Pennsylvania; the Pittsburg and Western; and the Pittsburg, Butler, and Lake Erie. It is prominent in the manufacture of glass, using natural gas for fuel. Population (1880), 3163; (1900), 10,853.

Butler, Benjamin Franklin (1818-1893), American lawyer and politician, was born in Deerfield, N.H., on 5th November 1818, and died in Washington, D.C., on 11th January 1893. He early attained distinction as a lawyer in criminal cases. At different times he was a member of each branch of the Massachusetts legislature, and in 1860 he was an unsuccessful candidate for the governorship of the state. Shortly after the beginning of the Civil War he became major-general, and was in command at Fort Monroe. When the return of some slaves that had come within his lines was demanded, he declined to comply on the ground that they were contraband of war. This was a new and important, as well as amusing, application of the term. He captured forts on the coast of North Carolina in August 1861, and, after Farragut's successful movements at New Orleans, Butler took possession of that city on 1st May 1862. In the administration of its affairs he showed much vigour and some severity. His famous order stating that women insulting Federal soldiers should be treated as women of the town, was misrepresented at the South and misunderstood abroad, and Jefferson Davis declared him an outlaw. Butler's seizure of $800,000, which had been deposited in the office of the Dutch consul, led to his displacement. Afterwards he was in command of the department of Virginia and North Carolina, but in 1864 he was removed by General Grant. He was Representative in Congress from 1867 until 1879, except the years 1875-77. He was one of the members appointed by the House of Representatives to conduct the impeachment trial of President Johnson. In 1882 the Democrats elected him as Governor of Massachusetts. In 1884 he was an unsuccessful candidate of the Greenback and Antimonopoly parties for the Presidency.

Butt, Isaac (1813-1879), Irish lawyer and Nationalist leader, was born at Stranorlar, Donegal, in 1813, his father being the local Episcopalian rector. Having won high honours at Trinity, Dublin, he was appointed professor of political economy in 1836. In 1838 he was called to the bar, and not only soon obtained a good practice, but became known as a politician on the Protestant Conservative side, and an opponent of O'Connell. In 1844 he was made a Q.C. He figured in nearly all the important Irish law cases for many years, and was engaged in the defence of Smith O'Brien in 1848, and of the Fenians between 1865 and 1869. In 1852 he was returned to Parliament by Youghal as a Liberal-Conservative, and retained this seat till 1865; but his views gradually became more liberal, and he drifted away from his earlier opinions. His career in Parliament was marred by his irregular habits, which resulted in pecuniary embarrassment, and between 1865 and 1870 he returned again to his work at the law courts. The result, however, of the disestablishment of the Irish Church was to drive Butt and other Irish Protestants into union with the Nationalists, who had always repudiated the English connexion; and on 19th May 1870, at a large meeting in Dublin, Butt inaugurated the Home Rule movement in a speech demanding an Irish parliament for local affairs. On this platform he was elected in 1871 for Limerick, and found himself at the head of an Irish Home Rule party of fifty-seven members. But it was an ill-assorted union, and Butt soon found that he had little or no control over his more aggressive followers. He had no liking for violent methods or for "obstruction" in Parliament; and his leadership gradually became a nullity. His false position undoubtedly assisted in breaking down his health, and he died in Dublin on 5th May 1879.

Butte, the largest city of Montana, U.S.A., and capital of Silver Bow county. It is situated in 46° 00′ N. lat. and 112° 32′ W. long., in the valley of Deer Lodge river, near its head, at an altitude of 5544 feet. It is entered by four railways—the Northern Pacific; the Great Northern; the Montana Central; and the Butte, Anaconda, and Pacific. It is the centre of the greatest copper-mining region on the globe; the surrounding hills are honeycombed with mines, and the city contains large smelting works. The annual output of copper from this district is usually almost one-half that of the whole United States. The assessed valuation of real and personal property in 1900, on a basis of assessment of about 60 per cent. of full value, was $18,989,200, the tax rate $26 per $1000, and the net debt $585,487. Population (1880), 3363; (1890), 10,723; (1900), 30,470, of whom 20,260 were native-born and 10,210 foreign-born.

Butterflies. See Insects.

Buturlinovka, or Petrovskoye, a village of Russia, government of Voronezh, district and 28 miles S.E. of Bobrov, on the great highway to Saratov. Its inhabitants are engaged in the leather industry, have twenty tanneries, and prepare a considerable amount of sheep-skins and boots exported to the Don and the Black Sea provinces. Population, 23,400.

Buxton, a market town and fashionable watering-place in the High Peak parliamentary division of Derbyshire, England, 36 miles N.W. by N. of Derby by rail, at an elevation of 1000 feet. Its popularity has been more than maintained, and it is calculated that the average annual number of people visiting the town to take the waters is nearly 63,000. Especially has there been, of late years, a steady increase in the number of winter visitors. In 1894 the duke of Devonshire erected a handsome pump-room at St Anne's Well, and the main baths are replete with every modern convenience. The old parish church has been restored, another enlarged, and the Devonshire Hospital extended. About 3000 poor people are now treated annually with the waters at this hospital, the dome over one of the buildings of which, it may be noted, has a circumference greater than that of any other dome in Europe. Public gardens, 23 acres in area, have been provided, with a pavilion and concert hall, a theatre, and reading- and other rooms. Electric lighting has been introduced, and there is an excellent golf-course. Buxton has become an important centre for horse-breeding, and a large horse fair is held annually. Area of urban district (constituted 1894), 1275 acres; population (1881), 6021; (1891), 7540; (1901), 10,179.

Buzeu, a town in Rumania, chief town of the district of the same name, 80 miles from Bucarest. It is the residence of an orthodox archbishop, and has a court of first instance, a seminary, and gymnasium. The cathedral was erected in 1740 by Prince Mathieu Bassaraba on the ruins of the old church built *circa* 1500 by Radu the Great. In the neighbourhood are many interesting monasteries. Population (1900), 21,561.

Byelostok (Polish, *Białystok*), a district town of West Russia, government and 57 miles by rail S.W. of Grodno, on the main line to Warsaw, at its junction with the Kieff-Graevo (Prussian frontier) line, and having a branch to Baranowiczi. Founded in 1320, it became part of Prussia after the third partition of Poland, but was annexed to Russia in 1807, after the Peace of Tilsit. Its development dates from 1845, when woollen-mills were built close by. Since that time it has grown very rapidly, its population being 13,787 in 1857, 56,629 in 1889, and 63,927 in 1897. Its sixty-eight woollen, four silk, and one felt hat factories give occupation to several thousand workers, most of whom live in its populous suburbs.

Byeltsy, a district town of Russia, government of Bessarabia, 83 miles N.W. of Kishineff, connected by rail with both Odessa and Nowoselitsy on the Austrian frontier. It is the main centre of the region for trade in cattle and horses exported from the south and south-east to Poland, Austria, Rumania, and partly Prussia. Population, 18,526.

Byrd, William (1543-1623), English musical composer (whose work has not been properly appreciated till recent years), was probably a member of one of the numerous Lincolnshire families of the name who were to be found at Lincoln, Spalding, Pinchbeck, Moulton, and Epworth in the 16th century. According to Wood, he was "bred up to musick under Thomas Tallis." He was appointed organist of Lincoln Cathedral about 1563, and on 14th September 1568 was married at St Margaret in the Close to Ellen or Julian Birley. His eldest son, Christopher, was baptized at the same church 18th November 1569. On 22nd February 1569 he was sworn in as a member of the Chapel Royal, but he does not seem to have left Lincoln immediately, for his eldest daughter, Elizabeth, was baptized there 20th January 1571-72, and on 7th December 1572 Thomas Butler was appointed master of the choristers and organist on Byrd's "nomination and commendation." In the Chapel Royal he shared with Tallis the honorary post of organist, and on 22nd January 1575 the two composers obtained a license for twenty-one years from Elizabeth to print music and music-paper, a monopoly which does not seem to have been at all remunerative. In 1575 Byrd and Tallis published a collection of Latin motets for five and six voices, printed by Thomas Vautrollier. In 1578 Byrd and his family were living at Harlington, Middlesex. As early as 1581 his name occurs among lists of recusants, and though he retained his post in the Chapel Royal he was throughout his life a Catholic. About 1579 he set a three-part song in Thomas Legge's Latin play "Ricardus Tertius." In 1588 he published *Psalmes, Sonets, and Songs of Sadnes and Pietie*, and in the same year contributed two madrigals to Nicolas Yonge's *Musica Transalpina*. In 1589 appeared *Songs of Sundrie Natures*, a second edition of which was issued in 1610. In the same year he published *Liber Primus Sacrarum Cantionum*, a second series of which was brought out in 1591. In 1590 two madrigals by Byrd were included in Thomas Watson's *First Sett of Italian Madrigalls Englished*; one of these seems to have been sung before Elizabeth on her visit to Lord Hertford at Elvetham in 1591. In April 1592 Byrd was still living at Harlington, but about 1593 he became possessed of the remainder of a lease of Stondon Place, Essex, a farm of some 200 acres, belonging to William Shelley, who was shortly afterwards convicted of high treason. The property was sequestrated, and on 15th July 1595 Byrd obtained a crown lease of it for the lives of his eldest son Christopher and his daughters Elizabeth and Rachel. On the death of Shelley his son bought back his estates (in 1604), whereupon his widow attempted to oust Byrd from Stondon Place, on the ground that it formed part of her jointure. Byrd was upheld in his possession of the property by James I. (*Calendar of State Papers, Dom. Series*, James I. add. series, vol. xxxvi.), but Mrs Shelley persevered in her suit, apparently until her death in 1609. In the following year the matter was settled for a time by Byrd's buying Stondon Place in the names of John and Thomas Petre, part of the property being charged with a payment to Byrd of £20 for his life, with remainder to his second son Thomas. Throughout this long suit Byrd, though in possession of property which had been confiscated from a recusant and actually taking part as a member of the Chapel Royal at the coronation of James I., had been excommunicated since 1598, while from 1605 until 1612, and possibly later, he was regularly presented before the archidiaconal court of Essex as a Catholic. In 1603 Easte published a work (no copies of which are known to exist) entitled *Medulla Musicke. Sucked out of the sappe of two* [*of*] *the most famous Musitians that ever were in this land, namely Master Wylliam Byrd . . . and Master Alphonso Ferabosco . . . either of whom having made 40*tie *severall waies* (*without contention*), *showing most rare and intricate skill in 2 partes in one upon the playne song Miserere*. In 1607 appeared two books of *Gradualia*, a second edition of which was issued in 1610. In the following year he published *Psalmes, Songs, and Sonnets: some solemne, others joyfull, framed to the life of the Words*. Probably in the same year was issued *Parthenia*, a collection of virginal music, in which Byrd was associated with Bull and Orlando Gibbons. The last work to which he contributed was Sir Thomas Leighton's *Teares or Lamentations of a Sorrowfull Soule* (1614). His death took place on 4th July 1623. It is recorded in the *Cheque Book* of the Chapel Royal as that of a "father of musicke." His will, dated 15th November 1622, shows that he remained a Catholic until the end of his life, and he expresses a desire that he may die at Stondon and be buried near his wife. From the same document it seems that his latter years had been embittered by a dispute with his eldest son, but that the matter was settled by an agreement with his daughter-in-law Catherine, to whom he left his property at Stondon, charged with the payment of £20 to his second son Thomas and £10 to his daughter Rachel, with remainder to his grandson Thomas and his second son of the same name. In 1635 the estate again came before the Court of Chancery, on the ground that the annuities had not been paid. The property seems about 1637 to have been let to one John Leigh, and in 1651 was held by a member of the Petre family. The committee for compounding with delinquents at that date allowed Thomas Byrd the annuity of £20 bequeathed by his father. Byrd's arms, as entered in the Visitation of Essex of 1634 *ex sigillo* were three stags' heads cabossed, a canton ermine. His children were (1) Christopher, who married Catherine, daughter of Thomas Moore of Bamborough, and had a son, Thomas, living at Stondon in 1634; (2) Thomas; (3) Elizabeth, who married successively John Jackson and — Burdett; (4) Rachel, married (1) — Hook, by whom she had two children, William and Catherine, married to

Michael Walton; in 1634 Rachel Hook had married (2) Edward Biggs; (5) Mary, married (1) Henry Hawksworth, by whom she had four sons, William, Henry, George, and John; (2) Thomas Falconbridge. Anne Byrd, who is mentioned in the proceedings *Shelley* v. *Byrd* (*Exchequer Decrees*, 7 James I., series ii. vol. vii. fol. 294 and 328), was probably a fourth daughter who died young.

Besides the works already mentioned Byrd was the composer of three masses, for three, four, and five voices respectively, which seem to have been published with some privacy about 1588. There exists a second edition (also undated) of the four-part mass; all three have recently appeared in modern editions, and increase Byrd's claim to rank as the greatest English composer of his age. In addition to his published works, a large amount still remains in MS., comprising nearly every kind of composition. The Fitzwilliam *Virginal Book* contains a long series of interesting pieces for the virginal, and more still remains unpublished in Lady Neville's *Virginal Book* and other contemporary collections. His industry was enormous, and though his work is unequal and the licenses he allowed can hardly be defended on strict grounds, his Latin church music and his instrumental compositions entitle him to high rank among his contemporaries. As a madrigalist he was inferior to Morley, Wilbye, and Gibbons, though even in this branch of his art he often displays great charm and individuality. (W. B. S.*)

Byron, Henry James (1834-1884), English playwright, son of Henry Byron, at one time British consul at Port-au-Prince, was born in Manchester in January 1834. He entered the Middle Temple as a student in 1858, with the intention of devoting his time to play-writing. He soon ceased to make any pretence of legal study, and joined a provincial company as an actor. In this line he never made any real success; and, though he continued to act for years, chiefly in his own plays, he had neither originality nor charm. Meanwhile he wrote assiduously, and few men have produced so many pieces of so diverse a nature. His first successes were in burlesque; but in 1865 he joined Miss Marie Wilton (afterwards Lady Bancroft) in the management of the Prince of Wales's Theatre, near Tottenham Court Road. Here several of his pieces, comedies, and extravaganzas were produced with success; but, upon his severing the partnership two years later, and starting management on his own account in the provinces, he was financially unfortunate. The commercial success of his life was secured with "Our Boys," which was played at the Vaudeville from January 1875 till April 1879—an unprecedented "run." "The Upper Crust," another of his successes, gave a congenial opportunity to Mr J. L. Toole for one of his inimitably broad character-sketches. During the last few years of his life Byron was in frail health; he died in Clapham, 11th April 1884. H. J. Byron was the author of some of the most popular stage pieces of his day. Yet his extravaganzas have no wit but that of violence; his rhyming couplets are without polish, and decorated only by forced and often pointless puns. His sentiment had T. W. Robertson's insipidity without its freshness, and restored an element of vulgarity which his predecessor had laboured to eradicate from theatrical tradition. He could draw a "Cockney" character with some fidelity, but his *dramatis personæ* were usually mere puppets for the utterance of his jests. In his social relations Byron had many friends, among whom he was justly popular for geniality and imperturbable good temper.

Caballero, Fernán (1796-1877), the pseudonym by which the Spanish novelist Cecilia Francisca Josefa Böhl de Faber y Larrea is known. Born at Morges in Switzerland on 24th December 1796, she was the daughter of Johan Nikolas Böhl von Faber, a Hamburg merchant, who lived long in Spain, married a native of Cadiz, and is creditably known to students of Spanish literature as the editor of the *Floresta de rimas antiguas castellanas* and the *Teatro español anterior á Lope de Vega*. Educated in Hamburg, she visited Spain in 1815, and, unfortunately for herself, in 1816 married Antonio Planells y Bardaxi, an infantry captain of bad character. In the following year Planells was killed in action, and in 1822 the young widow married Francisco Ruiz del Arco, Marqués de Arco Hermoso, an officer in one of the Spanish household regiments. Upon the death of Arco Hermoso in 1835, the Marquesa found herself in straitened circumstances, and in less than two years she married Antonio Arrón de Ayala, a man considerably her junior. Arrón was appointed consul in Australia, engaged in business enterprises and made money; but unfortunate speculations drove him to commit suicide in 1854. Five years earlier the name of Fernán Caballero (taken from a village in La Mancha) became famous in Spain as the author of *La Gaviota*. The writer had already published in German an anonymous romance, *Sola* (1831), and it is alleged that the earliest draft of *La Gaviota* was written in French. This novel first appeared as the feuilleton of *El Heraldo* (1849), and was received with marked favour. Ochoa, a prominent critic of the day, ratified the popular judgment, and hopefully proclaimed the writer to be a rival of Scott. No other Spanish book of the 19th century has obtained such instant and universal recognition. It was translated into most European languages, and, though it scarcely seems to deserve the intense enthusiasm which it excited, it is the best of its author's works, with the possible exception of *La Familia de Alvareda*. Less successful attempts are *Lady Virginia* and *Clemencia*; but the short stories entitled *Cuadros de Costumbres* are interesting in matter and form, and *Una en otra* and *Elia ó la España treinta años ha* are excellent specimens of picturesque narration. It would be difficult to maintain that Fernán Caballero was a great literary artist or even a remarkable novelist, but it is certain that she was a born teller of stories and that she has a graceful, delicate style very suitable to her purpose. She came into Spain at a most happy moment, before the new order had perceptibly disturbed the old, and she brought to bear not alone a fine natural gift of observation, but a freshness of vision, undulled by long familiarity. She combined the advantages of being both a foreigner and a native. In later publications she insisted too emphatically upon the moral lesson, and lost much of her primitive simplicity and charm; but even here we may believe her own positive statement that, though she occasionally idealized circumstances, she was conscientious in choosing for her themes subjects which had occurred in her own long and varied experience. Hence she may be regarded as a pioneer in the realistic field, and this historical fact adds to her positive importance. For many years she was the most popular of Spanish writers, and the sensation caused by her death at Seville on 7th April 1877 proved that her naïve truthfulness still attracted readers who were interested in records of national customs and manners. (J. F.-K.)

Cabatuan, a town in the east of Panay, one of

the Philippine Islands, in about 11° N. and 123° E., about 10 miles from Iloilo. It has a healthful climate, and is well situated on the banks of the Tigum river, in the midst of a very fertile region, which produces large quantities of rice, as well as Indian corn, tobacco, sugar, coffee, and a great variety of fruits. The language is Visayan. Population, 18,000.

Cable, George Washington (1844-——), American author, was born in New Orleans, Louisiana, on 12th October 1844. At the age of fourteen he entered a mercantile establishment as a clerk; joined the Confederate army (4th Mississippi Cavalry) at the age of nineteen; at the close of the war engaged in civil engineering, and in newspaper work in New Orleans; and first became known in literature by sketches and stories of old French-American life in that city. These were first published in *Scribner's Monthly*, and were collected in book form in 1879, under the title of *Old Creole Days*. The characteristics of the series—of which the novelette *Madame Delphine* (1881) is virtually a part—are neatness of touch, sympathetic accuracy of description of people and places, and a constant combination of gentle pathos with quiet humour. These shorter tales were followed by the novels *The Grandissimes* (1880), *Dr Sevier* (1883), and *Bonaventure* (1888), of which the first dealt with Creole life in Louisiana a hundred years ago, while the second was related to the period of the Civil War of 1861-65. *Dr Sevier*, on the whole, is to be accounted Cable's masterpiece, its character of Narcisse combining nearly all the qualities which have given him his place in American literature as an artist and a social chronicler. In this, as in nearly all of his stories, he makes much use of the soft French-English dialect of Louisiana. He does not confine himself to New Orleans, laying many of his scenes, as in the short story *Belles Demoiselles Plantation*, in the marshy lowlands towards the mouth of the Mississippi. Cable was the leader in the noteworthy literary movement which has influenced nearly all Southern writers since the war of 1861—a movement of which the chief importance lay in the determination to portray local scenes, characters, and historical episodes with accuracy instead of merely imaginative romanticism, and to interest readers by fidelity and sympathy of portrayal of things well known to the authors. Other writings by Cable have dealt with various problems of race and politics in the Southern States during and after the "reconstruction period" following the Civil War; while in *The Creoles of Louisiana* (1884) he presented a history of that folk from the time of its appearance as a social and military factor. His dispassionate treatment of his theme in this volume and its predecessors gave increasing offence to sensitive Creoles and their sympathizers, and in 1886 Cable removed to Northampton, Massachusetts, thenceforward engaging in magazine writing and in public readings from his works. At one time he also edited a magazine in Northampton, and afterwards conducted the monthly *Current Literature*, published in New York.

Cabrera, Ramon (1806-1877), Carlist general, was born at Tortosa, province of Tarragona, Spain, on 27th December 1806. As his family had in their gift two chaplaincies, young Cabrera was sent to the seminary of Tortosa, where he made himself conspicuous as an unruly pupil, ever mixed up in disturbances and careless in his studies. After he had taken minor orders, the bishop refused to ordain him as a priest, telling him that the Church was not his vocation, and that everything in him showed that he ought to be a soldier. Cabrera followed this advice and took part in Carlist conspiracies on the death of Ferdinand VII. The authorities exiled him, and he absconded to Morella to join the forces of the pretender Don Carlos. In a very short time he rose by sheer daring, fanaticism, and ferocity to the front rank among the Carlist chiefs who led the bands of Don Carlos in Catalonia, Aragon, and Valencia. As a raider he was often successful, and he was many times wounded in the brilliant fights in which he again and again defeated the generals of Queen Isabella. He sullied his victories by acts of cruelty, shooting prisoners of war whose lives he had promised to spare, and not respecting the lives and property of non-combatants. The queen's generals seized his mother as a hostage, whereupon Cabrera shot several mayors and officers. General Nogueras unfortunately caused the mother of Cabrera to be shot, and the Carlist leader then started upon a policy of reprisals so merciless that the people nicknamed him "The Tiger of the Maeztrazgo." It will suffice to say that he shot 1110 prisoners of war, 100 officers, and many civilians, including the wives of four leading Isabellinos, to avenge his mother. When Marshal Espartero induced the Carlists of the north-western provinces, with Maroto at their head, to submit in accordance with the Convention of Vergara, which secured the recognition of the rank and titles of 1000 Carlist officers, Cabrera held out in central Spain for nearly a year. Marshals Espartero and O'Donnell, with the bulk of the Isabellino armies, had to conduct a long and bloody campaign against Cabrera before they succeeded in driving him into French territory in July 1840. The Government of Louis Philippe kept him in a fortress for some months and then allowed him to go to England, where he quarrelled with the pretender, disapproving of his abdication in favour of the count of Montemolin. In 1848 Cabrera reappeared in the mountains of Catalonia at the head of Carlist bands. These were soon dispersed, and he again fled to France. After this last effort he did not take a very active part in the propaganda and subsequent risings of the Carlists, who, however, continued to consult him. He took offence when new men, not a few of them quondam regular officers, became the advisers and lieutenants of Don Carlos in the war which lasted more or less from 1870 to 1876. Indeed, his long residence in England, his marriage with Miss Richards, and his prolonged absence from Spain had much shaken his devotion to his old cause and belief in its success. In March 1875 Cabrera sprang upon Don Carlos a manifesto in which he called upon the adherents of the pretender to follow his own example and submit to the restored monarchy of Alphonso XII., the son of Queen Isabella, who recognized the rank of captain-general and the title of count of Morella conferred on Cabrera by the first pretender. Only a very few insignificant Carlists followed Cabrera's example, and Don Carlos issued a proclamation declaring him a traitor, and depriving him of all his honours and titles. Cabrera, who was ever afterwards regarded with contempt and execration by the Carlists, died in London on 24th May 1877. He did not receive much attention from the majority of his fellow-countrymen, who commonly said that his disloyalty to his old cause had proved more harmful to him than beneficial to the new state of things. A pension which had been granted to his widow was renounced by her in 1899 in aid of the Spanish treasury, after the loss of the colonies. (A. E. H.)

Caceres, a frontier province in the west of Spain. It is the second largest province in Spain, with an area of 8014 square miles, divided into 13 administrative districts and 222 communes. The population increased from 306,594 inhabitants in 1877 to 354,245 in 1897. The province is badly off as regards roads, but the railway from

Madrid to Portugal runs through it. The climate is temperate except in summer, when the hot east winds prevail. In the north, the centre, and south there are some mountainous districts, the remainder being undulating ground, with sparse vegetation, few forests, and in many parts lacking water. The Tagus is the principal river. Caceres has but few industries, outside the fast-decaying silk industry at Plasenim, and the regular manufactures of leather, cork, brandy, and coarse woollen stuffs. The principal manufacture is phosphorite, most of which goes abroad. The province contains only 8 mines that are actually worked—1 antimony, 3 iron, 1 argentiferous lead, and 3 phosphorite. There has been an increasing demand from abroad for wolgram and phosphate; 4500 tons of phosphorite was extracted in 1898, the proportion produced amounting to an average of 48 per cent., and in antimonium 55 per cent. As regards live stock, Caceres ranks second only to Badajoz, containing in all 1,038,435 head: in 1897 there were 13,162 horses, 17,278 mules, 34,572 asses, 74,333 cattle, 617,458 sheep, 191,264 goats, 90,368 pigs. It is famed for its sheep and pigs, and exports wool, hams, and the red sausage called "embutidos." To the culture of wheat 227,280 acres were devoted, 112,255 to that of barley, 64,310 to rye, 89,025 to oats, 362 to maize, 22,660 to chick-peas, 28,150 to vines, 72,480 to olives.

Caceres, the capital of the above province, had a population of 14,816 in 1877, but only 13,665 in 1897. The ancient part of the city is on a hill and surrounded with walls, and contrasts with the modern suburbs outside, which have broad streets and new buildings. The old town has some fine churches and residences of noble families, in good state of preservation. In the new part are the town hall, courts of justice, episcopal palace, schools, civil and foundling hospitals, and theatre.

Cachar, a district of British India, in the Surma Valley division of Assam. It occupies the upper basin of the Surma or Barak river, being bounded on three sides by high hills. The headquarters are at Silchar. The Cachar hills rank for some purposes as a separate district, under the name of North Cachar. The area (excluding the hills) is 2472 square miles; population (1881), 293,738; (1891), 367,542, showing an increase of 25 per cent.; average density, 149 persons per square mile. Classified according to religion, Hindus numbered 239,944; Mahommedans, 112,846; Christians, 809, of whom 273 were Europeans; hill tribes, 13,899; "others," 44. In 1901 the population of the entire district was 456,151, showing an increase of 18 per cent. The land revenue is Rs.3,80,062, the incidence of assessment being nearly R.1 per acre; the number of police is 526; the number of boys at school (1896-97) was 7436, being 24·33 per cent. of the male population of school-going age; the number of girls at school was 819, being 3 per cent.; the registered death-rate (1897) was 61 per thousand. Cachar is the most flourishing centre of tea cultivation in India. In 1897 the number of gardens was 191, with 61,190 acres under tea, employing 126,194 persons (more than one-third of the total population), of whom 5578 had been imported by contract, and yielding 22,000,000 lb, or 406 lb per acre. There are two timber-mills, producing tea-chests, &c., valued at Rs.33,000. The Assam-Bengal railway traverses the district, and is being extended through North Cachar. A branch from Badarpur to Silchar (18 miles) was opened in November 1898.

The district of North Cachar lies between the Jaintia Hills and the state of Manipur. The headquarters are at Gunjong. Area, 1728 square miles; population (1891), 20,120, mostly hill tribes; average density, 10 persons per square mile, being far the lowest in the province. The continuation of the railway through this hilly and unhealthy tract was a work of great difficulty.

Cadenabbia, a village of the province of Como, Lombardy, Italy, on the west shore of Lake Como, nearly opposite Bellagio, a favourite spring and autumn resort, the place being situated in the loveliest part of the lake, and sheltered against the prevailing winds. Here is the Villa Carlotta (1747), which contains the "Triumph of Alexander," one of the greatest creations of Thorwaldsen.

Cadillac, capital of Wexford county, Michigan, U.S.A., situated in the north-western part of the Lower Peninsula, in a heavily forested region, on the Ann Arbor and the Grand Rapids and Indiana railways, at an altitude of 1293 feet. Population (1880), 2213; (1890), 4461; (1900), 5997.

Cadiz, a maritime province in the extreme south of Spain. The highest mountains are the Cerro de San Cristobal and Sierra del Pinar. The mountainous districts are very picturesque, well wooded, and abound in large game. There are numerous rivers—the Guadalquivir, the Guadalete, the Majaceite, the Guadiaro, the Guadarranque Gibraltar, the Salado, the Palmorus, and the Barbate. The climate is generally mild and temperate, some parts of the coast only being unhealthy owing to a marshy soil. The main line of railway from Cadiz to Madrid runs through the centre of the province, with many branches, and new lines are being pushed forward. The province is divided into 13 administrative districts and 42 communes, more than one-third of which are thriving and populous towns. The population was 430,158 in 1877 and 434,250 in 1897, on an area of 2828 square miles. The industries are insignificant compared with the importance of the natural products of the soil, especially wines and olives. But the fisheries furnish more than 5,500,000 lb of fish per annum, one-fifth part of which is salted and the rest consumed in Spain. There are 40 establishments for salting the fish and 4000 hands are thus employed. Naval yards exist at Cadiz, Puerto Real, and San Fernando, the last being a State arsenal and dockyard. A considerable amount of salt is obtained by evaporation of sea-water in pans near Cadiz, San Fernando, Puerto Real, and Santa Maria. In 1897 the live stock included 20,865 horses, 8298 mules, 10,612 asses, 71,855 cattle, 86,972 sheep, 68,398 goats, and 45,132 pigs. Wheat occupied 231,077 acres, barley 58,060 acres, rye 4275, oats 6587, maize 6005, chick-peas 32,472, vines 51,285, and olives 42,867.

Cadiz, a seaport and the capital of the above province, with a population of 65,028 in 1877 and 67,987 in 1897. The final severing of the connexion between Spain and Cuba and Porto Rico, in 1898, coming as it did after several years of colonial wars that had greatly depressed trade, was a severe blow for Cadiz as a commercial emporium. Of late years local capital and enterprise have taken the direction of industries and shipbuilding, and numerous factories with their tall chimneys have sprung up in the suburbs. A private shipbuilding yard with a capital of £400,000 was started and obtained some government contracts, though much hampered by an agreement to draw its materials from native firms in Catalonia and Biscay, in preference to foreign. The beetroot-sugar industry is progressing in the neighbourhood, as in the rest of Spain, through the operation of high import duties on foreign sugars. Tunny fish is caught in great quantities near the port—83,000 in 1898—and salted, to be sent chiefly to Italy. The cork industries exported 58,000,000 corks in 1898—14,000,000

going to England—but, owing to high export duties, only 107 tons of cork-wood. 78,228 lasts of salt, each last being 2½ tons, were shipped for foreign countries in 1898, and 13,201 lasts for other Spanish ports. The number of British vessels that entered the port during 1898 was 291, of 180,535 tons, as against 267 vessels of 133,479 tons in 1897. 55 of the former brought 42,792 tons of British coal, and in all 202 entered with cargoes, while 89 were in ballast. 175 with cargoes and 5 in ballast cleared for Great Britain and British colonies, and 60 with cargoes and 50 in ballast for other countries. The total number of vessels of all nationalities that entered the port in 1898 was 2696 of 1,631,428 tons, of which 2050 of 1,216,026 tons were Spanish. The docks and quays, as well as the through railway communication, would require to be much improved to attract ocean-going steamers and make Cadiz a port of call, and a coaling station, especially with Gibraltar so near. The total value of the customs receipts in 1898 was £54,834, a falling-off of £27,934 on 1897 and £26,104 on 1896. Coal was one of the principal imports: 157,900 tons in 1898—94,786 from England and the rest from Spain itself. The wine trade of Jerez, Puerto Santa Maria, and Puerto Real, near Cadiz, contribute extensively to the exports of Cadiz.

Caen, chief town of Calvados, 148 miles N.W. of Paris by rail, and a fortified town of the third class. A monument of the "Sons of Calvados" commemorates those who fell in the war of 1870-71. The ancient Abbaye aux Hommes is now occupied by the Lycée. A natural history museum contains the collection of d'Urville, and an art museum has one of the richest collections of paintings in France. The number of vessels engaged in the foreign trade entered at Caen in 1899 was 644, of 205,749 tons. Iron ore has become by far the most important export. Population (1881), 34,460; (1891), 37,184; (1896), 37,457, (comm.) 39,105.

Cæsarea-Mazaca, now Kaisarieh, chief town of a sanjak in the Angora viláyet of Asia Minor. Mazaca, the residence of the kings of Cappadocia, later called *Eusebea*, and named *Cæsarea* by Claudius, stood on a low spur on the north side of Erjish Dagh (*M. Argæus*). It was taken by Tigranes, and afterwards, in A.D. 268, by Shahpúr I. (Sapor). In the 4th century Basil, when bishop, established an ecclesiastical centre on the plain, about one mile to the north-east, and this gradually supplanted the old town. A portion of Basil's new city was surrounded with strong walls, and turned into a fortress by Justinian; and within the walls, rebuilt in the 13th and 16th centuries, lies the greater part of Kaisarieh, altitude 3500 feet. The town was captured by the Seljúk sultan, Alp Arslan, 1064, and by the Mongols, 1243, before passing to the Osmanli Turks. Its early commercial importance was due to its position on the ancient trade route from Sinope to the Euphrates, on the Persian "Royal Road" from Sardis to Susa, and on the great Roman highway from Ephesus to the East. It is still the most important trade centre in eastern Asia Minor, and is remarkable for the enterprise of its merchants and traders. The town is noted for its fruit, especially its vines; and it exports tissues, carpets, hides, yellow berries, and dried fruit. Kaisarieh is the headquarters of the American Mission in Cappadocia, which has several churches and schools for boys and girls. It is the seat of a Greek bishop, an Armenian archbishop, and a Roman Catholic bishop, and there is a Jesuit school. On the 30th November 1895 there was a massacre of Armenians, in which several Gregorian priests and Protestant pastors lost their lives. Population, 50,000 (Moslems, 27,000; Christians, 23,000). (C. W. W.)

Cæsarea-Palæstina, now Kaisarieh, on the coast of Palestine. In 1884 a colony of Bosnians was settled on the site, and there has since been much destruction of the ruins.

Cagliari, a town and archiepiscopal see of Italy, capital of the province of Cagliari and of all Sardinia. It stands at the head of a fine bay at the south end of the island. The university, which has mineralogical and zoological collections, was attended by 241 students in 1898, and had 32 professors. This town is famous for its many excellent charitable organizations. There are, further, a botanical garden, a royal school of viticulture, a school of the industrial arts and sciences, and a school of navigation. The exports consist principally of metals and minerals, with timber, spirits, hides, cereals, live animals, &c., to the annual value of £533,600. The imports are of the annual value of £237,700. In addition to this there is a coasting trade of about £2,000,000 annually. The port was cleared in 1897 by 1517 vessels of 458,067 tons; all the ports of Sardinia together, by 2749 vessels of 804,400 tons in 1889. Population of province (1881), 420,635; (1901), 482,000; of town (1881), 38,598; (1901), 53,734.

Cagsaua, a town of 20,000 inhabitants, in the province of Albay, Luzon, Philippine Islands. It is 1½ miles from the town of Albay, which is its port, and its exports are those of the latter city. The language is Bicol.

Cahors, chief town of department Lot, France, 360 miles S.S.W. of Paris, on railway from Paris to Toulouse. Its industries include shoe manufactures, dye-works, and large distilleries. Coal is worked in the neighbourhood, and amongst minor articles of commerce are nuts, oil of nuts, and prunes. It was the birthplace of Léon Gambetta, of whom there is a bronze statue by Falguière in the Boulevard Gambetta. The Lycée Gambetta is installed in old monastic buildings. There is a monument in commemoration of the war of 1870-71. The restoration of the old fortified Valentré bridge was completed in 1881. Population (1876), 11,145, comm. 12,615; (1886), 12,057; (1896), 10,882, comm. 12,331; (1901), 13,981.

Caibarien, a sugar-shipping port on the north coast of Santa Clara province, Central Cuba, 193 miles E. by S. of Havana. Population (1899), 7013.

Caird, John (1820-1898), Scottish divine and philosopher, was born at Greenock, 15th December 1820. After being at school until his sixteenth year he began life in his father's office, his father being partner and manager of a firm of engineers. Two years later, however, he obtained leave to continue his studies at Glasgow University. Once more, after a year of academic life, he tried business again; he acquitted himself highly creditably at first, but he finally abandoned business in 1840, and returned to college. In 1845 he entered the ministry of the Church of Scotland, holding the livings of Newton-on-Ayr, of Lady Yester's, Edinburgh, of Errol in Perthshire, and of Park Church, Glasgow, until in 1862 he accepted the chair of Divinity at Glasgow. During these years he won for himself a foremost place among the preachers of Scotland, having for his contemporaries such men of great eloquence as Norman Macleod and Guthrie. His most notable sermons were: "Religion in Common Life," "What is Religion?" "The Universal Religion." In theology he was essentially a Broad Churchman, seeking always to show forth the permanent elements in religion, and ignoring the technicalities of doctrine. In 1873 he was appointed Vice-Chancellor and Principal of Glasgow University. He delivered the Gifford Lectures in 1892-93

and in 1895-96. His *Introduction to the Philosophy of Religion*, published in 1880, is an attempt to show the essential rationality of religion. It is idealistic in character, being, in fact, a reproduction of Hegelian teaching in clear and melodious language. His line of argument for the Being of God is based, briefly, on the hypothesis that thought—not individual but universal—is the reality of all things, the existence of this Infinite Thought being demonstrated by the limitations of finite thought. Again, his Gifford Lectures are devoted to the proof of the truth of Christianity on grounds of right reason alone. Principal Caird also wrote an excellent study of Spinoza, in which he showed the latent Hegelianism of the great Jewish philosopher. He died 30th July 1898.

Cairns, Hugh M'Calmont Cairns, 1st EARL (1819-1885), Irish statesman, and Lord Chancellor of England, was born at Cultra, county Down, Ireland, 27th December 1819. One of the ablest lawyers who ever adorned the woolsack, he also played in politics a more prominent part than lawyers have usually sustained, leading the Conservative party in the House of Lords between 1869 and 1880. His father, William Cairns, formerly a captain in the 47th Regiment, came of a family of Scottish origin, which migrated to Ireland in the time of James I. Hugh Cairns was his second son, and was educated at Belfast Academy and at Trinity College, Dublin. He showed such talent that his tutor at Trinity College, the Rev. George Wheeler, persuaded his father that he should be trained for the Law instead of for the Church, for which he had been intended. Accordingly, after taking a first-class in classics, and a B.A. degree in 1838, he left Ireland for London and entered at the Middle Temple, where he was called to the bar in 1844, afterwards becoming a member of Lincoln's Inn. During his first years at the Chancery Bar, Cairns showed little promise of the eloquence which afterwards distinguished him. Never a rapid speaker, he was then so slow and diffident, that he feared that this defect might interfere with his legal career. Fortunately he was soon able to rid himself of the idea that he was only fit for practice as a conveyancer. In 1852 he entered Parliament as member for Belfast, and his Inn, on his becoming a Q.C. in 1856, made him a Bencher.

In 1858 Cairns was appointed Solicitor-General, and was knighted, and in May of that year made two of his most brilliant and best-remembered speeches in the House of Commons. In the first, he defended the action of Lord Ellenborough, who, as President of the Board of Control, had not only censured Lord Canning for a proclamation issued by him as Governor-General of India, but had made public the despatch in which the censure was conveyed. On the other occasion referred to, Sir Hugh Cairns spoke in opposition to Lord John Russell's amendment to the motion for the second reading of the Government Reform Bill, winning the most cordial commendation of Mr Disraeli. Disraeli's appreciation found an opportunity for displaying itself some years later, when in 1868 he invited him to be Lord Chancellor in the brief Conservative administration which followed Lord Derby's resignation of the leadership of his party. Meanwhile, Cairns had maintained his reputation in many other debates, both when his party was in power, and when it was in opposition. In 1866 Lord Derby, returning to office, had made him Attorney-General, and in the same year he had availed himself of the retirement of Sir J. Knight Bruce, to seek the comparative rest of the Court of Appeal. While a Lord Justice he had been offered a peerage, and though at first unable to accept it, he had finally done so on a relative, a member of the wealthy family of M'Calmont, providing the means necessary for the endowment of a title.

The appointment of Baron Cairns of Garmoyle as Lord Chancellor involved the superseding of Lord Chelmsford, an act which apparently was carried out by Mr Disraeli with less tact than might have been expected of him. Lord Chelmsford bitterly declared that he had been sent away with less courtesy than if he had been a butler, but the testimony of Lord Malmesbury is strong that the affair was the result of an understanding arrived at when Lord Chelmsford took office. Mr Disraeli held office on this occasion for a few months only, and when Lord Derby died in 1869, Lord Cairns became the leader of the Conservative opposition in the House of Lords. He had distinguished himself in the Commons by his resistance to the Roman Catholics' Oath Bill brought in in 1865; in the Lords, his efforts on behalf of the Irish Church were equally strenuous. His speech on Mr Gladstone's Suspensory Bill was afterwards published as a pamphlet, but the attitude which he and the peers who followed him had taken up, in insisting on their amendments to the preamble of the Bill, was one difficult to maintain, and Lord Cairns made terms with Lord Granville in circumstances which precluded his consulting his party first. He issued a circular to explain his action in taking a course for which many blamed him. Viewed dispassionately, the incident appears to have exhibited his statesmanlike qualities in a marked degree, for he secured concessions which would have been irretrievably lost by continued opposition. Not long after this, Lord Cairns resigned the leadership of his party in the Upper House, but he had to resume it in 1870, and took a strong part in opposing the Irish Land Bill in that year. On the Conservatives coming into power in 1874, he again became Lord Chancellor; in 1878 he was made Viscount Garmoyle and Earl Cairns; and in 1880 his party went out of office. In opposition he did not take as prominent a part as previously, but when Lord Beaconsfield died in 1881, there were some Conservatives who considered that his title to lead the party was better than that of Lord Salisbury. His health, however, never robust, had for many years shown intermittent signs of failing. He had periodically made enforced retirements to the Riviera, and for many years had had a house at Bournemouth, and it was here that he died on 2nd April 1885.

Cairns was a great lawyer, with an immense grasp of first principles and the power to express them; his judgments taking the form of luminous expositions or treatises upon the law governing the case before him, rather than of controversial discussions of the arguments adduced by counsel, or of analysis of his own reasons. Lucidity and logic were the leading characteristics of his speeches in his professional capacity, and in the political arena. An incident of his Lord Chancellorship deserves record. In the hearing of an appeal by the House of Lords, a noble lord fresh from the Appeal Court, where interruptions of counsel are still too common, kept interposing questions during the argument. Lord Cairns turned to this gentleman and said coldly but decisively, "I think the House is desirous of hearing the argument of counsel, and not of putting questions to him." In an eloquent tribute to his memory in the House of Lords, Lord Chief Justice Coleridge expressed the high opinion of the legal profession upon his merits, and upon the severe integrity and single-minded desire to do his duty which animated him in his selections for the bench. As far as the higher judicial appointments filled by Lord Cairns were concerned, such eulogy was not undeserved. Giffard, V.C., Hayes, Brett, Cleasby, Archibald, Field,

Lindley, Huddleston, Manisty, Hawkins, Lopes, Fry, Stephen, and Bowen, form a list with which no Chancellor need be ashamed to figure in the history of his profession, while he was also responsible for the raising of Baggallay, Cotton, and Thesiger (son of his old rival, Lord Chelmsford) to the Court of Appeal. In filling up vacancies on the County Court bench, Lord Cairns was not quite so successful, but the complaints that were made did not contain charges of personal or political prejudice in favour of those appointed; they suggested rather that the best chance of success attended those whose religious views or professions were of the Evangelistic type. Of Lord Cairns's honourable desire, however, to act for the best in all things, few can doubt. His piety was reflected by that of his great opponent, rival and friend, Lord Selborne. Like Lord Selborne and Lord Hatherley, Cairns found leisure at his busiest for teaching in the Sunday-school, but it is not recorded of them (as of him) that they refused to undertake work at the bar on Saturdays, in order to devote that day to hunting. He used to say that his great incentive to hard work at his profession in early days was his desire to keep hunters, and he retained his keenness as a sportsman as long as he was able to indulge it. Of his personal characteristics, it may be said that he was a spare man, with a Scottish, not an Irish, cast of countenance. He was scrupulously neat in his personal appearance, faultless in bands and necktie, and fond of wearing a flower in his button-hole. His chilly manner, coupled with his somewhat austere religious principles, had no doubt much to do with the fact that he was never a popular man. His friends claimed for him a keen sense of humour, but it was not to be detected by those whose knowledge of him was professional rather than personal. Probably he thought the exhibition of humour incompatible with the dignity of high judicial position. Of his legal attainments there can be no doubt. His influence upon the legislation of the day was largely felt where questions affecting religion and the Church were involved, and in matters peculiarly affecting his own profession. His power was felt, as has been said, both when he was in office and when his party was in opposition. He had been chairman of the Committee on Judicature Reform, and although he was not in office when the Judicature Act was passed, all the reforms in the legal procedure of his day owed much to him. He took part, when out of office, in the passing of the Married Women's Property Act, and was directly responsible for the Conveyancing Acts of 1881-82, and for the Settled Land Act, which a Chancery judge (Mr Justice Byrne, in the *Law Magazine*, vol. xxv. p. 260) has called "the greatest real property revolution effected in England for centuries." Many other statutes in which he was largely concerned might be quoted. His judgments are to be found in the Law Reports, and those who wish to consider his oratory should read the speeches above referred to, or that delivered in the House of Lords on the Compensation for Disturbance Bill in 1880, and his memorable criticism of Mr Gladstone's policy in the Transvaal, after Majuba Hill. (See Hansard and the *Times*, 1st April 1881.) His style of delivery was, as a rule, cold to a marked degree. The term "frozen oratory" has been applied to his speeches, and it has been said of them that they flowed "like water from a glacier. . . . The several stages of his speech are like steps cut out in ice, as sharply defined, as smooth and as cold." Lord Cairns married in 1856 Mary Harriet, eldest daughter of Mr John Macneill, of Park Mount, county Antrim, by whom he had issue five sons and two daughters.

AUTHORITIES.—See the *Times*, 3rd and 14th April 1885; *Law Journal*, *Law Times*, *Solicitors' Journal*, 11th April 1885; the *Law Magazine*, vol. xi. p. 133; the *Law Quarterly*, vol. i. p. 365; *Earl Russell's Recollections*; *Memoirs of Lord Malmesbury*; Sir THEODORE MARTIN, *The Life of the Prince Consort*; MANSON, *Builders of our Law*. (E. A. AR.)

Cairns, a seaport and municipality in Queensland, Australia, in the county of Nares, about 900 miles N.W. of Brisbane, on Trinity Bay, with a fine and well-sheltered harbour. It is the natural outlet for the gold-fields, tin-mines, and silver-fields of the district and for the rich copper district of Chillagoe. In the vicinity are extensive sugar plantations, with sugar mills and refineries; the culture of coffee is rapidly extending, bananas and other fruits are exported in considerable quantities, and there is a large industry in cedar. Population, about 3000.

Cairo, the capital of modern Egypt, situated on the right bank of the Nile, 12 miles S. of the apex of the Delta, in 30° 2′ N. lat. and 31° 15′ E. long. It is 130 miles by rail from Alexandria, and from Suez it is distant 148 miles, though only 84 by the old overland route across the desert, before the opening of the Suez Canal. It occupies a length of 5 miles on the right bank of the Nile, from the old Roman fortress of Babylon on the S., to the new railway bridge on the N., and covers an area of about 8 square miles, occupying all the available space between the Nile and the Moqattam hills. It is built partly on the alluvial plain of the Nile valley and partly on the rocky slopes of the Moqattam hills, which rise to an altitude of 550 feet above the town, on a lower spur of which (200 feet) stands the Citadel. Though the eastern or native part has changed but little, whole new quarters have sprung up of late years to supply the demand created by the large increase of European population and the growing wealth of the country. Thus what in 1875 was an open space on the western side, is now a closely-built-over district, comprising the quarters of Qasr el Dubara on the south of the Qasr el Nil bridge; Ismailia, between this bridge and the main road leading to Bulaq; and Tewfiqia to the north of the main road. In these districts the houses are large, high, and well built, resembling those of southern Italy and France. In most cases they consist of residential flats, detached single houses being the exception, most of the latter being situated in the Qasr el Dubara quarter. To the south the rubbish mounds of ancient Fostat, the first Arab town on the site, have prevented any extension in that direction, but to the north and north-west growth has proceeded rapidly. Bulaq, the river port, is now a part of the city itself, and Abbassia, an outlying district on the edge of the desert, two miles from the wall of the old town, is now connected by a continuous line of houses. Large and luxurious hotels have been built in the newer quarters for the accommodation of the increasing number of visitors who arrive each winter; while on the island or "Gezira" of Bulaq are to be found polo, cricket, and tennis grounds, as well as a racecourse. On the west bank of the Nile, not far from the town of Giza, are the Zoological Gardens in the grounds of the former Khedivial palace of Giza. A large number of the newer houses are lighted with electric light, and electric trams traverse most of the principal streets. The improvement in the houses, the laying out of open spaces, and a good water-supply, have done much to improve the sanitary condition of the city, the death-rate for the native population being 37·5 and 36·7 per 1000 for the years 1898 and 1899 respectively. In recent years a railway bridge has been built across the Nile, a little to the north of Bulaq, so that the Upper Egypt line, which extends to Assuan, with a break of gauge at Luxor, passes over this bridge, and is now connected with the railway system of the Delta. To the

south of Cairo a short railway line runs to the town of Helwan, 14 miles distant, situated in the desert 3 miles from the river, and much frequented by invalids on account of its sulphur baths. With the increasing prosperity of the country the public buildings of Cairo are being gradually improved and rebuilt. The collection of Egyptian antiquities, formerly housed in a small building at Bulaq, was removed in 1889 to the Khedivial palace of Giza on the west bank of the Nile; a new museum has now been constructed close to the Qasr el Nil barracks, to which the collection will be transferred. More in the centre of the city have been built the new Law Courts, while close by is a large building which, when finished, will receive the Khedivial public library and the collections of the Museum of Arab Art. On the bank of the river, in the south part, the Medical School and the Government Hospital occupy the old palace of Qasr el Aïni. A new Observatory will be built at Helwan, as the extension of the city northwards has rendered the present site quite unsuitable. Though it is inevitable that the Oriental character of much of the town will be replaced by modern European buildings, still much that is picturesque remains; and the careful and systematic renewal and restoration of the old mosques, fountains, &c., which represent the best styles of Arab art, are preserving much that is of interest and beauty which would otherwise have fallen into decay. In 1882 the population was 374,838, and in 1897 it amounted to 570,062, of which 35,385 were foreigners; the suburbs of Helwan and Mataria being included in the latter census, though not in the former. (H. G. L.)

Cairo, capital of Alexandria county, Illinois, U.S.A., situated, at an altitude of 313 feet, in the southern part of the state where the Ohio joins the Mississippi in the bottom-lands. It is protected from floods by the levees which surround the place. Occupying a central position, it has a large river traffic, besides which five railways centre in it, giving it also extensive land traffic. Population (1880), 9011; (1890), 10,324; (1900), 12,566.

Cairoli, Benedetto (1825-1889), Italian statesman, was born at Pavia, 28th January 1825. From 1848 until the completion of Italian unity in 1870, his whole activity was devoted to the Risorgimento, as Garibaldian officer, political refugee, anti-Austrian conspirator, and deputy to Parliament. He commanded a volunteer company under Garibaldi in 1859 and 1860, being wounded slightly at Calatafimi, and severely at Palermo in the latter year. In 1866, with the rank of colonel, he assisted Garibaldi in Tyrol, in 1867 fought at Mentana, and in 1870 conducted the negotiations with Bismarck, during which the German Chancellor is alleged to have promised Italy possession of Rome and of her natural frontiers if the Democratic party could prevent an alliance between Victor Emmanuel and Napoleon. The prestige personally acquired by Benedetto Cairoli was augmented by that of his four brothers, who fell during the wars of Risorgimento, and by the heroic conduct of their mother. His refusal of all compensation or distinction further endeared him to the Italian people. When in 1876 the Left came into power, Cairoli, then a deputy of sixteen years' standing, became parliamentary leader of his party, and, after the fall of Depretis, Nicotera, and Crispi, formed his first Cabinet in March 1878 with a Francophil and Irredentist policy. After his marriage with the Countess Elena Sizzo of Trent, he permitted the Irredentist agitation to carry the country to the verge of a war with Austria. General irritation was caused by his policy of "clean hands" at the Berlin Congress, while the attempt of Passanante to assassinate King Humbert at Naples (12th December 1878) caused his downfall, in spite of the courage displayed and the severe wound received by him in protecting the king's person on that occasion. On 3rd July 1879 he returned to power, and in the following November formed, with Depretis, a coalition ministry, in which he retained the Premiership and the Foreign Office. Confidence in French assurances, and belief that Great Britain would never permit the extension of French influence in North Africa, prevented him from foreseeing the French occupation of Tunis (11th May 1881). In view of popular indignation, he resigned in order to avoid making inopportune declarations to the Chamber. Thenceforward he practically disappeared from political life. In 1887 he received the Knighthood of the Annunziata, the highest Italian decoration, and on 8th August 1889 died while a guest of King Humbert in the royal palace of Capodimonte, near Naples. (H. W. S.)

Caithness, the most northerly county of the Scottish mainland, bounded W. and S. by Sutherlandshire, E. by the German Ocean, and N. by the Pentland Firth.

Area and Population.—According to the last official estimate, the area (foreshore excluded) is 446,017 acres, or about 697 square miles. The population was in 1881, 38,865; in 1891, 37,177, of whom 17,472 were males and 19,705 females; in 1901, 33,859. Taking the land area only (438,878 acres or 685·7 square miles), the number of persons to the square mile in 1891 was 54, and the number of acres to the person 11·8. In the registration county, the decrease of population between 1881 and 1891 was 6·7 per cent. Between 1881 and 1891 the excess of births over deaths was 3950, and the decrease of the resident population 1474. The following table gives particulars of births, deaths, and marriages in 1880, 1890, and 1899:—

Year.	Deaths.	Marriages.	Births.	Percentage of Illegitimate.
1880	677	175	1056	11·5
1890	733	163	970	11·65
1899	621	167	872	11·5

The following table gives the birth-rate, death-rate, and marriage-rate per thousand of the population for a series of years:—

	1880.	1881-90.	1890.	1891-98.	1899.
Birth-rate . .	26·44	26·98	25·39	24·36	24·41
Death-rate . .	16·95	16·84	19·18	16·55	17·39
Marriage-rate .	4·38	4·56	4·26	4·48	4·67

The number of Gaelic-speaking persons in the county in 1891 was 4068, of whom 76 spoke Gaelic only, and there were 18 foreigners. Valuation in 1889-90, £132,795; 1899-1900, £114,105.

Administration.—The county returns a member to parliament. Wick (2773) is the only royal burgh, and the parliamentary burgh of Wick (7881) is one of the Northern group of burghs. Thurso (3938) and Pulteneytown (5502) are police burghs. There are 10 civil parishes, of which all but one are included in the combinations of Latheron and Thurso. The number of paupers and dependants in September 1899 was 1480. Caithness unites with Orkney and Shetland to form a sheriffdom, and there is a resident sheriff-substitute at Wick, who sits also at Thurso and Lybster.

Education.—Twelve school boards manage 63 schools, with an average attendance of 5504 in 1898-99, and there are 3 voluntary schools, with an average attendance of 200. There are academies at Wick and Thurso, and six other schools earned grants in 1898-99 for higher education. The county council spent £262 out of the "residue" grant in 1898 in subsidizing elementary schools and cookery classes, and in buying apparatus for technical classes.

Agriculture.—About two-fifths of the arable land are good, one-fifth is bad, and the rest medium. The cold, wet, and windy climate has been successfully counteracted by improving landlords and tenants, and a considerable part of the acreage is in large farms tilled in a thoroughly good style. Twenty-five per cent. of the land was under cultivation in 1898. According to the return of 1895, the average size of the 2694 holdings was 41 acres. Only 24·83 per cent. were under 5 acres, compared with 64·92 in the adjacent county of Sutherland; 59·28 were between 5 and 50, and 15·89 over 50 acres. The number between 50 and 100 was 201; between 100 and 300, 159; between 300 and 500, 38; between 500 and 1000, 21; and there were 9 over 1000. Oats are the vastly preponderant crop; wheat-growing has died out, and the barley acreage remains fairly constant at about 1000.

The following table gives the principal acreages at intervals of five years from 1880:—

Year.	Area under Crops.	Corn Crops.	Green Crops.	Clover.	Permanent Pasture.	Fallow.
1880	105,551	35,953	16,967	26,688	25,359	584
1885	106,710	35,559	16,392	28,282	25,806	671
1890	109,082	36,419	16,764	30,505	25,231	161
1895	110,026	35,455	16,184	29,748	28,596	35
1899	111,869	35,113	16,051	32,205	28,438	59

The following table gives particulars of the live stock in the same years:—

Year.	Total Horses.	Total Cattle.	Cows or Heifers in Milk or Calf.	Sheep.	Pigs.
1880	5177	19,746	7040	93,969	1559
1885	5021	20,030	7040	101,378	1736
1890	5431	20,664	7406	121,127	1928
1895	5580	21,646	7417	108,621	1806
1899	5653	21,780	7841	130,006	1495

Since the commencement of the operations of the Crofters Commission in 1886 down to the end of 1898, 1359 fair rents have been fixed in Caithness, rents amounting to £9032 were reduced to £6143, and of £12,600 of arrears £7051 was cancelled. In the same period, 117 applications for enlargement of holdings were dealt with, and 552 acres were added to existing holdings. Only 952 acres were under wood in 1895. According to the census of 1891, 4258 men and 1010 women were engaged in agriculture.

Industries and Trade.—Twelve thousand tons of pavement flags were quarried in 1895 and 22,089 tons, valued at £21,867, in 1899. It is fishing, however, that makes Caithness crofting possible. Thurso, Scrabster, Lybster, and Wick are the chief fishing ports. The following tables show particulars of the combined districts of Lybster and Wick, which may be taken as representing the county:—

Year.	Boats.			Value of Gear.	Resident Fishermen and Boys.	Total Value of all Fish.
	No.	Tons.	Value.			
1890	920	10,242	£55,304	£53,174	3807	£109,988
1898	659	6,594	£28,200	£47,064	2878	£124,935
1899	639	6,540	£35,538	£41,778	2353	£117,539

The value of the herring catch alone, in 1898, was £95,216. There were 6266 persons in 1899 employed in the two districts in connexion with the various branches of the sea fisheries. The salmon fisheries along the coast and at the mouths of rivers are of considerable value. A light railway (13 miles) from Wick to Lybster has been sanctioned.

See S. Laing. *Prehistoric Remains of Caithness.* Lond. and Edin., 1866.—James T. Calder. *History of Caithness* (2nd edition). Wick.—John Horne. *In and About Wick.* Wick.—Thomas Sinclair. *Caithness Events.* Wick, 1899.—*History of the Clan Gunn.* Wick, 1890.—J. Henderson. *Caithness Family History.* Edinburgh, 1884.—Harvie-Brown. *Fauna of Caithness.* Edinburgh, 1887.—Principal Miller. *Our Scandinavian Forefathers.* Thurso, 1872.—Smiles. *Robert Dick, Botanist and Geologist.* London, 1878.—H. Morrison. *Guide to Sutherland and Caithness.* Wick, 1883.—A. Auld. *Ministers and Men in the Far North.* Edinburgh, 1891. (W. Wa.)

Cajamarca, an interior department of northern Peru, with an area of 12,538 square miles, and a population (1896) of 442,412. It is divided into 7 provinces—Jaen, Chota, Hualgayoc, Colendin, Cajamarca, Contumara, and Cajabamba, the principal towns being Cajamarca and Cajamarquilla, with populations, respectively, of 12,000 and 8000.

Calabar. See Nigeria.

Calabria, a territorial division of S. Italy, practically coincident with the "toe" of the "boot," and embracing the provinces of Catanzaro, Cosenza, and Reggio, with an area of 5819 sq. miles, and a population of 1,257,883 (1881), and of 1,375,760 (1901). Except the three provincial capitals, Reggio, Catanzaro, and Cosenza, the towns are mostly small. On the coast stand Cotrone, Gerace, Scilla, Palmi, Pizzo, Paola, and some others. Inland are Castrovillari, Corigliano, Rossano, Nicastro, Monteleone, Cittanova, Acri, and San Giovanni.

Calafat, a town in Rumania (population, 7113 in 1900), on the left bank of the Danube, opposite Viddin. It was founded in the 14th century by Genoese colonists, who employed large numbers of workmen (Calfats) in repairing ships—which industry gave its name to the place. It is now an important centre of the grain trade, and is connected by railway with Craiova.

Calais, a seaport on the Strait of Dover in the arrondissement of Boulogne, department of Pas-de-Calais, France, 184 miles from Paris by rail. The manufacturing suburb of St Pierre-lès-Calais has been incorporated with the municipality. Important industries, besides the long-established manufacture of tulle and lace, of which the value exported in 1899 amounted to £3,267,860, are the manufacture of carriages, bicycles, motor cars, and telegraph cables; brewing, silk-milling, brick-making, and soap-making are also carried on. In outlying districts important industries are—the manufacture of chairs at Audruicq; iron-founding and quarrying at Marquise; the working of phosphates near Caffiers; and sugar-refining at Port d'Ardres, employing during the busy season about 1200 persons, with an output of sugar (1899-1900) of 22,000 tons. The fitting of machinery carried on in six establishments at Calais, Marquise, and Audruicq, employs about 8000 persons. There is a proposal to establish large shipbuilding yards at Calais, only fishing boats having hitherto been built here. The number of vessels entered and cleared respectively in 1899 was 2101, tonnage 812,815, and 2106, tonnage 786,735. Of this total, British vessels numbered 1432 entered, tonnage 392,786, and cleared 1443, tonnage 395,216. The produce of the fisheries, in which 88 boats were employed, was valued at £56,000. The total number of passengers carried between Dover and Calais in 1899 was 263,420. Port accommodation has been greatly improved. The entrance channel has a width between jetties of 430 feet, and a depth of 34 feet and 13 feet at high and low spring tides respectively. There are four principal basins, of which the East Tidal Basin (that used by the mail packets) has an area of 16 acres. The canal of Calais, 18½ miles long, connects the port with the Aa and the navigable waterways of the department. Inland canal traffic in 1899 amounted to 464,066 tons. Total value of imports 1899, £3,244,000; of exports, £6,732,000. There are a chamber of commerce, three hospitals, and two libraries. Population (1881), 12,446; St Pierre-lès-Calais, 30,155; (1891, including St Pierre-lès-Calais), 51,056; (1896), 50,818; (1901), 59,893.

Calais, a city of Washington county, Maine, U.S.A., at the head of navigation on St Croix river, a few miles above its mouth, and on the St Croix and Penobscot Railway. It has many lumber-mills and shipyards, and considerable commerce. Population (1880), 6173; (1890), 7290; (1900), 7655.

Calarasi, chief town of the district of the same name, Rumania, 223 miles from Bucarest, on the left bank of the Borcea branch of the Danube. It was formerly called Stirbey in honour of the prince of that name. It has a considerable export of wheat, linseed, hemp, and timber. Population (1895), 11,000; (1900), 11,024.

Calatafimi, a town of the province of Trapani, Sicily, Italy, 21 miles E. by S. from Trapani. A monument was erected in 1882 on the battlefield where Garibaldi defeated the Neapolitan forces in 1860. It has a trade in wine, olive oil, and sumach. Two and a half miles to the north-west are the ruins of the ancient city of Segesta. Population, about 10,500.

Calbayog, a town of 30,000 inhabitants, near the

west coast of Samar, Philippine Islands, on a small river of the same name, in 12° 3′ N. It does an important export business in hemp, which is shipped to Manila. Rice and copra are also produced in considerable quantity, and there is fine timber close at hand. The climate is pleasant and healthful. The language is Visayan.

Calculating Machines. See MATHEMATICAL INSTRUMENTS.

Calcutta, the capital of British India, and also of the province of Bengal, is situated in 22° 34′ N. lat. and 88° 24′ E. long. It lies on the left or east bank of the Hooghly, about 80 miles above the sea. It covers an area of 20 square miles. Its population in 1881 was 549,376, and in 1891 it was 681,560. Adding the suburbs, the total population was 903,374; and if Howrah be also included, the grand total rises to 1,018,980. Classified according to religion, Hindus numbered 444,137, or 65 per cent.; Mahommedans, 203,173, or 30 per cent.; Christians, 28,997, or 4 per cent., of whom 12,516 were Europeans and 9818 Eurasians, leaving 6663 for native converts; Jains and Buddhists, 2693; Parsis, 166; "others," 2394. Of the total number of inhabitants, less than one-third were born in the city. The preliminary returns of the census of 1901 gave the population of Calcutta as 843,487, showing an increase of 24 per cent., the same rate of increase as in the preceding decade. Adding the suburbs, the total population is 1,121,664; and if Howrah be also included, the grand total rises to 1,279,511. Just two-thirds of the population are males.

Calcutta is a busy commercial centre, but most of the industries are carried on outside municipal limits. Howrah, on the opposite side of the Hooghly, is the terminus of three great railway systems, and also the headquarters of the jute industry and other large factories. It is connected with Calcutta by an immense floating bridge, 1530 feet in length, which was constructed in 1874. A project is now under consideration to build a railway bridge across the river, with a central station in Calcutta. Other railways have their terminus at Sealdah, an eastern suburb. The docks lie outside Calcutta, at Kidderpur, on the south; and at Alipur are the Zoological Gardens, the residence of the lieutenant-governor of Bengal, cantonments for a native infantry regiment, the central jail, and a Government reformatory. The port of Calcutta stretches about 10 miles along the river. It is under the control of a port trust, whose jurisdiction extends to the mouth of the Hooghly, and also over the floating bridge. During the five years ending 1897-98, the number of vessels entering the port rose from 991 to 1235, and the tonnage from 2,567,440 to 3,562,373. New docks were opened in 1892, which cost Rs.2,87,70,000; and a loan of Rs.15,00,000 was raised in 1898 for improvements in the docks and jetties and for new warehouses. In 1897-98 the total income of the port trust was Rs.61,85,000, and the total expenditure was Rs.61,05,000, of which Rs.21,19,000 represents debt and sinking fund. The total amount of liabilities outstanding was Rs.4,09,50,000, against which the port trust holds land, &c., estimated at a considerably higher value. The figures for the sea-borne trade of Bengal are included in those given for Bengal (*q.v.*) During the ten years ending 1897-98, imports of foreign merchandise rose in value from Rs.25,65,12,730 to Rs.27,85,49,500, or by 9 per cent.; while exports rose from Rs.36,63,69,890 to Rs.44,13,96,590, or by 20 per cent. In 1899-1900 the foreign trade amounted to £56,828,000 (imports, £23,511,000; exports, £33,317,000), of which 51 per cent. was trade with the United Kingdom and 8·4 per cent with the United States. The inland trade of Calcutta is registered as it enters or leaves the city by country boat, by inland steamer, by rail, or by road. The following table gives the results of this registration for 1897-98:—

	Imports.	Exports.	Total.
	Rs.	Rs.	Rs.
By country boat .	13,22,03,507	3,57,87,627	16,79,91,134
By inland steamer	7,72,75,288	5,37,08,677	13,09,83,965
By East Indian Railway . .	27,99,37,306	23,23,18,027	51,22,55,333
By Eastern Bengal Railway . .	9,30,86,345	5,58,64,506	14,89,50,851
By road . .	4,20,44,354	2,23,47,509	6,43,91,863
Total . .	62,45,46,800	40,00,26,346	1,02,45,73,146

More than half of the total is carried by the East Indian railway, which serves the North-Western Provinces. Country boats hold their own against inland steamers, especially in imports.

The municipal government of Calcutta has been reconstituted by an Act of the Bengal Legislature, passed in 1899. Previously, the governing body consisted of seventy-five commissioners, of whom fifty were elected. Under the new system, modelled upon that of the Bombay municipality, this body, styled the Corporation, remains comparatively unaltered; but a large portion of their powers is transferred to a general committee, composed of twelve members, of whom one-third are elected by the Corporation, one-third by certain public bodies, and one-third are nominated by the Government. At the same time, the authority of the chairman, as supreme executive officer, is considerably strengthened. The two most important works undertaken by the old municipality were the provision of a supply of filtered water and the construction of a main drainage system. The water-supply is derived from the river Hooghly, about 16 miles above Calcutta, where there are large pumping-stations and settling-tanks. The total length of the main is 315 miles. In 1897-98 the daily supply of filtered water was more than 20 million gallons, being 38 gallons per head of population. In addition, there was a daily supply of more than 5 million gallons of unfiltered water, being 12 gallons per head. The drainage system consists of underground sewers, which are discharged by a pumping-station into a natural depression to the eastward, called the Salt Lake. Refuse is also removed to the Salt Lake by means of a municipal railway.

The following table gives the principal heads of municipal income and expenditure in 1897-98:—

Income.		Expenditure	
	Rs.		Rs.
General rate . .	17,79,106	Interest of debt .	5,99,209
Sewage rate . .	3,74,540	Repayment of debt	2,44,615
Water rate . .	11,23,621	General establishment	4,92,025
Lighting rate . .	3,74,540	Office . . .	1,04,381
Taxes on trades, carriages, &c. . .	5,31,869	Roads . . .	3,60,446
Market . . .	1,33,556	Street watering .	98,278
Sale of water . .	1,55,210	Gowkhana . .	2,17,501
Conservancy . .	64,760	Conservancy . .	1,57,676
Roads . . .	34,975	Busti cleaning .	80,231
Slaughter-house .	41,148	Sewer cleaning, &c.	1,28,480
Miscellaneous .	1,37,756	Hospital and vaccination . . .	67,102
		Suburban improvements . . .	37,884
		Sewers . . .	2,72,006
		Water . . .	11,79,085
		Lighting . . .	4,56,098
		Miscellaneous .	4,40,682
Total . .	47,51,060	Total . .	48,45,593

The total amount levied by rate was Rs.36,51,897, the incidence of taxation being nearly Rs.7 per head. The assessment of the annual valuation of the city amounts to Rs.2,08,54,607. The

outstanding liabilities at the close of the year were Rs.2,67,72,879, the rates of interest ranging from 5 to 3½ per cent.

The Calcutta University was constituted in 1857, as an examining body, on the model of the University of London. During the five years ending 1897, the total number of persons who matriculated was 12,602, while 1830 graduated B.A., and 329 M.A., 627 passed examinations in law, 925 in medicine, and 92 in engineering. The chief educational institutions are the Government Presidency College (with 497 students in 1897), three aided missionary colleges (with a total of 1315 students), and four unaided native colleges (with a total of 1474 students); the Sanskrit College and the Mahommedan Madrasah, the Government medical college (with 468 students), the Government engineering college at Sibpur, on the opposite bank of the Hooghly (with 310 students), the Government school of art (with 261 students), 49 high schools for boys, which passed 465 candidates for the matriculation; the Bethune College, and 4 high schools for girls. In 1896-97 the total number of pupils under instruction was 47,295, the proportion to population of school-going age being 81 per cent. for boys and 21 per cent. for girls.

Calcutta has been comparatively fortunate in escaping the plague. The disease manifested itself in a sporadic form in April 1898, but disappeared by September of that year. Many of the Marwari traders fled the city, and some trouble was experienced in shortness of labour in the factories and at the docks. The plague returned in 1899, and caused a heavy mortality during the early months of the following year; but the population was not demoralised, nor was trade interfered with. A yet more serious outbreak occurred in the early months of 1901. The total death-rate in 1900 was 43·54 per thousand, the number of deaths from plague being 8354, compared with 2332 in the preceding year.

Though Calcutta has been called "the city of palaces," its modern public buildings cannot compare with those of Bombay. Its chief glory is the Maidan, or Park, which is large enough to embrace the area of Fort William and a racecourse. Many monuments find a place on the Maidan, amongst the latest additions being two equestrian statues of Lord Roberts and Lord Lansdowne, which face one another on each side of the Red Road, where the rank and fashion of Calcutta take their evening drive. In the north-eastern corner of the Maidan it is proposed to erect the Indian memorial to Queen Victoria, consisting of a marble hall, with a statue and historical relics. The Government has acquired Metcalfe Hall, in order to convert it into a public library and reading-room worthy of the capital of India; and also the country-house of Warren Hastings at Alipur, for the entertainment of Indian princes. Lord Curzon has restored, at his own cost, the monument which formerly commemorated the massacre of the Black Hole. A wide street, called Harrison Road in memory of a former chairman of the municipality, has been run through the centre of the city, in continuation of the line of the Hooghly bridge; but much yet remains to be done to open up the native quarters, which are densely built over, regardless of sanitary requirements. (J. S. Co.)

Caldecott, Randolph (1846-1886), English artist and illustrator, was born at Chester on 22nd March 1846. From 1861 to 1872 he was a bank clerk, first at Whitchurch in Shropshire, afterwards at Manchester; but devoted all his spare time to the cultivation of a remarkable artistic faculty. In 1872 he migrated to London, became a student at the Slade School, and finally adopted the artist's profession. He gained immediately a wide reputation as a prolific and original illustrator, gifted with a genial, humorous faculty, and he succeeded also, though in less degree, as a painter and sculptor. His health gave way in 1876, and after prolonged suffering, he died in Florida on 12th February 1886. His chief book illustrations are as follows: *Old Christmas* (1876) and *Bracebridge Hall* (1877), both by Washington Irving; *North Italian Folk* (1877), by Mrs Comyns Carr; *The Harz Mountains* (1883); *Breton Folk* (1879), by Henry Blackburn; picture-books (*John Gilpin*, *The House that Jack Built*, and other children's favourites) from 1878 onwards; *Some Æsop's Fables with Modern Instances, &c.* (1883). He held a roving commission for the *Graphic*, and was an occasional contributor to *Punch*. He was a member of the Royal Institute of Painters in Water-colours.

See Henry Blackburn: *Randolph Caldecott, Personal Memoir of his Early Life*. London, 1886. (A. L. B.)

Calgary, a port of entry and the principal town of Alberta, Canada, situated 840 miles by rail W. of Winnipeg, at the junction of the main line and Edmonton and Macleod branches of the Candian Pacific railway, in 51° 02′ N. lat. and 114° 04′ W. long., at an altitude of 3421 feet above the sea. It is the centre of the ranching country and the main distributing point for the district. The population in 1901 was 4865.

Cali, a town in the department of Cauca, Colombia, South America, situated on the Cali. The river is spanned by a handsome bridge, and the town has 7 churches, several convents, and a number of good public buildings. Its population is 16,000.

Calibration.—The term Calibration primarily signifies the determination of the "calibre" or bore of a gun. The word *calibre* was introduced through the French from the Italian *calibro*, together with other terms of gunnery and warfare, about the 16th century. The origin of the Italian equivalent appears to be uncertain. It will readily be understood that the calibre of a gun requires accurate adjustment to the standard size, and further, that the bore must be straight and of uniform diameter throughout. The term was subsequently applied to the accurate measurement and testing of the bore of any kind of tube, especially those of thermometers. In modern scientific language, by a natural process of transition, it has come to denote the accurate comparison of any measuring instrument with a standard, and more particularly the determination of the errors of its scale. It is seldom possible in the process of manufacture to make an instrument so perfect that no error can be discovered by the most delicate tests, and it would rarely be worth while to attempt to do so even if it were possible. The cost of manufacture would in many cases be greatly increased without adding materially to the utility of the apparatus. The scientific method, in all cases which admit of the subsequent determination and correction of errors, is to economize time and labour in production by taking pains in the subsequent verification or calibration. This process of calibration is particularly important in laboratory research, where the observer has frequently to make his own apparatus, and cannot afford the time or outlay required to make special tools for fine work, but is already provided with apparatus and methods of accurate testing. For non-scientific purposes it is generally possible to construct instruments to measure with sufficient precision without further correction. The present article will therefore be restricted to the scientific use and application of methods of accurate testing.

General Methods and Principles.—The process of calibration of any measuring instrument is frequently divisible into two parts, which differ greatly in importance in different cases, and of which one or the other may often

be omitted. (1) The determination of the value of the unit to which the measurements are referred by comparison with a standard unit of the same kind. This is often described as the *Standardization* of the instrument, or the determination of the *Reduction factor*. (2) The verification of the accuracy of the subdivision of the scale of the instrument. This may be termed calibration of the scale, and does not necessarily involve the comparison of the instrument with any independent standard, but merely the verification of the accuracy of the relative values of its indications. In many cases the process of calibration adopted consists in the comparison of the instrument to be tested with a standard over the whole range of its indications, the relative values of the subdivisions of the standard itself having been previously tested. In this case the distinction of two parts in the process is unnecessary, and the term calibration is for this reason frequently employed to include both. In some cases it is employed to denote the first part only, but for greater clearness and convenience of description we shall restrict the term as far as possible to the second meaning.

The methods of standardization or calibration employed have much in common even in the cases that appear most diverse. They are all founded on the axiom that "things which are equal to the same thing are equal to one another." Whether it is a question of comparing a scale with a standard, or of testing the equality of two parts of the same scale, the process is essentially one of interchanging, or substituting one for the other, the two things to be compared. In addition to the things to be tested there is usually required some form of balance, or comparator, or gauge, by which the equality may be tested. The simplest of such comparators is the instrument known as the *callipers*, from the same root as calibre, which is in constant use in the workshop for testing equality of linear dimensions, or uniformity of diameter of tubes or rods. The more complicated forms of optical comparators or measuring machines with scales and screw adjustments, are essentially similar in principle, being finely adjustable gauges to which the things to be compared can be successively fitted. A still simpler and more accurate comparison is that of volume or capacity, using a given mass of liquid as the gauge or test of equality, which is the basis of many of the most accurate and most important methods of calibration. The common balance, for testing equality of mass or weight, is so delicate and so easily tested, that the process of calibration may frequently with advantage be reduced to a series of weighings, as for instance in the calibration of a burette or measure-glass by weighing the quantities of mercury required to fill it to different marks. The balance may, however, be regarded more broadly as the type of a general method capable of the widest application in accurate testing. It is possible, for instance, to balance two electromotive forces or two electrical resistances against each other, or to measure the refractivity of a gas by balancing it against a column of air adjusted to produce the same retardation in a beam of light. These "equilibrium," or "null," or "balance" methods of comparison afford the most accurate measurements, and are generally selected if possible as the basis of any process of calibration. In spite of the great diversity in the nature of the things to be compared, the fundamental principles of the methods employed are so essentially similar that it is possible, for instance, to describe the testing of a set of weights, or the calibration of an electrical resistance-box, in almost the same terms, and to represent the calibration correction of a mercury thermometer or of an ammeter by precisely similar curves.

Method of Substitution.—In comparing two units of the same kind and of nearly equal magnitude, some variety of the general method of substitution is invariably adopted. The same method in a more elaborate form is employed in the calibration of a series of multiples or submultiples of any unit. The details of the method depend on the system of subdivision adopted, which is to some extent a matter of taste. The simplest method of subdivision is that on the binary scale, proceeding by multiples of 2. With a pair of submultiples of the smallest denomination and one of each of the rest, thus 1, 1, 2, 4, 8, 16, &c., each weight or multiple is equal to the sum of all the smaller weights, which may be substituted for it, and the small difference, if any, observed. If we call the weights A, B, C, &c., where each is approximately double the following weight, and if we write a for observed excess of A over the rest of the weights, b for that of B over $C+D+$&c., and so on, the observations by the method of substitution give the series of equations,

$$A - \text{rest} = a,\ B - \text{rest} = b,\ C - \text{rest} = c, \text{ \&c.} \quad . \quad (1).$$

Subtracting the second from the first, the third from the second, and so on, we obtain at once the value of each weight in terms of the preceding, so that all may be expressed in terms of the largest, which is most conveniently taken as the standard

$$B = A/2 + (b-a)/2,\ C = B/2 + (c-b)2, \text{ \&c.} \quad . \quad (2).$$

The advantages of this method of subdivision and comparison, in addition to its extreme simplicity, are (1) that there is only one possible combination to represent any given weight within the range of the series; (2) that the least possible number of weights is required to cover any given range; (3) that the smallest number of substitutions is required for the complete calibration. These advantages are important in cases where the accuracy of calibration is limited by the constancy of the conditions of observation, as in the case of an electrical resistance-box, but the reverse may be the case when it is a question of accuracy of estimation by an observer.

In the majority of cases the case of numeration afforded by familiarity with the decimal system is the most important consideration. The most convenient arrangement on the decimal system for purposes of calibration is to have the units, tens, hundreds, &c., arranged in groups of four adjusted in the proportion of the numbers 1, 2, 3, 4. The relative values of the weights in each group of four can then be determined by substitution independently of the others, and the total of each group of four, making ten times the unit of the group, can be compared with the smallest weight in the group above. This gives a sufficient number of equations to determine the errors of all the weights by the method of substitution in a very simple manner. A number of other equations can be obtained by combining the different groups in other ways, and the whole system of equations may then be solved by the method of least squares; but the equations so obtained are not all of equal value, and it may be doubted whether any real advantage is gained in many cases by the multiplication of comparisons, since it is not possible in this manner to eliminate constant errors or personal equation, which are generally aggravated by prolonging the observations. A common arrangement of the weights in each group on the decimal system is 5, 2, 1, 1, or 5, 2, 2, 1. These do not admit of the independent calibration of each group by substitution. The arrangement 5, 2, 1, 1, 1, or 5, 2, 2, 1, 1, permits independent calibration, but involves a larger number of weights and observations than the 1, 2, 3, 4, grouping. The arrangement of ten equal weights in each group, which is adopted in "dial" resistance-boxes, and in some forms of chemical balances where the weights are mechanically applied by turning a handle, presents great advantages in point of quickness of manipulation and ease of numeration, but the complete calibration of such an arrangement is tedious, and in the case of a resistance-box it is difficult to make the necessary connexions. In all cases where the same total can be made up in a variety of ways, it is necessary in accurate work to make sure that the same weights are always used for a given combination, or else to record the actual weights used on each occasion. In many investigations where time enters as one of the factors, this is a serious drawback, and it is better to avoid the more complicated arrangements. The accurate adjustment of a set of weights is so simple a matter that it is often possible to neglect the errors of a well-made set, and no calibration is of any value without the most scrupulous attention to details of manipulation, and particularly to the correction for the air displaced in comparing weights of different materials. Electrical resistances are much more difficult to adjust owing to the change of resistance with temperature, and the calibration of a resistance-box can seldom be neglected on account of the changes of resistance which are liable to occur after adjustment from imperfect annealing. It is also necessary to remember that the order of accuracy required and the actual values of the smaller resistances depend to some extent on the method of connexion, and that the box must be calibrated with due regard to the conditions under which it is to be used. Otherwise the method of procedure is much the same as in the case of a box of weights, but it is necessary to pay more attention to the constancy and uniformity of the temperature conditions of the observing-room.

Method of Equal Steps.—In calibrating a continuous scale divided into a number of divisions of equal length, such as a metre scale divided in millimetres, or a thermometer tube divided in degrees of temperature, or an electrical slide-wire, it is usual to proceed by a method of equal steps. The simplest method is that known as the method of Gay-Lussac in the calibration of mercurial thermometers or tubes of small bore. It is essentially a method of substitution employing a column of mercury of constant volume as the gauge for comparing the capacities of different parts of the tube. A precisely similar method, employing a pair of microscopes at a fixed distance apart as a standard of length, is applicable to the calibration of a divided scale. The interval to be calibrated is divided into a whole number of equal steps or sections, the points of division at which the corrections are to be determined are called *points of calibration*.

Calibration of a Mercury Thermometer.—To facilitate description, we will take the case of a fine-bore tube, such as that of a thermometer, to be calibrated with a thread of mercury. The bore of such a tube will generally vary considerably even in the best standard instruments, the tubes of which have been specially drawn and selected. The correction for inequality of bore may amount to a quarter or half a degree, and is seldom less than a tenth. In ordinary chemical thermometers it is usual to make allowance for variations of bore in graduating the scale, but such instruments present discontinuities of division, and cannot be used for accurate work, in which a finely-divided scale of equal parts is essential. The calibration of a mercury thermometer intended for work of precision is best effected after it has been sealed. A thread of mercury of the desired length is separated from the column. The exact adjustment of the length of the thread requires a little manipulation. The thermometer is inverted and tapped to make the mercury run down to the top of the tube, thus collecting a trace of residual gas at the end of the bulb. By quickly reversing the thermometer the bubble passes to the neck of the bulb. If the instrument is again inverted and tapped, the thread will probably break off at the neck of the bulb, which should be previously cooled or warmed so as to obtain in this manner, if possible, a thread of the desired length. If the thread so obtained is too long or not accurate enough, it is removed to the other end of the tube, and the bulb further warmed till the mercury reaches some easily recognized division. At this point the broken thread is rejoined to the mercury column from the bulb, and a microscopic bubble of gas is condensed which generally suffices to determine the subsequent breaking of the mercury column at the same point of the tube. The bulb is then allowed to cool till the length of the thread above the point of separation is equal to the desired length, when a slight tap suffices to separate the thread. This method is difficult to work with short threads owing to deficient inertia, especially if the tube is very perfectly evacuated. A thread can always be separated by local heating with a small flame, but this is dangerous to the thermometer, it is difficult to adjust the thread exactly to the required length, and the mercury does not run easily past a point of the tube which has been locally heated in this manner.

Having separated a thread of the required length, the thermometer is mounted in a horizontal position on a suitable support, preferably with a screw adjustment in the direction of its length. By tilting or tapping the instrument the thread is brought into position corresponding to the steps of the calibration successively, and its length in each position is carefully observed with a pair of reading microscopes fixed at a suitable distance apart. Assuming that the temperature remains constant, the variations of length of the thread are inversely as the variations of cross-section of the tube. If the length of the thread is very nearly equal to one step, and if the tube is nearly uniform, the average of the observed lengths of the thread, taking all the steps throughout the interval, is equal to the length which the thread should have occupied in each position had the bore been uniform throughout and all the divisions equal. The error of each step is therefore found by subtracting the average length from the observed length in each position. Assuming that the ends of the interval itself are correct, the correction to be applied at any point of calibration to reduce the readings to a uniform tube and scale, is found by taking the sum of the errors of the steps up to the point considered with the sign reversed.

In the following example of the method an interval of ten degrees is taken, divided into ten steps of 1° each. The distances of the ends of the thread from the nearest degree divisions are estimated by the aid of micrometers to the thousandth of a degree. The error of any one of these readings probably does not exceed half a thousandth, but they are given to the nearest thousandth only. The excess length of the thread in each position over the corresponding degree is obtained by subtracting the second reading from the first. Taking the average of the numbers in this line, the mean excess-length is −10·4 thousandths. The error of each step is found by subtracting this mean from each of the numbers in the previous line. Finally, the corrections at each degree are obtained by adding up the errors of the steps and changing the sign. The errors and corrections are given in thousandths of 1°.

TABLE I.—*Calibration by Method of Gay-Lussac.*

No. of Step.	1	2	3	4	5	6	7	8	9	10
Ends of thread	+·010	−·016	−·020	−·031	+·016	+·008	+·013	+·017	+·004	−·008
	+·038	+·017	−·003	−·022	+·016	+·005	+·032	+·018	+·013	−·008
Excess-length.	−·028	−·033	−·017	−·009	+·000	−·003	−·020	−·001	−·004	+·005
Error of step.	−17·6	−22·6	−6·6	+1·4	+10·4	+7·4	−9·6	+9·4	+6·4	+15·4
Correction.	+17·6	+40·2	+46·8	+45·4	+29·0	+21·6	+31·2	+21·8	+15·4	0

Complete Calibration.—The simple method of Gay-Lussac does very well for short intervals when the number of steps is not excessive, but it would not be satisfactory for a large range owing to the accumulation of small errors of estimation, and the variation of the personal equation. The observer might, for instance, consistently over-estimate the length of the thread in one half of the tube, and under-estimate it in the other. The errors near the middle of the range would probably be large. It is evident that the correction at the middle point of the interval could be much more accurately determined by using a thread equal to half the length of the interval. To minimize the effect of these errors of estimation, it is usual to employ threads of different lengths in calibrating the same interval, and to divide up the fundamental interval of the thermometer into a number of subsidiary sections for the purpose of calibration, each of these sections being treated as a step in the calibration of the fundamental interval. The most symmetrical method of calibrating a section, called by Guillaume a "Complete Calibration," is to use threads of all possible lengths which are integral multiples of the calibration step. In the example already given nine different threads were used, and the length of each was observed in as many positions as possible. Proceeding in this manner the following numbers were obtained for the excess-length of each thread in thousandths of a degree in different positions, starting in each case with the beginning of the thread at 0°, and moving it on by steps of 1°.

TABLE II.—*Complete Calibration of Interval of* 10° *in* 10 *Steps.*

Lengths of Threads.	1°	2°	3°	4°	5°	6°	7°	8°	9°
Observed excess-lengths of threads in various positions, the beginning of the thread being set near the points	0°	−28	−32	−67	−62	−11	−15	−48	− 2	− 8
	1°	−33	−21	−47	−28	+14	− 8	−22	+21	+24
	2°	−17	+ 2	− 8	+ 1	+26	+23	+ 6	+58	
	3°	− 9	+26	+ 5	− 3	+41	+36	+28		
	4°	+ 6	+31	− 7	+ 4	+45	+49			
	5°	− 3	+ 5	−15	− 6	+43				
	6°	−20	+ 7	−16	+ 2					
	7°	− 1	+23	+10						
	8°	− 4	+29							
	9°	+ 5								

The observations in the first column are the excess-lengths of the thread of 1° already given in illustration of the method of Gay-Lussac. The other columns give the corresponding observations with the longer threads. The simplest and most symmetrical method of solving these observations, so as to find the errors of each step in terms of the whole interval, is to obtain the differences of the steps in pairs by subtracting each observation from the one above it. This method eliminates the unknown lengths of the threads, and gives each observation approximately its due weight. Subtracting the observations in the second line from those in the first, we obtain a series of numbers, entered in column 1 of the next table, representing the excess of step (1) over each of the other steps. The sum of these differences is ten times the error of the first step, since by hypothesis the sum of the errors of all the steps is zero in terms of the whole interval. The numbers in the second column of Table III. are similarly obtained by subtracting the third line from the second in Table II., each difference being inserted in its appropriate place in the table. Proceeding in this way we find the excess of each interval over those which follow it. The table is completed by a diagonal row of zeros representing the difference of each step from itself, and by repeating the numbers already found in symmetrical positions with their signs changed, since the excess of any step, say 6 over 3, is evidently equal to that of 3 over 6 with the sign changed. The errors of each step having been found by adding the columns, and dividing by 10, the corrections at each point of the calibration are deduced as before.

TABLE III.—*Solution of Complete Calibration.*

Step No.	1	2	3	4	5	6	7	8	9	10
1	0	− 5	+11	+20	+34	+25	+ 7	+26	+23	+32
2	+ 5	0	+16	+23	+39	+29	+12	+31	+28	+37
3	−11	−16	0	+ 8	+24	+13	− 4	+15	+13	+22
4	−20	−23	− 8	0	+15	+ 5	−12	+ 7	+ 4	+13
5	−34	−39	−24	−15	0	− 9	−26	− 8	−10	− 2
6	−25	−29	−13	− 5	+ 9	0	−17	+ 2	− 1	+ 8
7	− 7	−12	+ 4	+12	+26	+17	0	+19	+16	+26
8	−26	−31	−15	− 7	+ 8	− 2	−19	0	− 3	+ 6
9	−23	−28	−13	− 4	+10	+ 1	−16	+ 3	0	+ 9
10	−32	−37	−22	−13	+ 2	− 8	−26	− 6	− 9	0
Error of step.	−17·3	−22·0	−6·4	+1·9	+16·7	+7·1	−10·1	+8·9	+6·1	+15·1
Corrections.	+17·3	+39·3	+45·7	+43·8	+27·1	+20·0	+30·1	+21·2	+15·1	0

The advantages of this method are the simplicity and symmetry of the work of reduction, and the accuracy of the result, which

exceeds that of the Gay-Lussac method in consequence of the much larger number of independent observations. It may be noticed, for instance, that the correction at point 5 is 27·1 thousandths by the complete calibration, which is 2 thousandths less than the value 29 obtained by the Gay-Lussac method, but agrees well with the value 27 thousandths obtained by taking only the first and last observations with the thread of 5°. The disadvantage of the method lies in the great number of observations required, and in the labour of adjusting so many different threads to suitable lengths. It is probable that sufficiently good results may be obtained with much less trouble by using fewer threads, especially if more care is taken in the micrometric determination of their errors.

The method adopted for dividing up the fundamental interval of any thermometer into sections and steps for calibration may be widely varied, and is necessarily modified in cases where auxiliary bulbs or "ampoules" are employed. The Paris mercury-standards, which read continuously from 0° to 100° C., without intermediate ampoules, were calibrated by Chappuis in five sections of 20° each, to determine the corrections at the points 20°, 40°, 60°, 80°, which may be called the "principal points" of the calibration, in terms of the fundamental interval. Each section of 20° was subsequently calibrated in steps of 2°, the corrections being at first referred, as in the example already given, to the mean degree of the section itself, and being afterwards expressed, by a simple transformation, in terms of the fundamental interval, by means of the corrections already found for the ends of the section. Supposing, for instance, that the corrections at the points 0° and 10° of Table III. are not zero, but C° and C' respectively, the correction C_n at any intermediate point n will evidently be given by the formula,

$$C_n = C^\circ + c_n + (C' - C^\circ)n/10 \quad . \quad . \quad . \quad (3)$$

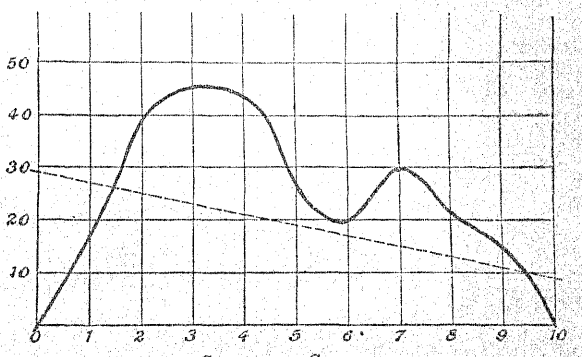
where c_n is the correction already given in the table.

If the corrections are required to the thousandth of a degree, it is necessary to tabulate the results of the calibration at much more frequent intervals than 2°, since the correction, even of a good thermometer, may change by as much as 20 or 30 thousandths in 2°. To save the labour and difficulty of calibrating with shorter threads, the corrections at intermediate points are usually calculated by a formula of interpolation. This leaves much to be desired, as the section of a tube often changes very suddenly and capriciously. It is probable that the graphic method gives equally good results with less labour.

Slide-Wire.—The calibration of an electrical slide-wire into parts of equal resistance is precisely analogous to that of a capillary tube into parts of equal volume. The Carey Foster method, employing short steps of equal resistance, effected by transferring a suitable small resistance from one side of the slide-wire to the other, is exactly analogous to the Gay-Lussac method, and suffers from the same defect of the accumulation of small errors unless steps of several different lengths are used. The calibration of a slide-wire, however, is much less troublesome than that of a thermometer tube for several reasons. It is easy to obtain a wire uniform to one part in 500 or even less, and the section is not liable to capricious variations. In all work of precision the slide-wire is supplemented by auxiliary resistances by which the scale may be indefinitely extended. In accurate electrical thermometry, for example, the slide-wire itself would correspond to only 1°, or less, of the whole scale, which is less than a single step in the calibration of a mercury thermometer, so that an accuracy of a thousandth of a degree can generally be obtained without any calibration of the slide-wire. In the rare cases in which it is necessary to employ a long slide-wire, such as the cylinder potentiometer of Latimer Clark, the calibration is best effected by comparison with a standard, such as a Thomson-Varley slide-box.

Graphic Representation of Results.—The results of a calibration are often best represented by means of a correction curve, such as that illustrated in the diagram, which is plotted to represent the corrections found in Table III. The abscissa of such a curve is the reading of the instrument to be corrected. The ordinate is the correction to be added to the observed reading to reduce to a uniform scale. The corrections are plotted in the figure in terms of the whole section, taking the correction to be zero at the beginning and end. As a matter of fact the corrections at these points in terms of the fundamental interval were found to be -29 and -9 thousandths respectively. The correction curve is transformed to give corrections in terms of the fundamental interval by ruling a straight line joining the points $+29$ and $+9$ respectively, and reckoning the ordinates from this line instead of from the base-line. Or the curve may be replotted with the new ordinates thus obtained. In drawing the curve from the corrections obtained at the points of calibration, the exact form of the curve is to some extent a matter of taste, but the curve should generally be drawn as smoothly as possible on the assumption that the changes are gradual and continuous.

The ruling of the straight line across the curve to express the corrections in terms of the fundamental interval, corresponds to the first part of the process of



CALIBRATION CURVE.

calibration mentioned above under the term "Standardization." It effects the reduction of the readings to a common standard, and may be neglected if relative values only are required. A precisely analogous correction occurs in the case of electrical instruments. A potentiometer, for instance, if correctly graduated or calibrated in parts of equal resistance, will give correct relative values of any differences of potential within its range if connected to a constant cell to supply the steady current through the slide-wire. But to determine at any time the actual value of its readings in volts, it is necessary to standardize it, or determine its scale-value or reduction-factor, by comparison with a standard cell.

A very neat use of the calibration curve has been made by Prof. Rogers in the automatic correction of screws of dividing machines or lathes. It is possible, by the process of grinding as applied by Rowland (see *Ency. Brit.* vol. xxi. pp. 552-3), to make a screw which is practically perfect in point of uniformity, but even in this case errors may be introduced by the method of mounting. In the production of divided scales, and more particularly in the case of optical gratings, it is most important that the errors should be as small as possible, and should be automatically corrected during the process of ruling. With this object a scale is ruled on the machine, and the errors of the uncorrected screw are determined by calibrating the scale. A metal template may then be cut out in the form of the calibration-correction curve on a suitable scale. A lever projecting from the nut which feeds the carriage or the slide-rest is made to follow the contour of the template, and to apply the appropriate correction at each point of the travel, by turning the nut through a small angle on the screw. A small periodic error of the screw, recurring regularly at each revolution, may be similarly corrected by means of a suitable cam or eccentric revolving with the screw and actuating the template. This kind of error is important in optical gratings, but is difficult to determine and correct.

Calibration by Comparison with a Standard.—The commonest and most generally useful process of calibration is the direct comparison of the instrument with a standard over the whole range of its scale. It is necessary that the standard itself should have been already calibrated, or else that the law of its indications should be known. A continuous current ammeter, for instance, can be calibrated, so far as the relative values of its readings are concerned, by comparison with a tangent galvanometer, since it is known that the current in this instrument is proportional to the tangent of the angle of deflexion. Similarly an alternating current ammeter can be calibrated by com-

parison with an electro-dynamometer, the reading of which varies as the square of the current. But in either case it is necessary, in order to obtain the readings in ampères, to standardize the instrument for some particular value of the current by comparison with a voltameter, or in some equivalent manner. Whenever possible, ammeters and voltmeters are calibrated by comparison of their readings with those of a potentiometer, the calibration of which can be reduced to the comparison and adjustment of resistances, which is the most accurate of electrical measurements. The commoner kinds of mercury thermometers are generally calibrated and graduated by comparison with a standard. In many cases this is the most convenient, or even the only possible method. A mercury thermometer of limited scale reading between 250° and 400° C., with gas under high pressure to prevent the separation of the mercury column, cannot be calibrated on itself, or by comparison with a mercury standard possessing a fundamental interval, on account of difficulties of stem exposure and scale. The only practical method is to compare its readings every few degrees with those of a platinum thermometer under the conditions for which it is to be used. This method has the advantage of combining all the corrections for fundamental interval, &c., with the calibration correction in a single curve, except the correction for variation of zero which must be tested occasionally at some point of the scale.

AUTHORITIES.—**Mercurial Thermometers:** GUILLAUME, *Thermométrie de Précision*, Paris, 1889, gives several examples and references to original memoirs. The best examples of comparison and testing of standards are generally to be found in publications of Standards Offices, such as those of the Bureau International des Poids et Mésures at Paris. **Dial Resistance-Box:** GRIFFITHS, *Phil. Trans.* A, 1893. **Platinum Thermometry Box:** HARKER and CHAPPINS, *Phil. Trans.* A, 1900. **Thomson-Varley Potentiometer and Binary Scale Box:** CALLENDAR and BARNES, *Phil. Trans.* A, 1901. For **general electrical methods,** see text-books and articles ELECTRIC CURRENT, &c. (H. L. C.)

Calicut, a city of British India, in the Malabar district of Madras; on the coast, 6 miles N. of Beypur. In 1881 the population was 57,805; in 1891 it was 66,078; and in 1901 it was 75,510, showing an increase of 14 per cent. The municipal income in 1897-98 was Rs.74,320. As the administrative headquarters of the district and the western terminus of the Madras railway, Calicut maintains its historical importance. It is now the chief seaport on the Malabar coast, with a lighthouse. In 1897-98 the number of vessels that entered and cleared for foreign trade was 30, with an aggregate of 23,016 tons. The principal exports are coffee, timber, and cocoa-nut products. There are factories for coffee-cleaning, employing several hundred hands; for coir-pressing and timber-cutting; and also tile-works. The town has a cotton-mill, with 18,424 spindles, employing 500 hands; an unaided native college, with 57 students in 1896-97; one missionary and two native high schools; six printing-presses, issuing two English and three vernacular newspapers; two reading-rooms and a club. A detachment of European troops is generally stationed here to overawe the fanatical Moplas.

California, the first and principal Pacific coast State of the American Union, second of all the States in size, with a gross area of 158,360 square miles (of which 155,980 square miles are land surface), and in 1900 twenty-first in population. It is bounded on the N. by Oregon, on the E. by Nevada and Arizona, on the S. by Mexico, and on the W. by the Pacific.

Population.—The following table shows the population and rate of increase at each census since California was admitted to the Union:—

Census Years.	Population.	Increase.	
		Number.	Per cent.
1850	92,597		
1860	379,994	287,397	310·3
1870	560,247	180,253	47·4
1880	864,694	304,447	54·3
1890	1,208,130	343,436	40·3
1900	1,485,053	276,923	22·4

In 1900, 1,117,813, or 75·3 per cent., were native-born, 367,240 foreign-born, as against 841,821 native-born and 366,309 foreign-born in 1890. The foreign-born include 45,753 Chinese (a falling-off of 25,313 in the decade), and 10,151 Japanese. There were 15,377 Indians, 11,045 persons of Negro descent. Of the total population, 820,531 were males, 664,522 females, a gain of 35,979 more females than males in the decade. Density of population (1900), 9·5 per square mile. The death-rate in 1900, on the basis of the deaths reported to the U.S. census enumerators in that year, was about 15·1. Of the total population 43·7 per cent. was urban (*i.e.*, resident in cities of more than 8000 inhabitants), which much exceeds the average of the United States. The chief cities and their population in 1900 were:—

City.	Population.	Increase since 1890.
San Francisco	342,782	43,785
Los Angeles	102,479	52,084
Oakland (suburb of S.F.)	66,960	18,278
Sacramento (State capital)	29,282	2,896
San José	21,500	3,440
San Diego	17,700	1,541
Stockton	17,506	3,082
Alameda	16,464	5,299
Berkeley (seat State Univ.)	13,214	8,113
Fresno	12,470	1,652

There were (1900) 116 incorporated cities and towns, and 19 of them had populations of over 5000. Immense social and economic changes have taken place in California since 1876. Nearly all parts of the State have developed greatly, and particularly the seven counties south of the Tehachepi range, collectively and specifically known as "Southern California." The determining factor in the inequality of immigration was the first railway competition in California. The completion of a new transcontinental line to Southern California in 1885, and a startling railway "rate-war" soon afterwards, precipitated an immigration which in numbers, in distance travelled, and in average wealth, was probably unparalleled in history. In 1886 began an extraordinary "Land Boom" in Southern California, a wild speculation which was initiated almost entirely by the newcomers. The bubble burst in 1888, fortunately with little disaster, and substantial development has since been continuous. The special attractiveness of orange-growing also had much to do with the disproportionate growth of the southern end of the State; but development has extended over nearly the whole 900 miles of California north and south.

Education.—In 1890 the illiteracy of California was 7·7 per cent. as against 13·3 per cent. for the whole Union. The recent migration has probably reduced this illiteracy considerably, as it is almost wholly of educated people. In 1900, 6·2 per cent. of the total males of voting age, and 2·4 per cent. of the native-born males of voting age, were unable to write. California has one college student to every 419 of total population. The State University (at Berkeley) had in 1900 resources of over $7,250,000, 1895 undergraduates (exceeded only by Harvard University), 463 instructors, and a total enrolment of 3226. Plans for a harmonious scheme of new buildings to cost $10,000,000 were won in a competition open to the world by M. Benard of Paris. The university is liberally endowed by private benefactions, and is supported by a State tax of two cents on each $100 of valuation. The Leland Stanford Jr. University was founded by Governor

Stanford and his wife, and was opened in 1891. It has a total endowment of over $26,000,000, which is said to be the largest in the world. Its total enrolment is over 1500. Both universities are co-educational, and the female attendance is approximately one-third of the total. There were in 1900, 5 State normal schools, 120 high schools, 7119 kindergarten, primary, and grammar schools, with a total of 7706 teachers, 272,352 enrolled scholars, and total value of school property $19,135,722. The total expenditure for public schools in 1900 was $6,195,000. According to the U.S. census of 1900, the number of persons of school age (5 to 20 years inclusive) was 420,081.

Charitable and Reform Institutions.—California has two State prisons, two industrial reform schools, five asylums for the insane (with, in 1897, 4814 inmates, of whom 62 per cent. were of foreign birth), and a large number of public and private hospitals, asylums, orphanages, libraries, and associations and fraternities of all sorts. It is one of the few States in the Union which have an incorporated and active association to conserve historic landmarks.

Religion.—In 1890 the number of church edifices was 1505, with a seating capacity of 422,609; value of church property, nearly $12,000,000; number of communicants, 280,619. Of these, 156,846 were Roman Catholics, about 37,000 Methodists, about 19,000 Presbyterians, and Baptists and Congregationalists between 11,000 and 12,000 each. The totals, however, greatly changed in the last decade of the 19th century.

Agriculture.—For thirty years after the American occupation gold and silver mining was the only great industry. Agriculture came into prominence in wheat-raising on ranches of from 50,000 to several hundred thousand acres in extent. A few of these, particularly in the Sacramento-San Joaquin valley, are still worked; but the majority of the old Spanish land grants have been subdivided into small farms, and the characteristic farming of California is now diversified, intensive, and on holdings of 20 acres and less. Horticulture is now the leading industry, and along a line about 500 miles north and south. Deciduous fruits are raised on a large scale from Humboldt county south to the Mexican line; the culture of citrus fruits preponderates in the five most southerly counties. Southern California is much more arid than the northern counties. Thousands of wells, artesian and other, have been sunk, and scores of horizontal tunnels driven. In 1899 alone, over 30,000 "Miners' inches," sufficient to irrigate 300,000 acres, were "developed" in the seven southern counties. Some of the largest storage dams and irrigating canals in the world are in California. The principal agricultural products in 1900 were:—

	Carloads.	
Oranges and lemons	18,400	$18,000,000
Fresh tree fruit	9,695	9,695,000
Walnuts Almonds	558 232	1,098,000
Grapes Raisins	5,578	3,578,400
Wines, sweet and dry	...	5,858,000
Brandies	...	2,214,428
Prunes, dried	5,711	3,426,800
Other cured fruits	3,425	6,850,000
Canned fruits and vegetables	...	6,575,000
Olive oil	...	1,170,871
Fresh vegetables shipped east	3,405	1,375,000
Hops	...	1,091,500
Beans	2,076	1,660,600
Beet sugar	...	3,244,500
Honey	141	255,000
Wheat	...	21,000,000
Barley	...	8,460,000
Oats	...	1,020,000
Corn	...	1,080,000
Alfalfa and other hay	...	24,444,891
Potatoes	...	1,105,815
Dairy products	...	12,830,797
Wool	...	2,266,560

Total (not including many minor products) $138,301,162

or over $52,000,000 in excess of the greatest annual gold output. In 1875 these products, except grain, hay, and wool, were practically *nil*, and the State led only in gold and sheep. Wheat production has increased little since 1880, barley has about doubled, hay nearly trebled, sheep have declined over 50 per cent., as lands have become more valuable under diversified farming. The largest single influence of recent growth has been the citrus industry. In 1862 there were 25,000 orange-trees, all seedlings. In 1873 two seedless orange-trees from Brazil were sent to Riverside from the Department of Agriculture, and from these two trees the modern industry has sprung. Millions of trees from their buds are now bearing a seedless orange known as the "Washington navel," which has taken first rank in American markets, and is not grown "commercially" anywhere except in California. There are now (nearly all in the seven southern counties) 4,120,470 orange and 1,432,829 lemon trees planted, or 55,540 acres. The shipments for 1900 were 18,400 carloads, or 6,624,000 boxes, worth $18,000,000. The beauty of the groves, the fact that the crop is actually continuous (shipments being made every month in the year), and exceptional cases of fabulous profit (not infrequently up to $1000 per acre, which is at least four times the average for competent growers), made the orange almost as epidemic a fever as gold had been. By reason of the co-operative effort demanded for the large problems of irrigation, packing, and marketing, the orange has done far more for the permanent development of the State than gold or other mining ever did.

Live stock numbered in 1900:—

Horses	321,729
Mules	48,682
Milch cows	308,872
Other cattle	604,881
Sheep	2,001,501
Swine (1899)	374,141

Mineral Products.—California is the second State in the Union in production of gold, having been exceeded in recent years by Colorado. It has, however, produced in gold since 1848 (to 1st January 1900) $1,409,849,068—or more than all the rest of North America since 1492. California's capital and enterprise also developed the silver "Bonanzas" of Nevada, which produced over $300,000,000 in twenty years. It produces about two-fifths of the quicksilver of the world. Since 1895 it has become a great producer of crude petroleum, and in 1900 ranked as fourth in America. Seventeen counties, in a line over 600 miles north and south, produce oil; in July 1900 there were 1590 producing wells and 470 prospect wells, and these figures were increasing daily. The production more than doubled in five years, and in 1899 was 2,677,875 barrels. The high cost of coal makes this oil deposit of peculiar value. Crude oil is already generally used for fuel in manufactures and even on railway locomotives. The total mineral output of the State for 1899 was:—

Gold	$15,336,031
Copper	3,990,534
Petroleum	2,660,793
Quicksilver	1,405,045
Borax	1,139,882
Lime, limestone, cement	523,760
Silver	504,012
Asphalt and bituminous rock	424,227
Coal	420,109
Mineral waters	406,691
Soda	250,000
Salt	149,588
Other mineral products	2,102,788
Total	$29,313,460

Gold production since 1875 has averaged from fifteen to sixteen millions a year. The total mineral output is now about 35 per cent. greater than it was in 1875.

Lumber Products.—California is one of the leading States in lumber products. Its sequoia, redwood, pine, and fir forests are the densest in "merchantable lumber" in the world. The redwoods cover about 2000 square miles. There is now a strong movement in favour of preserving the redwood forests and the groves of Big Trees (*Sequoia gigantea*). A Bill to purchase and protect one of the largest and noblest redwood forests, that of the Big Basin, has become a State law. The average annual lumber cut is as follows: redwood, 272,283,000 feet B.M.; yellow pine, 211,115,000 do.; sugar pine, 50,736,000 do.; spruce, 21,963,000 do.; fir, 20,508,000 do.; cedar, 4,882,000 do.; with a total value of $14,537,000.

Transportation.—The mileage of railroads was (1900) 5532 miles; ten times as great as in 1876. This is practically all in the hands of the Southern Pacific railway (controlled by the Union Pacific) and the Atchison, Topeka, and Santa Fé railway, each having a transcontinental system of over 7000 miles. The long, narrow State is traversed longitudinally by their trunk lines (three running from Los Angeles to San Francisco, about 500 miles), with numerous feeders, particularly in the southern counties. There are also many lines of steamships. The principal port is San Francisco, with its magnificent harbour. San Diego, San Pedro, Port Los Angeles, and Eureka have fair harbours and considerable commerce. The commerce of San Francisco amounts to between eighty and ninety million dollars annually, about equally divided between exports and imports.

Manufactures.—Manufactures have greatly increased since the census of 1890. In this year there were 7923 establishments, with $146,797,102 capital; 83,642 employees, whose aggregate annual wages were $51,538,780; total value of products, $213,403,996.

Perhaps the most important single development has been the rise of great shipyards. The *Oregon* and several other first-class vessels for the U.S. navy were built in San Francisco. California was in 1900 the leading State in the production of beet sugar; it had $10,139,780 invested in this manufacture as against $20,958,519 for the whole U.S., and yielded a little over one-half the total U.S. product.

Finances.—In 1900 the assessed valuation of real estate was $669,905,988; of improvements, $272,447,321; of personal property, $184,380,015. The total assessed valuation had more than doubled in twenty years. In 1880 it was $584,578,036, and in 1900 it was $1,218,292,457. In 1901 it was $1,241,705,803. The returns from agriculture by the census of 1890 were $72 per caput. The State has a nominal bonded debt of about two and a half millions, but owns the bonds. The total of county indebtedness was in 1901 $3,333,233. The total receipts in 1900 were $11,148,204; total disbursements, $9,518,608.

Banking.—The banks on 31st August 1898 were as follows:—

Banks.	No.	Capital paid up.	Resources.
National . .	34	$10,825,000	$50,660,651
Commercial . .	172	31,139,300	125,354,783
Savings . . .	55	7,941,930	52,123,716
Private . . .	23	964,026	2,753,385
Total . .	284	$50,870,256	$230,892,535

California has the largest savings bank deposits per caput. On 31st December 1898 there were in California $637.75 per depositor, as against $392.13 for the U.S., and $507.29 for Rhode Island, the next highest State. The California depositors numbered 209,908, or nearly one in every seven of the entire population, Chinese and Indians included. The State was exceeded in 1890 only by Massachusetts and Rhode Island in assessed valuation per caput.

Political.—State politics have improved with the new immigration. A symptom probably of political health is the peculiar independence of Californian voters. In State elections since the Civil War, California went Democratic in 1867, 1875, 1882, 1886 (Democratic Governor and Republican Lieut.-Governor, who became Governor by his superior's death), and 1894. It went Republican in 1871, 1879, 1890, and 1898. The leading features of legislation since 1876 have been the struggle for exclusion of the Chinese, "Anti-Débris," and irrigation laws, and an elaborate system for the inspection and fumigation of fruit-trees, and the importation of predatory insects to destroy "insect pests." The Anti-Chinese agitation, though finally national in its scope, was initiated and chiefly carried on in California, as a majority of the Chinese in the United States were in this one State. In 1879 California voted against further immigration of Mongolians by 154,638 to 883. Exclusion has not been an unmixed blessing; but the conviction prevailed that a very large element of population, non-citizen and non-assimilable, sending most of its earnings out of the country, living meanly at best, and practically without wives, children, or homes, was socially and economically a menace that far outweighed the undoubted convenience of cheaper (and frequently more trustworthy) menial labour than the native population afforded. The exclusion was a serious factor in making the huge single-crop ranches unprofitable, and in leading to their replacement by small farms tilled and dwelt upon by American families. There are now about 45,000 Chinese in the State, many of them wealthy, and race-feeling against them has practically disappeared. For many years the mining interests were supreme, and agriculture, long after it assumed large proportions, was invariably worsted when the two clashed. The great conflicts were over water rights and hydraulic mining. In 1880 engineers' measurements showed that in the Yuba river alone over 100,000,000 cubic yards of gravel had been washed by the hydraulics into the bed of the stream, raising it in places over 70 feet above its normal level, and burying over 15,000 acres of choicest farming lands under the detritus. In 1884 the long and bitter "Anti-Débris" or "Anti-Slickens" fight ended in favour of the farmers. Local Option laws are in force, and a considerable proportion of the towns and smaller cities, particularly in the southern part of the State, adopt "prohibition." In most of the rest "high license" is rather strictly enforced. The Australian ballot was introduced in 1891. (C. F. L.)

California, Lower, a territory of the Mexican Republic, bounded on the N. by the United States, on the E. by the Gulf of California, and on the W. and S. by the Pacific. Its area covers 58,345 square miles. The population in 1879 was 30,208, and in 1895 it numbered 42,243. The coast-line measures 1860 miles, and is bordered by numerous islands. Though the country is sterile, some portions of the peninsula have natural products of value, principally orchil or Spanish moss, used for dyeing purposes. Henequen is also found in the interior and hemp in the north. Sugar-cane and tropical fruits are successfully cultivated in the humid interior, as are also, to a limited extent, cereals, cotton, tobacco, &c. The principal mineral products are gold, silver, copper, lead, gypsum, and coal. There are no manufactures of any importance. The territory is divided into two districts, the Northern (pop. 7452) and the Southern (pop. 34,791). The capital of the former is La Paz (4737 inhabitants), and of the latter Ensenada de Todos Santos (1259 inhabitants). The principal towns are Santa Rosalia, Santiago, San Antonio, and San José.

Callander, a police burgh of Perthshire, Scotland, situated on the river Teith, and on the Caledonian railway, 15½ miles N.W. of Stirling. There are Established, United Free, and Episcopalian churches. The town owes its prosperity to its proximity to the Trossachs, and its general importance as a tourist centre, the surrounding country being renowned for the beauty of its lake, river, mountain, and woodland scenery. Within 2 miles to the N.E. are the Falls of Bracklinn. It possesses several large hotels and a hydropathic, and within recent years many villa residences have been erected. The population of the police burgh in 1891 was 1538, and in 1901 it was 1458. By way of the Pass of Leny, which begins or ends here, Callander practically forms the "gate of the Highlands." From here, too, the ascent of Ben Ledi is commonly made.

Callao, a coast department of central Peru, a littoral province, embracing only the city of Callao, with a population (1898) of 48,118. The port of Callao is the most important in Peru. In 1895 there entered 1376 merchant vessels, with a total tonnage of 563,160 tons; in 1896, 1485 vessels of 604,257 tons; and in 1898, 1255 of 591,685 tons, of which 201 were British, with a tonnage of 293,342 tons. In 1895 the receipts of the Callao Custom House were £211,763.

Calmar, a seaport town of Sweden, on the E. coast, 184 miles by rail N.E. from Malmö, *viâ* Alfvesta on the Malmö-Stockholm railway. The industries embrace steam flour-mills, tobacco and match factories, and shipbuilding yards. There is an export trade in timber (£157,160 in 1898), oats, and matches; and import trade in cereals and flour (£100,000 to £200,000 a year), coffee, coal, manure, hides, petroleum, fish, tobacco, and sugar; the total exports amounting to £184,750 in 1898, and the total imports to £293,600. The harbour, which in 1899-1900 was deepened to admit vessels drawing 19 feet, is cleared by some 900 vessels of 180,000 tons annually. Population (1880), 10,963; (1898), 12,582.

Calne, municipal borough and railway station, in the Chippenham parliamentary division (since 1885) of Wiltshire, England, 18 miles E. by N. of Bath. A hospital for infectious diseases has been erected and a public recreation ground opened. Area of borough (extended in 1889), 356 acres; population on this in 1901, 3456. In 1889 the borough was constituted as the separate civil parish of Calne Within, the remainder of the ancient parish being called Calne Without.

Calorimetry signifies the measurement of quantities of heat, and must be distinguished from thermometry, which signifies the measurement of temperature. A calorimeter is any piece of apparatus in which heat is measured. This distinction of meanings is purely a matter of convention, but is very rigidly observed. Quantities of heat may be measured indirectly in a variety of ways in terms of

the different effects of heat on material substances. The most important of these effects are, (*a*) rise of temperature, (*b*) change of state, (*c*) transformation of energy.

§ 1. The rise of temperature of a body, when heat is imparted to it, is found to be in general nearly proportional to the quantity of heat added. The *thermal capacity* of a body is measured by the quantity of heat required to raise its temperature one degree, and is necessarily proportional to the mass of the body for bodies of the same substance under similar conditions. The *specific heat* of a substance is sometimes defined as the thermal capacity of unit mass, but more often as the ratio of the thermal capacity of unit mass of the substance to that of unit mass of water at some standard temperature. The two definitions are identical, provided that the thermal capacity of unit mass of water, at a standard temperature, is taken as the unit of heat. But the specific heat of water is often stated in terms of other units. In any case, it is necessary to specify the temperature, and sometimes also the pressure, since the specific heat of a substance generally depends to some extent on the external conditions. The methods of measurement, founded on rise of temperature, may be classed as *thermometric methods*, since they depend on the observation of change of temperature with a thermometer. The most familiar of these are the method of mixture and the method of cooling.

§ 2. The *Method of Mixture* consists in imparting the quantity of heat to be measured to a known mass of water, or some other standard substance, contained in a vessel or calorimeter of known thermal capacity, and in observing the rise of temperature produced, from which data the quantity of heat may be found as explained in all elementary text-books. This method is the most generally convenient and most readily applicable of calorimetric methods, but it is not always the most accurate, for various reasons. Some heat is generally lost in transferring the heated body to the calorimeter; this loss may be minimized by performing the transference rapidly, but it cannot be accurately calculated or eliminated. Some heat is lost when the calorimeter is raised above the temperature of its enclosure, and before the final temperature is reached. This can be roughly estimated by observing the rate of change of temperature before and after the experiment, and assuming that the loss of heat is directly proportional to the duration of the experiment and to the average excess of temperature. It can be minimized by making the mixing as rapid as possible, and by using a large calorimeter, so that the excess of temperature is always small. The latter method was generally adopted by Joule, but the rise of temperature is then difficult to measure with accuracy, since it is necessarily reduced in nearly the same proportion as the correction. There is, however, the advantage that the correction is rendered much less uncertain by this procedure, since the assumption that the loss of heat is proportional to the temperature-excess is only true for small differences of temperature. Rumford proposed to eliminate this correction by starting with the initial temperature of the calorimeter as much below that of its enclosure as the final temperature was expected to be above the same limit. This method has been very generally recommended, but it is really bad, because, although it diminishes the absolute magnitude of the correction, it greatly increases the uncertainty of it, and therefore the probable error of the result. The coefficient of heating of a calorimeter when it is below the temperature of its surroundings is seldom, if ever, the same as the coefficient of cooling at the higher temperature, since the convection currents, which do most of the heating or cooling, are rarely symmetrical in the two cases, and moreover, the duration of the two stages is seldom the same. In any case, it is desirable to diminish the loss of heat as much as possible by polishing the exterior of the calorimeter to diminish radiation, and by suspending it by non-conducting supports, inside a polished case, to protect it from draughts. It is also very important to keep the surrounding conditions as constant as possible throughout the experiment. This may be secured by using a large water-bath to surround the apparatus, but in experiments of long duration it is necessary to use an accurate temperature regulator. The method of lagging the calorimeter with cotton-wool, or other non-conductors, which is often recommended, diminishes the loss of heat considerably, but renders it very uncertain and variable, and should never be used in work of precision. The bad conductors take so long to reach a steady state that the rate of loss of heat at any moment depends on the past history more than on the temperature of the calorimeter at the moment. A more serious objection to the use of lagging of this kind is the danger of its absorbing moisture. The least trace of damp in the lagging, or of moisture condensed on the surface of the calorimeter, may produce serious loss of heat by evaporation. This is another objection to Rumford's method of cooling the calorimeter below the surrounding temperature before starting. Among minor difficulties of the method may be mentioned the uncertainty of the thermal capacity of the calorimeter and stirrer, and of the immersed portion of the thermometer. This is generally calculated by assuming values for the specific heats of the materials obtained by experiment between 100° C. and 20° C. Since the specific heats of most metals increase rapidly with rise of temperature, the values so obtained are generally too high. It is best to make this correction as small as possible by using a large calorimeter, so that the mass of water is large in proportion to that of metal. Analogous difficulties arise in the application of other calorimetric methods. The accuracy of the work in each case depends principally on the skill and ingenuity of the experimentalist in devising methods of eliminating the various sources of error.

§ 3. *Method of Cooling.*—A common example of this method is the determination of the specific heat of a liquid by filling a small calorimeter with the liquid, raising it to a convenient temperature, and then setting it to cool in an enclosure at a steady temperature, and observing the time taken to fall through a given range when the conditions have become fairly steady. The same calorimeter is afterwards filled with a known liquid, such as water, and the time of cooling is observed through the same range of temperature, in the same enclosure, under the same conditions. The ratio of the times of cooling is equal to the ratio of the thermal capacities of the calorimeter and its contents in the two cases. The advantage of the method is that there is no transference or mixture; the defect is that the whole measurement depends on the assumption that the rate of loss of heat is the same in the two cases, and that any variation in the conditions, or uncertainty in the rate of loss, produces its full effect in the result, whereas in the previous case it would only affect a small correction. Other sources of uncertainty are, that the rate of loss of heat generally depends to some extent on the rate of fall of temperature, and that it is difficult to take accurate observations on a rapidly falling thermometer. As the method is usually practised, the calorimeter is made very small, and the surface is highly polished to diminish radiation. It is better to use a fairly large calorimeter to diminish the rate of cooling and the uncertainty of the correction for the water equivalent. The surface of the calorimeter and the enclosure should be permanently blackened so as to increase the loss of heat by radiation as much as possible as compared with the losses by convection and conduction, which are less regular. For accurate work it is essential that the liquid in the calorimeter should be continuously stirred, and also in the enclosure, the lid of which must be water-jacketed, and kept at the same steady temperature as the sides. When all these precautions are taken, the method loses most of the simplicity which is its chief advantage. It cannot be satisfactorily applied to the case of solids or powders, and is much less generally useful than the method of mixture.

§ 4. *Method of Fusion.*—The methods depending on change of state are theoretically the simplest, since they do not necessarily involve any reference to thermometry, and the corrections for external loss of heat and for the thermal capacity of the containing vessel can be completely eliminated. They nevertheless present peculiar difficulties and limitations, which render their practical application more troublesome and more uncertain than is usually supposed. They depend on the experimental fact that the quantity of heat required to produce a given change of state (*e.g.*, to convert one gramme of ice at 0° C. into water at 0° C., or one gramme of water at 100° C. into steam at 100° C.) is always the same, and that there need be no change of temperature during the process. The difficulties arise in connexion with the determination of the quantities of ice melted or steam condensed, and in measuring the latent heat of fusion or vaporization in terms of other units for the comparison of observations. The earlier forms of ice-calorimeter, those of Black, and of Laplace and Lavoisier, were useless for work of precision, on account of the impossibility of accurately estimating the quantity of water left adhering to the ice in each case. This difficulty was overcome by the invention of the Bunsen calorimeter, in which the quantity of ice melted is measured by observing the diminution of volume, but the successful employment of this instrument requires considerable skill in manipulation. The sheath of ice surrounding the bulb must be sufficiently continuous to prevent escape of heat, but it must not be so solid as to produce risk of strain. The ideal condition is difficult to secure. In the practical use of the instrument it is not necessary to know both the latent heat of fusion of ice and the change of volume which occurs on melting; it is sufficient to determine the change of volume per calorie, or the quantity of mercury which is drawn into the bulb of the

apparatus per unit of heat added. This can be determined by a direct calibration, by inserting a known quantity of water at a known temperature, and observing the contraction, or weighing the mercury drawn into the apparatus. In order to be independent of the accuracy of the thermometer employed for observing the initial temperature of the water introduced, it has been usual to employ water at 100° C., adopting as unit of heat the "mean calorie," which is one-hundredth part of the heat given up by one gramme of water in cooling from 100° to 0° C. The weight of mercury corresponding to the mean calorie has been determined with considerable care by a number of observers well skilled in the use of the instrument. The following are some of their results:—Bunsen, 15·41 mgm.; Velten, 15·47 mgm.; Zakrevski, 15·57 mgm.; Staub, 15·26 mgm. The explanation of these discrepancies in the fundamental constant is not at all clear, but they may be taken as an illustration of the difficulties of manipulation attending the use of this instrument, to which reference has already been made. It is not possible to deduce a more satisfactory value from the latent heat and the change of density, because these constants are very difficult to determine. The following are some of the values deduced by well-known experimentalists for the latent heat of fusion:—Regnault, 79·06 to 79·24 calories, corrected by Person to 79·43; Person, 79·99 calories; Hess, 80·34 calories; Bunsen, 80·025 calories. Regnault, Person, and Hess employed the method of mixture, which is probably the most accurate for the purpose. Person and Hess avoided the error of water sticking to the ice by using dry ice at various temperatures below 0° C., and determining the specific heat of ice as well as the latent heat of fusion. These discrepancies might, no doubt, be partly explained by differences in the units employed, which are somewhat uncertain, as the specific heat of water changes rapidly in the neighbourhood of 0° C.; but making all due allowance for this, it remains evident that the method of ice-calorimetry, in spite of its theoretical simplicity, presents grave difficulties in its practical application.

§ 5. The *Method of Condensation* was first successfully applied by Joly in the construction of his steam calorimeter, a full description of which will be found in several recent text-books. The body to be tested is placed in a special scale-pan, suspended by a fine wire from the arm of a balance inside an enclosure which can be filled with steam at atmospheric pressure. The temperature of the enclosure is carefully observed before admitting steam. The weight of steam condensed on the body gives a means of calculating the quantity of heat required to raise it from the atmospheric temperature up to 100° C. in terms of the latent heat of vaporization of steam at 100° C. There can be no appreciable gain or loss of heat by radiation, if the admission of the steam is sufficiently rapid, since the walls of the enclosure are maintained at 100° C., very nearly. The thermal capacity of the scale-pan, &c., can be determined by a separate experiment, or, still better, eliminated by the differential method of counterpoising with an exactly similar arrangement on the other arm of the balance. The method requires very delicate weighing, as one calorie corresponds to less than two milligrammes of steam condensed; but the successful application of the method to the very difficult problem of measuring the specific heat of a gas at constant volume, shows that these and other difficulties have been very skilfully overcome. The application of the method appears to be practically limited to the measurements of specific heat between the atmospheric temperature and 100° C. The results depend on the value assumed for the latent heat of steam, which Joly takes as 536·7 calories, following Regnault. Joly has himself determined the mean specific heat of water between 12° and 100° C. by this method, in terms of the latent heat of steam as above given, and finds the result ·9952. Assuming that the mean specific heat of water between 12° and 100° is really 1·0011 in terms of the calorie at 20° C. (see table below), the value of the latent heat of steam at 100° C., as determined by Joly, would be 540·2 in terms of the same unit. The calorie employed by Regnault is to some extent uncertain, but the difference is hardly beyond the probable errors of experiment, since it appears from the results of recent experiments that Regnault made an error of the same order in his determination of the specific heat of water at 100° C.

§ 6. *Energy Methods.* — The third general method of calorimetry, that based on the transformation of some other kind of energy into the form of heat, rests on the general principle of the conservation of energy, and on the experimental fact that all other forms of energy are readily and completely convertible into the form of heat. It is therefore often possible to measure quantities of heat indirectly, by measuring the energy in some other form and then converting it into heat. In addition to its great theoretical interest, this method possesses the advantage of being frequently the most accurate in practical application, since energy can be more accurately measured in other forms than in that of heat. The two most important varieties of the method are (*a*) mechanical, and (*b*) electrical. These methods have reached their highest development in connexion with the determination of the mechanical equivalent of heat, but they may be applied with great advantage in connexion with other problems, such as the measurement of the variation of specific heat, or of latent heats of fusion or vaporization.

§ 7. *Mechanical Equivalent of Heat.* — The phrase "mechanical equivalent of heat" is somewhat vague, but has been sanctioned by long usage. It is generally employed to denote the number of units of mechanical work or energy which, when completely converted into heat without loss, would be required to produce one heat unit. The numerical value of the mechanical equivalent necessarily depends on the particular units of heat and work employed in the comparison. The British engineer prefers to state results in terms of foot-pounds of work in any convenient latitude per pound-degree-Fahrenheit of heat. The Continental engineer prefers kilogrammetres per kilogramme-degree-centigrade. For scientific use the C.G.S. system of expression in ergs per gramme-degree-Centigrade, or "calorie," is the most appropriate, as being independent of the value of gravity. A more convenient unit of work or energy, in practice, on account of the smallness of the erg, is the *joule*, which is equal to 10^7 ergs, or one *watt-second* of electrical energy. On account of its practical convenience, and its close relation to the international electrical units, the *joule* has been recommended by the British Association for adoption as the absolute unit of heat. Other convenient practical units of the same kind would be the *watt-hour*, 3600 joules, which is of the same order of magnitude as the kilo-calorie, and the *kilowatt-hour*, which is the ordinary commercial unit of electrical energy.

§ 8. *Joule.*—The earlier work of Joule is now chiefly of historical interest, but his later measurements in 1878, which were undertaken on a larger scale, adopting Hirn's method of measuring the work expended in terms of the torque and the number of revolutions, still possess value as experimental evidence. In these experiments the paddles were revolved by hand at such a speed as to produce a constant torque on the calorimeter, which was supported so as to be free to turn, but was kept at rest by the couple due to a pair of equal weights suspended from fine strings passing round the circumference of a horizontal wheel attached to the calorimeter. Each experiment lasted about forty minutes, and the rise of temperature produced was nearly 5° C. The calorimeter contained about 5 kilogrammes of water, so that the rate of heat-supply was about 6 calories per second. Joule's final result was 772·55 foot-pounds at Manchester per pound-degree-Fahrenheit at a temperature of 62° F., but individual experiments differed by as much as 1 per cent. This result in C.G.S. measure is equivalent to 4·177 joules per calorie at 16·5° C., on the scale of Joule's mercury thermometer. His thermometers were subsequently corrected to the Paris scale by Schuster in 1895, which had the effect of reducing the above figure to 4·173.

§ 9. *Rowland.* — About the same time Rowland (*Proc. Amer. Acad.* xv. p. 75, 1880) repeated the experiment, employing the same method, but using a larger calorimeter (about 8400 grammes) and a petroleum motor, so as to obtain a greater rate of heating (about 84 calories per second), and to reduce the importance of the uncertain correction for external loss of heat. He also paid greater attention to the important question of thermometry, and extended his researches over a much wider range of temperature, namely 5° to 35° C. His experiments revealed for the first time a diminution in the specific heat of water with rise of temperature between 0° and 30° C., amounting to four parts in 10,000 per 1° C. His thermometers have been recently compared with a mercury thermometer standardized in Paris, and with a platinum thermometer standardized by Griffiths. The result has been to reduce the coefficient of diminution of specific heat at 15° C. by nearly one half, but the absolute value at 20° C. is practically unchanged. Thus corrected his values are as follows:—

Temperature .	10°	15°	20°	25°	30°	35°
Joules per cal. .	4·197	4·188	4·181	4·176	4·175	4·177

These are expressed in terms of the hydrogen scale but the

difference from the nitrogen scale is so small as to be within the limits of experimental error in this particular case. Rowland himself considered his results to be probably correct to one part in 500, and that the greatest uncertainty lay in the comparison of the scale of his mercury thermometer with the air thermometer. The subsequent correction, though not carried out strictly under the conditions of the experiment, has shown that the order of accuracy of his work about the middle of the range from 15° to 25° was at least 1 in 1000, and probably 1 in 2000. At 30° he considered that, owing to the increasing magnitude and uncertainty of the radiation correction, there "might be a small error in the direction of making the equivalent too great, and that the specific heat might go on decreasing to even 40° C." The results considered with reference to the variation of the specific heat of water are shown in the curve marked Rowland in Fig. 1.

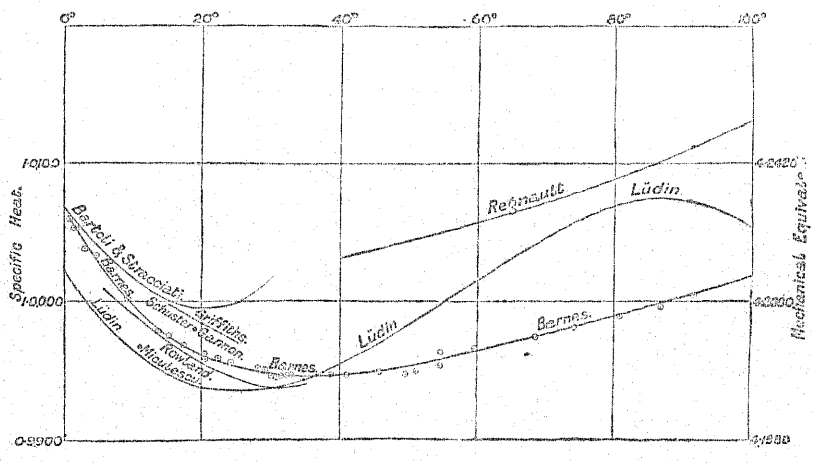


Fig. 1.

§ 10. *Reynolds and Moorby* (*Phil. Trans.* 1897, p. 381) have determined the mechanical equivalent of the mean thermal unit between 0° and 100° C., on a very large scale, with a Froude-Reynolds hydraulic brake and a steam-engine of 100 h.p. This brake is practically a Joule calorimeter, ingeniously designed to churn the water in such a manner as to develop the greatest possible resistance. The admission of water at 0° C. to the brake was controlled by hand in such a manner as to keep the outflow nearly at the boiling-point, the quantity of water in the brake required to produce a constant torque being regulated automatically, as the speed varied, by a valve worked by the lifting of the weighted lever attached to the brake. With 300 pounds on a four-foot lever at 300 revolutions per minute, the rate of generation of heat was about 12 kilo-calories per second. In spite of the large range of temperature, the correction for external loss of heat amounted to only 5 per cent with the brake uncovered, and was reduced to less than 2 per cent by lagging. This is the special advantage of working on so large a scale with so rapid a generation of heat. But, for the same reason, the method necessarily presents peculiar difficulties, which were not overcome without great pains and ingenuity. The principal troubles arose from damp in the lagging, which necessitated the rejection of several trials, and from dissolved air in the water, causing loss of heat by the formation of steam. Next to the radiation loss, the most uncertain correction was that for conduction of heat along the 4-inch shaft. These losses were as far as possible eliminated by combining the trials in pairs, with different loads on the brake, assuming that the heat-loss would be the same in the heavy and light trials, provided that the external temperature and the gradient in the shaft, as estimated from the temperature of the bearings, were the same. The values deduced in this manner for the equivalent agreed as closely as could be expected considering the impossibility of regulating the external condition of temperature and moisture with any certainty in an engine-room. The extreme variation of results in any one series was only from 776·63 to 779·46 foot-pounds, or less than ½ per cent. This variation may have been due to the state of the lagging, which Moorby distrusted in spite of the great reduction of the heat-loss, or it may have been partly due to the difficulty of regulating the speed of the engine and the water-supply to the brake in such a manner as to maintain a constant temperature in the outflow, and avoid variations in the heat capacity of the brake. Since hand regulation is necessarily discontinuous, the speed and the temperature were constantly varying, so that it was useless to take readings nearer than the tenth of a degree. The largest variation recorded in the two trials of which full details are given, was 4·9° F. in two minutes in the outflow temperature, and four or five revolutions per minute on the speed. These variations, so far as they were of a purely accidental nature, would be approximately eliminated on the mean of a large number of trials, so that the accuracy of the final result would be of a higher order than might be inferred from a comparison of separate pairs of trials. Great pains were taken to discuss and eliminate all the sources of constant error which could be foreseen. The results of the light trials with 400 foot-pounds on the brake differ slightly from those with 600 foot-pounds. This might be merely accidental, or it might indicate some constant difference in the conditions requiring further investigation. It would have been desirable, if possible, to have tried the effect of a larger range of variation in the experimental conditions of load and speed, with a view to detect the existence of constant errors; but owing to the limitations imposed by the use of a steam-engine, and the difficulty of securing steady conditions of running, this proved to be impossible. There can be no doubt, however, that the final result is the most accurate direct determination of the value of the mean calorie between 0° and 100° C. in mechanical units. Expressed in joules per calorie the result is 4·1832, which agrees very closely with the value found by Rowland as the mean over the range 15° to 20° C. The value 4·183 is independently confirmed in a remarkable manner by the results of the electrical method described below, which give 4·185 joules for the mean calorie, if Rowland's value is assumed as the starting-point, and taken to be 4·189 joules at 20° C.

§ 11. *Electrical Methods.*—The value of the international electrical units has by this time been so accurately determined in absolute measure that they afford a very good, though indirect, method of determining the mechanical equivalent of heat. But, quite apart from this, electrical methods possess the greatest value for calorimetry, on account of the facility and accuracy of regulating and measuring the quantity of heat supplied by an electric current. The frictional generation of heat in a metallic wire conveying a current can be measured in various ways, which correspond to slightly different methods. By Ohm's law, and by the definition of difference of electric pressure or potential, we obtain the following alternative expressions for the quantity of heat H in joules generated in a time T seconds by a current of C amperes flowing in a wire of resistance R ohms, the difference of potential between the ends of the wire being $E = CR$ volts:—

$$H = ECT = C^2RT = E^2T/R \quad . \quad . \quad (1).$$

The method corresponding to the expression C^2RT was adopted by Joule and by most of the early experimentalists. The defects of the earlier work from an electrical point of view lay chiefly in the difficulty of measuring the current with sufficient accuracy owing to the imperfect development of the science of electrical measurement. These difficulties have been removed by the great advances since 1880, and in particular by the introduction of accurate standard cells for measurements of electrical pressure.

§ 12. *Griffiths.*—The method adopted by Griffiths (*Phil. Trans.* 1893, p. 361), whose work threw a great deal of light on the failure of previous observers to secure consistent results, corresponded to the last expression E^2T/R, and consisted in regulating the current by a special rheostat, so as to keep the potential difference E on the terminals of the resistance R balanced against a given number of standard Clark cells of the Board of Trade pattern. The resistance R could be deduced from a knowledge of the temperature of the calorimeter and the coefficient of the wire. But in order to obtain trustworthy results by this method he found it necessary to employ very rapid stirring (2000 revolutions per minute), and to insulate the wire very carefully from the liquid to prevent leakage of the current. He also made a special experiment to find how much the temperature of the wire exceeded that of the liquid under the conditions of the experiment. This correction had been neglected by previous observers employing similar methods. The resistance R was about 9 ohms, and the potential difference E was varied from three to six Clark cells,

giving a rate of heat-supply about 2 to 6 watts. The water equivalent of the calorimeter was about 85 grammes, and was determined by varying the quantity of water from 140 to 260 or 280 grammes, so that the final results depended on a difference in the weight of water of 120 to 140 grammes. The range of temperature in each experiment was 14° to 26° C. The rate of rise was observed with a mercury thermometer standardized by comparison with a platinum thermometer under the conditions of the experiment. The time of passing each division was recorded on an electric chronograph. The duration of an experiment varied from about 30 to 70 minutes. Special observations were made to determine the corrections for the heat supplied by stirring, and that lost by radiation, each of which amounted to about 10 per cent. of the heat-supply. The calorimeter was gilded, and completely surrounded by a nickel-plated steel enclosure, forming the bulb of a mercury thermo-regulator, immersed in a large water-bath, maintained at a constant temperature. In spite of the large corrections the results were extremely consistent, and the value of the temperature-coefficient of the diminution of the specific heat of water, deduced from the observed variation in the rate of rise at different points of the range 15° to 25°, agreed with the value subsequently deduced from Rowland's experiments over the same range, when his thermometers were reduced to the same scale. Griffiths' final result for the average value of the calorie over this range was 4·192 joules, taking the E.M.F. of the Clark cell at 15° C. to be 1·4342 volts. The difference from Rowland's value, 4·181, could be explained by supposing the E.M.F. of the Clark cells to have in reality been 1·4323 volts, or about 2 millivolts less than the value assumed. Griffiths has since applied the same method to the measurement of the specific heat of aniline, and the latent heat of vaporization of benzene and water.

§ 13. *Schuster and Gannon.*—The method employed by Schuster and Gannon for the determination of the specific heat of water in terms of the international electric units (*Phil. Trans.* A, 1895, p. 415) corresponded to the expression ECT, and differed in many essential details from that of Griffiths. The current through a platinoid resistance of about 31 ohms in a calorimeter containing 1500 grammes of water was regulated so that the potential difference on its terminals was equal to that of twenty B.O.T. Clark cells in series. The duration of an experiment was about ten minutes, and the product of the mean current and the time, namely CT, was measured by the weight of silver deposited in a voltameter, which amounted to about 0·56 gramme. The uncertainty due to the correction for the water equivalent was minimized by making it small (about 27 grammes) in comparison with the water weight. The correction for external loss was reduced by employing a small rise of temperature (only 2·22°), and making the rate of heat-supply relatively rapid, nearly 24 watts. The platinoid coil was insulated from the water by shellac varnish. The wire had a length of 760 cms., and the P.D. on its terminals was nearly 30 volts. The rate of stirring adopted was so slow that the heat generated by it could be neglected. The result found was 4·191 joules per calorie at 19° C. This agrees very well with Griffiths considering the difficulty of measuring so small a rise of temperature as 2° with a mercury thermometer. Admitting that the electro-chemical equivalent of silver increases with the age of the solution, a fact which has since been discovered, and that the E.M.F. of the Clark cell is probably less than 1·4340 volts (the value assumed by Schuster and Gannon), there is no difficulty in reconciling the result with that of Rowland.

§ 14. *Callendar and Barnes* (*Brit. Assoc. Reports*, 1897 and 1899) adopted an entirely different method of calorimetry, as well as a different method of electrical measurement. A steady current of liquid, Q grammes per second, of specific heat, Js joules per degree, flowing through a fine tube, 1 or 2 millims. in diameter, is heated by a steady electric current during its passage through the tube, and the difference of temperature $d\theta$ between the inflowing and the outflowing liquid is measured by a single reading with a delicate pair of differential platinum thermometers. The difference of potential E between the ends of the tube, and the electric current C through it, are measured on a very accurately calibrated potentiometer, in terms of a Clark cell and a standard resistance. If $hd\theta$ is the radiation loss in watts we have the equation,

$$EC = JsQd\theta + hd\theta \quad . \quad . \quad . \quad (2).$$

The advantage of this method is that all the conditions are steady, so that the observations can be pushed to the limit of accuracy and sensitiveness of the apparatus. The water equivalent of the calorimeter is immaterial, since there is no appreciable change of temperature. The heat-loss can be reduced to a minimum by enclosing the flow-tube in a hermetically sealed glass vacuum jacket. The insulation is the most perfect possible. No stirring is required, if the tube is sufficiently fine and the velocity of flow adequate. The conditions can be very easily varied through a wide range. The heat-loss $hd\theta$ is determined and eliminated by varying the flow of liquid and the electric current simultaneously, in such a manner as to secure approximately the same rise of temperature for two or more widely different values of the flow of liquid. An example taken from the *Electrician*, September 1897, of one of the earliest experiments by this method on the specific heat of mercury will make the method clearer. The flow-tube was about 1 metre long and 1 millim. in diameter, coiled in a short spiral inside the vacuum jacket. The outside of the vacuum jacket was immersed in a water jacket at a steady temperature equal to that of the inflowing mercury.

Specific Heat of Mercury by continuous Electric Method.

Flow of Hg.	Rise of Temp.	Watts.	Heat-loss.	Specific Heat.
gm./sec.	$d\theta$	EC	$hd\theta$	Per gm. deg.
8·753	11·764	14·862	0·655	·13780 joules
4·594	12·301	7·912	0·685	·03297 cals.

It is assumed as a first approximation that the heat-loss is proportional to the rise of temperature $d\theta$, provided that $d\theta$ is nearly the same in both cases, and that the distribution of temperature in the apparatus is the same for the same rise of temperature whatever the flow of liquid. The result calculated on these assumptions is given in the last column in joules, and also in calories at 20° C. The heat-loss in this example is large, nearly 4·5 per cent. of the total supply, owing to the small flow and the large rise of temperature, but this correction was greatly reduced in subsequent observations on the specific heat of water by the same method. In the case of mercury the liquid itself can be utilized to conduct the electric current. In the case of water or other liquids it is necessary to employ a platinum wire stretched along the tube as heating conductor. This introduces additional difficulties of construction, but does not otherwise affect the method. The absolute value of the specific heat deduced necessarily depends on the absolute values of the electrical standards employed in the investigation. But for the determination of relative values of specific heats in terms of a standard liquid, or of the variations of specific heat of a liquid, the method depends only on the constancy of the standards, which can be readily and accurately tested. The result found by this method for the specific heat of water at 20° C. would agree with that of Rowland within the probable limits of error, if the ohm were taken as correct, and the Clark cell at 15° C. were supposed to have an E.M.F. of 1·4333 volts. These values appear to be extremely probable in the light of recent researches, but the more important application of electrical methods to calorimetry is to the relative measurements for which it is peculiarly adapted.

§ 15. *Variation of Specific Heat of Water.*—The question of the variation of the specific heat of water has a peculiar interest and importance in connexion with the choice of a thermal unit. Many of the uncertainties in the reduction of older experiments, such as those of Regnault, arise from uncertainty in regard to the unit in terms of which they are expressed, which again depends on the scale of the particular thermometer employed in the investigation. The first experiments of any value were those of Regnault in 1847 on the specific heat of water between 110° C. and 192° C. They were conducted on a very large scale by the method of mixture, but showed discrepancies of the order of 0·5 per cent., and the calculated results in many cases do not agree with the data. This may be due merely to deficient explanation of details of tabulation. We may probably take the tabulated values as showing correctly the rate of variation between 110° and 190° C., but the values in terms of any particular thermal unit must remain uncertain to at least 0·5 per cent. owing to the uncertainties of the thermometry. Regnault himself adopted the formula,

$$s = 1 + 0{\cdot}000,04t + 0{\cdot}000,000,9t^2 \quad \text{(Regnault)}, \qquad (3)$$

for the specific heat s at any temperature t C. in terms of the specific heat at 0° C. taken as the standard. This formula has since been very generally applied over the whole range 0° to 200° C., but the experiments could not in reality give any information with regard to the specific heat at temperatures below 100° C. The linear formula proposed by Bosscha from an independent reduction of Regnault's experiments is probably within the limits of accuracy between 100° and 200° C., so far as the mean rate of variation is concerned, but the absolute values require reduction. It may be written—

$$s = s_{100} + {\cdot}00023\,(t - 100) \quad \text{(Bosscha-Regnault)} \qquad (4).$$

The work of Pfaundler and Platter, of Hirn, of Jamin and Amaury, and of many other experimentalists who succeeded Regnault, appeared to indicate much larger rates of increase than he had found, but there can be little doubt that the discrepancies of their results, which often exceeded 5 per cent., were due to lack of appreciation of the difficulties of calorimetric measurements. The work of Rowland by the mechanical method was the first in which due attention was paid to the thermometry and to

the reduction of the results to the absolute scale of temperature. The agreement of his corrected results with those of Griffiths by a very different method, left very little doubt with regard to the rate of diminution of the specific heat of water at 20° C. The work of Bartoli and Stracciati by the method of mixture between 0° and 30° C., though their curve is otherwise similar to Rowland's, had appeared to indicate a minimum at 20° C., followed by a rapid rise. This lowering of the minimum was probably due to some constant errors inherent in their method of experiment. The more recent work of Lüdin, 1895, under the direction of Prof. Pernet, extended from 0° to 100° C., and appears to have attained as high a degree of excellence as it is possible to reach by the employment of mercury thermometers in conjunction with the method of mixture. His results, exhibited in Fig. 1, show a minimum at 25° C., and a maximum at 87° C., the values being ·9935 and 1·0075 respectively in terms of the mean specific heat between 0° and 100° C. He paid great attention to the thermometry, and the discrepancies of individual measurements at any one point nowhere exceed 0·3 per cent., but he did not vary the conditions of the experiments materially, and it does not appear that the well-known constant errors of the method could have been completely eliminated by the methods which he adopted. The rapid rise from 25° to 75° may be due to radiation error from the hot water supply, and the subsequent fall of the curve to the inevitable loss of heat by evaporation of the boiling water on its way to the calorimeter. It must be observed, however, that there is another grave difficulty in the accurate determination of the specific heat of water near 100° C. by this method, namely, that the quantity actually observed is not the specific heat *at* the higher temperature, but the *mean specific heat* over the range 18° to 100°. The specific heat itself can be deduced only by differentiating the curve of observation, which greatly increases the uncertainty. The peculiar advantage of the electric method of Callendar and Barnes, already referred to, is that the specific heat itself is determined over a range of 8° to 10° at each point, by adding accurately measured quantities of heat to the water at the desired temperature in an isothermal enclosure, under perfectly steady conditions, without any possibility of evaporation or loss of heat in transference. These experiments, which have been extended by Barnes over the whole range 0° to 100°, agree very well with Rowland and Griffiths in the rate of variation at 20° C., but show a rather flat minimum of specific heat in the neighbourhood of 38° to 40° C. At higher points the rate of variation is very similar to that of Regnault's curve, but taking the specific heat at 20° as the standard of reference, the actual values are nearly 0·56 per cent. less than Regnault's. It appears probable that his values for higher temperatures may be adopted with this reduction, which is further confirmed by the results of Reynolds and Moorby, and by those of Lüdin. According to the electric method, the whole range of variation of the specific heat between 10° and 80° is only 0·5 per cent. Comparatively simple formulæ, therefore, suffice for its expression to 1 in 10,000, which is beyond the limits of accuracy of the observations. It is more convenient in practice to use a few simple formulæ, than to attempt to represent the whole range by a single complicated expression :—

Below 20° C. $s = 0{\cdot}9982 + 0{\cdot}000{,}0045\ (t-40)^2 - 0{\cdot}000{,}0005\ (t-20)^3$.
From 20° to 60°, $s = 0{\cdot}9982 + 0{\cdot}000{,}0045\ (t-40)^2$ (5).
Above 60° to 200° $\begin{cases} s = 0{\cdot}9944 + {\cdot}000{,}04t + 0{\cdot}000{,}0009\,t^2 \text{ (Reg. corrd.)} \\ s = 1{\cdot}000 + 0{\cdot}000{,}22\ (t-60), \text{ (Bosscha corrd.)} \end{cases}$

The addition of the cubic term below 20° is intended to represent the somewhat more rapid change near the freezing-point. This effect is probably due, as suggested by Rowland, to the presence of a certain proportion of ice molecules in the liquid, which is also no doubt the cause of the anomalous expansion. Above 60° C. Regnault's formula is adopted, the absolute values being simply diminished by a constant quantity 0·0056 to allow for the probable errors of his thermometry. Above 100° C., and for approximate work generally, the simpler formula of Bosscha, similarly corrected, is probably adequate.

The following table of values, calculated from these formulæ, is taken from the *Brit. Assoc. Report*, 1899, with a slight modification to allow for the increase in the specific heat below 20° C. This was estimated in 1899 as being equivalent to the addition of the constant quantity 0·020 to the values of the total heat h of the liquid as reckoned by the parabolic formula (5). This quantity is now, as the result of further experiments, added to the values of h, and also represented in the formula for the specific heat itself by the cubic term.

The unit of comparison in the following table is taken as the specific heat of water at 20° C. for the reasons given below. This unit is taken as being 4·180 joules per gramme-degree-Centigrade on the scale of the platinum thermometer, corrected to the absolute scale as explained in the article THERMOMETRY, § 23, which has been shown to be practically equivalent to the hydrogen scale. The value 4·180 joules at 20° C. is the mean

Specific Heat of Water in terms of Unit at 20° C. 4·180 Joules.

t° C.	Joules.	s.	h.	Rowland.
0°	4·208	1·0094	0	0
5°	4·202	1·0054	5·037	5·037
10°	4·191	1·0027	10·056	10·058
15°	4·184	1·0011	15·065	15·068
20°	4·180	1·0000	20·068	20·071
25°	4·177	0·9992	25·065	25·067
30°	4·175	0·9987	30·060	30·057
35°	4·173	0·9983	35·052	35·053
40°	4·173	0·9982	40·044	
50°	4·175	0·9987	50·028	
60°	4·180	1·0000	60·020	
70°	4·187	1·0016	70·028	
80°	4·194	1·0033	80·052	
90°	4·202	1·0053	90·095	Shaw
100°	4·211	1·0074	100·158	Regnault
120°	4·231	1·0121	120·35	120·73
140°	4·254	1·0176	140·65	140·88
160°	4·280	1·0238	161·07	161·20
180°	4·309	1·0308	181·62	182·14
200°	4·341	1·0384	202·33	
220°	4·376	1·0467	223·20	

between Rowland's corrected result 4·181 and the value 4·179, deduced from the experiments of Reynolds and Moorby on the assumption that the ratio of the mean specific heat 0° to 100° to that at 20° is 1·0016, as given by the formulæ representing the results of Callendar and Barnes. This would indicate that Rowland's corrected values should, if anything, be lowered. In any case the value of the mechanical equivalent is uncertain to at least 1 in 2000.

The mean specific heat, over any range of temperature, may be obtained by integrating the formulæ between the limits required, or by taking the difference of the corresponding values of the total heat h, and dividing by the range of temperature. The quantity actually observed by Rowland was the total heat. It may be remarked that starting from the same value at 5°, for the sake of comparison, Rowland's values of the total heat agree to 1 in 5000 with those calculated from the formulæ. The values of the total heat observed by Regnault, as reduced by Shaw, also show a very fair agreement, considering the uncertainty of the units. It must be admitted that it is desirable to redetermine the variation of the specific heat above 100° C. This is very difficult on account of the steam-pressure, and could not easily be accomplished by the electrical method. The writer has, however, devised a continuous method of mixture, which appears to be peculiarly adapted to the purpose, and promises to give more certain results. In any case it may be remarked that formulæ such as those of Jamin, Henrichsen, Baumgartner, Winkelmann, or Dieterici, which give far more rapid rates of increase than that of Regnault, cannot possibly be reconciled with his observations, or with those of Reynolds and Moorby, or Callendar and Barnes, and are certainly inapplicable above 100° C.

§ 16. *On the Choice of the Thermal Unit.*—So much uncertainty still prevails on this fundamental point that it cannot be passed over without reference. There are three possible kinds of unit, depending on the three fundamental methods already given : (1) The thermometric unit, or the thermal capacity of unit mass of a standard substance under given conditions of temperature and pressure on the scale of a standard thermometer. (2) The latent-heat unit, or the quantity of heat required to melt or vaporize unit mass of a standard substance under given conditions. This unit has the advantage of being independent of thermometry, but the applicability of these methods is limited to special cases, and the relation of the units to other units is difficult to determine. (3) The absolute or mechanical unit, the quantity of heat equivalent to a given quantity of mechanical or electrical energy. This can be very accurately realized, but is not so convenient as (1) for ordinary purposes.

In any case it is necessary to define a thermometric unit of class (1). The standard substance must be a liquid. Water is always selected, although some less volatile liquid, such as aniline or mercury, would possess many advantages. With regard to the scale of temperature, there is very general agreement that the absolute scale as realized by the hydrogen or helium thermometer should be adopted as the ultimate standard of reference. But as the hydrogen thermometer is not directly available for

the majority of experiments, it is necessary to use a secondary standard for the practical definition of the unit. The electrical resistance thermometer of platinum presents very great advantages for this purpose over the mercury thermometer in point of reproducibility, accuracy, and adaptability to the practical conditions of experiment. The conditions of use of a mercury thermometer in a calorimetric experiment are necessarily different from those under which its corrections are determined, and this difference must inevitably give rise to constant errors in practical work. The primary consideration in the definition of a unit is to select that method which permits the highest order of accuracy in comparison and verification. For this reason the definition of the thermal unit will in the end probably be referred to a scale of temperature defined in terms of a standard platinum thermometer.

There is more diversity of opinion with regard to the question of the standard temperature. Many authors, adopting Regnault's formula, have selected 0° C. as the standard temperature, but this cannot be practically realized in the case of water, and his formula is certainly erroneous at low temperatures. A favourite temperature to select is 4° C., the temperature of maximum density, since at this point the specific heat at constant volume is the same as that at constant pressure. But this is really of no consequence, since the specific heat at constant volume cannot be practically realized. The specific heat at 4° could be accurately determined as the mean over the range 0° to 8° keeping the jacket at 0° C. But the change appears to be rather rapid near 0°, the temperature is inconveniently low for ordinary calorimetric work, and the unit at 4° would be so much larger than the specific heat at ordinary temperatures that nearly all experiments would require reduction. The natural point to select would be that of minimum specific heat, but if this occurs at 40° C. it would be inconveniently high for practical realization except by the continuous electrical method. It was proposed by a committee of the British Association to select the temperature at which the specific heat was 4·200 joules, leaving the exact temperature to be subsequently determined. It was supposed at the time, from the original reduction of Rowland's experiments, that this would be nearly at 10° C., but it now appears that it may be as low as 5° C., which would be inconvenient. This is really only an absolute unit in disguise, and evades the essential point, which is the selection of a standard temperature for the water thermometric unit. A similar objection applies to selecting the temperature at which the specific heat is equal to its mean value between 0° and 100°. The mean calorie cannot be accurately realized in practice in any simple manner, and is therefore unsuitable as a standard of comparison. Its relation to the calorie at any given temperature, such as 15° or 20°, cannot be determined with the same degree of accuracy as the ratio of the specific heat at 15° to that at 20°, if the scale of temperature is given. The most practical unit is the calorie at 15° or 20° or some temperature in the range of ordinary practice. The temperature most generally favoured is 15°, but 20° would be more suitable for accurate work. These units differ only by 11 parts in 10,000 according to Callendar and Barnes, or by 13 in 10,000 according to Rowland and Griffiths, so that the difference between them is of no great importance for ordinary purposes. But for purposes of definition it would be necessary to take the mean value of the specific heat *over a given range* of temperature, preferably at least 10°, rather than the specific heat *at a point* which necessitates reference to some formula of reduction for the rate of variation The specific heat at 15° would be determined with reference to the mean over the range 10° to 20°, and that at 20° from the range 15° to 25°. There can be no doubt that the range 10° to 20° is too low for the accurate thermal regulation of the conditions of the experiment. The range 15° to 25° would be much more convenient from this point of view, and a mean temperature of 20° is probably nearest the average of accurate calorimetric work. For instance 20° is the mean of the range of the experiments of Griffiths and of Rowland, and is close to that of Schuster and Gannon. It is readily attainable at any time in a modern laboratory with adequate heating arrangements, and is probably on the whole the most suitable temperature to select.

§ 17. *Specific Heat of Gases.*—In the case of solids and liquids under ordinary conditions of pressure, the external work of expansion is so small that it may generally be neglected; but with gases or vapours, or with liquids near the critical point, the external work becomes so large that it is essential to specify the conditions under which the specific heat is measured. The most important cases are, the specific heats (1) at constant volume; (2) at constant pressure; (3) at saturation pressure in the case of a liquid or vapour. In consequence of the small thermal capacity of gases and vapours per unit volume at ordinary pressures, the difficulties of direct measurement are almost insuperable except in case (2). Thus the direct experimental evidence is somewhat meagre and conflicting, but the question of the relation of the specific heats of gases is one of great interest in connexion with the kinetic theory and the constitution of the molecule. The well-known experiments of Regnault and Wiedemann on the specific heat of gases at constant pressure agree in showing that the *molecular specific heat*, or the thermal capacity of the molecular weight in grammes, is approximately independent of the temperature and pressure in case of the more stable diatomic gases, such as H_2, O_2, N_2, CO, &c., and has nearly the same value for each gas. They also indicate that it is much larger, and increases considerably with rise of temperature, in the case of more condensible vapours, such as Cl_2, Br_2, or more complicated molecules, such as CO_2, N_2O, NH_3, C_2H_4. The direct determination of the specific heat at constant volume is extremely difficult, but has been successfully attempted by Joly with his steam calorimeter, in the case of air and CO_2. Employing pressures between 7 and 27 atmospheres, he found that the specific heat of air between 10° and 100° C. increased very slightly with increase of density, but that of CO_2 increased nearly 3 per cent. between 7 and 21 atmospheres. The following formulæ represent his results for the specific heat s at constant volume in terms of the density d in gms. per c.c.:—

$$\text{Air, } s = 0{\cdot}1715 + 0{\cdot}028d,$$
$$CO_2, \; s = 0{\cdot}165 + 0{\cdot}213d + 0{\cdot}34d^2.$$

§ 18. *Ratio of Specific Heats.*—According to the elementary kinetic theory of an ideal gas, the molecules of which are so small and so far apart that their mutual actions may be neglected, the kinetic energy of translation of the molecules is proportional to the absolute temperature, and is equal to 3/2 of pv, the product of the pressure and the volume, per unit mass. The expansion per degree at constant pressure is $v/\theta = R/p$. The external work of expansion per degree is equal to R, being the product of the pressure and the expansion, and represents the difference of the specific heats $S - s$, at constant pressure and volume, assuming as above that the internal work of expansion is negligible. If the molecules are supposed to be like smooth, hard, elastic spheres, incapable of receiving any other kind of energy except that of translation, the specific heat at constant volume would be the increase per degree of the kinetic energy, namely $3pv/2\theta = 3R/2$, that at constant pressure would be $5R/2$, and the ratio of the specific heats would be 5/3 or 1·666. This appears to be actually the case for monatomic gases such as mercury vapour (Kundt and Warburg, 1876), argon and helium (Ramsay, 1896). For diatomic or compound gases Maxwell supposed that the molecule would also possess energy of rotation, and endeavoured to prove that in this case the energy would be equally divided between the six degrees of freedom, three of translation and three of rotation, if the molecule were regarded as a rigid body incapable of vibration-energy. In this case we should have $s = 3R$, $S = 4R$, $S/s = 4/3 = 1{\cdot}333$. In 1879 Maxwell considered it one of the greatest difficulties which the kinetic theory had yet encountered, that in spite of the many other degrees of freedom of vibration revealed by the spectroscope, the experimental value of the ratio S/s was 1·40 for so many gases, instead of being less than 4/3. Somewhat later Boltzmann suggested that a diatomic molecule, regarded as a rigid dumb-bell or figure of rotation, might have only five effective degrees of freedom, since the energy of rotation about the axis of symmetry could not be altered by collisions between the molecules. The theoretical value of the ratio S/s in this case would be the required 7/5. For a rigid molecule on this theory the smallest value possible would be 4/3. Since much smaller values are found for more complex molecules, we may suppose that, in these cases, relative movements of the constituent atoms are possible, which may be classed generally as energy of vibration. A hypothesis doubtfully attributed to Maxwell is that each additional atom in the molecule is equivalent to two extra degrees of freedom. From an m-atomic molecule we should then have $S/s = 1 + 2/(2m+1)$. This gives a series of ratios 5/3, 7/5, 9/7, 11/9, &c., for 1, 2, 3, 4, &c., atoms in the molecule, values which fall within the limits of experimental error in many cases. It is not at all clear, however, that energy of vibration should bear a constant ratio to that of translation, although this would probably be the case for rotation. For the simpler gases, which are highly diathermanous and

radiate badly even at high temperatures, the energy of vibration is probably very small, except under the special conditions which produce luminosity in flames and electric discharges. For such gases, assuming a constant ratio of rotation to translation, the specific heat at low pressures would be very nearly constant. For more complex molecules the radiative and absorptive powers are known to be much greater. The energy of vibration may be appreciable at ordinary temperatures, and would probably increase more rapidly than that of translation with rise of temperature, especially near a point of dissociation. This would account for an increase of S, and a diminution of the ratio S/s, with rise of temperature which apparently occurs in many vapours. The experimental evidence, however, is somewhat conflicting, and further investigations are very desirable on the variation of specific heat with temperature. Given the specific heat as a function of the temperature, its variation with pressure may be determined from the characteristic equation of the gas, as illustrated for a simple case in the article THERMODYNAMICS, § 15. The direct methods of measuring the ratio S/s, by the velocity of sound and by adiabatic expansion, are sufficiently described in many text-books.

§ 19. *Atomic and Molecular Heats.*—The ideal atomic heat is the thermal capacity of a gramme-atom in the ideal state of monatomic gas at constant volume. This would be nearly three calories. For a diatomic gas, the molecular heat would be nearly five calories, or the atomic heat of a gas in the diatomic state would be 2·5. Estimated at constant pressure the atomic heat would be 3·5. Some authors adopt 2·5 and some 3·5 for the ideal atomic heat. The atomic heat of a metal in the solid state is in most cases larger than six calories at ordinary temperatures. Considering the wide variations in the physical condition and melting-points, the close agreement of the atomic heats at any one temperature is very remarkable. The specific heats as a rule increase with rise of temperature, in some cases, *e.g.*, iron and nickel, very rapidly. According to Tilden (*Phil. Trans.*, 1900), the atomic heats of pure nickel and cobalt, as determined from experiments at the boiling-points of O_2, and CO_2, diminish so rapidly at temperatures below 0° C. as to suggest that they would reach the value 2·42 at the absolute zero. This is the value of the minimum of atomic heat calculated by Perry from diatomic hydrogen, but the observations themselves might be equally well represented by taking the imaginary limit 3, since the quantity actually observed is the mean specific heat between 0° and −182·5° C. Subsequent experiments on other metals at low temperatures did not indicate a similar diminution of specific heat, so that it may be doubted whether the atomic heats really approach the ideal value at the absolute zero. No doubt there must be approximate relations between the atomic and molecular heats of similar elements and compounds, but considering the great variations of specific heat with temperature and physical state, in alloys, mixtures, or solutions, and in allotropic or other modifications, it would be idle to expect that the specific heat of a compound could be deduced by any simple additive process from that of its constituents.

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Caltagirone, a town and bishop's see of the province of Catania, Sicily, Italy, 57 miles S.W. from Catania. Besides the cathedral, it has a technical school, school of agriculture, and several fine mansions. Population, about 33,000.

Caltanissetta, Italian town and episcopal see and capital of the province of Caltanissetta, Sicily, 43 miles by rail N.E. from Girgenti. It has a diocesan seminary, a royal school of mines, and a technical school. Population of town (1881), 30,480; (1901), 44,600; of province (1881), 266,379; (1901), 330,972.

Caluire et Cuire, a town of France, department of Rhône, in the arrondissement of Lyons, 7½ miles N. by E. of that city, on railway from Lyons to Trevaux. It has manufactures of coarse earthenware and hardware; copper- and bronze-founding, and essence distilleries. Population (1881), 6828; (1896), 8070, (comm.) 9035; (1901), 10,926.

Calumpit, a town of 15,000 inhabitants in the province of Bulacan, Luzon, Philippine Islands, at the junction of the Quingua river with the Rio Grande de la Pampanga. The surrounding country is a fertile plain, producing large quantities of rice, as well as sugar, indigo, and a variety of fruits. The Manila-Dagupan railway passes through, and the bridge across the Rio Grande is the longest in the Philippines. The town was fired and completely burned by insurgent troops in 1899. The language is Tagalog.

Calvados, a department of the N. of France, bordering on the English Channel, watered by the Orne and Vire.

Area, 2198 square miles, distributed among 38 cantons and 763 communes. The population decreased to 437,267 in 1886 and 410,178 in 1901, a reduction due to the fact that the number of births is in steady decline and much surpassed by the number of deaths. In 1899 the deaths numbered 9966 against 8520 births, of which 968 were illegitimate; marriages numbered 3009. Caen, the capital, had in 1896, 45,000 inhabitants. In 1896 there were 1055 primary schools with 55,000 pupils, and the illiterate formed 2 per cent. of the population. Calvados is chiefly noted for its rearing of live stock, an industry favoured by the excellence of its pastures. Out of 1,460,498 acres forming in 1896 the total area cultivated, 617,786 acres were laid out in grass and 590,600 acres were plough-land. In 1899 the wheat crop yielded the value of £1,015,000. The total production of the green crop (trefoil, lucerne, and sainfoin) and natural pastures and grass lands amounted to 11,510,000 cwts., of the value of £1,498,000. In the way of grass lands Calvados ranked third among the departments of France. Colza, which was produced to the amount of fully a fourth of the total produce of France, returned a value of £230,000. Among the fruits cultivated, apples for cider gave a revenue estimated at £444,000. The live stock in 1899 included 65,000 horses, 236,614 cattle, and 68,750 pigs, and the value of milk products was £1,839,140. The horses of Calvados are much prized. Agriculture constitutes the principal wealth of this department, which supplies large quantities of butter (Isigny) and of cheese. It has, however, also a few coal-mines and seams of iron, the latter supplying 13,000 metric tons in 1898. The department produces plenty of stone. The textile industry has developed around Caen and Falaise.

Calverley, Charles Stuart (1831-1884), one of the brightest of English wits, and the literary father of what may be called the university school of humour, was born at Martley in Worcestershire, 22nd December 1831. His father, the Rev. Henry Blayds, resumed in 1852 the old family name of Calverley, which his grandfather had exchanged for Blayds in 1807. It was as Charles Stuart Blayds that most of the son's university distinctions were attained. He went up to Balliol from Harrow in 1850, and was soon known in Oxford as the most daring and most high-spirited undergraduate of his time. He was a universal favourite, a delightful companion, a brilliant scholar, and the playful enemy of all "dons." In 1851 he won the Chancellor's prize for Latin verse, and it is said that the entire exercise was written in an afternoon, when his friends had locked him into his rooms, declining to let him out till he had finished what they were confident would prove the prize poem. A year later he took his name off the books, to avoid the consequences of a college escapade, and migrated to Christ's College, Cambridge. Here he was again successful in Latin verse, and remains the unique example of an undergraduate who has won the Chancellor's prize at both universities. In 1856 he took second place in the first class in the Classical Tripos. He was elected fellow of Christ's (1858), published *Verses and Translations* in 1862, married a cousin, and was called to the bar in 1865. Owing to an accident while skating he was prevented from following up a professional career, and during the last years of his life he was an invalid. His *Translations into English and Latin* appeared in 1866; his *Theocritus translated into English Verse* in 1869; *Fly Leaves* in 1872; and *Literary Remains* in 1885. He died on the 17th February 1884. Calverley

was one of the most brilliant men of his day; and, had he enjoyed health, might have achieved distinction in any career he chose. Constitutionally indolent, he was endowed with singular gifts in every department of culture; he was a scholar, a musician, an athlete, and a brilliant talker. What is left us marks only a small portion of his talent, but his sparkling, dancing verses, which have had many clever imitators, are still without a rival in their own line. His humour was illumined by good nature; his satire was keen but kind; his laughter was of that human sort which is often on the verge of tears. Imbued with the classical spirit, he introduced into the making of light verse the polish and elegance of the great masters, and even in its most whimsical mood his verse is raised to the level of poetry by the saving excellence of style. (A. WA.)

Calvo, Carlos (1824-1893), Argentine publicist and historian, was born at Buenos Ayres on 26th February 1824, and devoted himself to the study of the law. In 1860 he was sent by the Paraguayan Government on a special mission to London and Paris. Remaining in France, he published in 1863 his *Derecho internacional teorico y practico de Europa y America*, in two volumes, and at the same time brought out a French version. The book immediately took rank as one of the highest modern authorities on the subject, and by 1887 the first French edition had become enlarged to six volumes. Señor Calvo's next publications were of a semi-historical character. Between 1862 and 1869 he published in Spanish and French his great collection in fifteen volumes of the treaties and other diplomatic acts of the South American republics, and between 1864 and 1875 his *Annales historiques de la révolution de l'Amérique latine*, in five volumes. In 1884 he was one of the founders at the Ghent Congress of the Institut de droit international. In the following year he was Argentine minister at Berlin, and published his *Dictionnaire du droit international publié et privé* in that city. Calvo died on 4th May 1893.

Camacho, Juan Francisco (1824-1896), Spanish statesman and financier, was born in Cadiz in 1824. The first part of his life was devoted to mercantile and financial pursuits at Cadiz, and then in Madrid, where he managed the affairs of and liquidated a mercantile and industrial society to the satisfaction and profit of the shareholders. In 1837 he became a captain in the national militia, in 1852 Conservative deputy in the Cortes for Alcoy, in 1853 secretary of congress, and was afterwards elected ten times deputy, twice senator, and life senator in 1877. Camacho took a prominent part in all financial debates and committees, was offered a seat in the Mon cabinet of 1864, and was appointed under-secretary of state finances in 1866 under Canovas and O'Donnell. After the revolution of 1868 he declined the post of minister of finance offered by Marshal Serrano, but served in that capacity in 1872 and 1874 in Sagasta's cabinets. When the restoration took place, Camacho sat in the Cortes among the dynastic Liberals with Sagasta as leader, and became finance minister in 1881 at a critical moment when Spain had to convert, reduce, and consolidate her treasury and other debts with a view to resuming payment of compons. Camacho drew up an excellent budget and collected taxation with a decidedly unpopular vigour. A few years later Sagasta again made him finance minister under the regency of Queen Christina, but had to sacrifice him when public opinion very clearly pronounced against his too radical financial reforms and his severity in collection of taxes. He was for the same reasons unsuccessful as a governor of the Tobacco Monopoly Company. He then seceded from the Liberals, and during the last years of his life he affected to vote with the Conservatives, who made him governor of the Bank of Spain. He died in Madrid on 23rd January 1896. (A. E. H.)

Camajore, a town of the province of Lucca, Tuscany, Italy, at the foot of the Apuan Alps, 12 miles N.W. from Lucca. It is still surrounded by walls, and has a 13th-century church and an old triumphal arch. Population, about 9000.

Cambay (KHAMBHAT), a native state of India, within the Gujarat division of Bombay. It has an area of 350 square miles Population (1891), 89,722; (1901), 75,122, showing a decrease of 16 per cent. due to the famine of 1899-1900. The estimated gross revenue was Rs.6,18,139; the tribute, Rs.21,924; the number of police was 170; the number of schools in 1897-98 was 36, with 2490 pupils, being 3·43 per cent. of the population, compared with 2·4 for Bombay generally.

The town of CAMBAY had a population in 1881 of 36,007, and in 1891 of 31,390; the municipal income in 1897-98 was Rs.10,229, together with Rs.5,596 contributed by the state. It is proposed to connect the town by railway with the terminus of the Gaekwar's railway at Petlad, 19 miles distant, at a cost to the state of Rs.10,00,000. There is a high school and a state printing-press, which issues a monthly gazette.

Cambodia, called by the inhabitants *Srockhmer* (Khmer province), lies between 10° 30′ and 13° 46′ N. lat., and 102° 50′ and 106° 50′ E. long. It is bounded on the W. and N. by Siam and the Laos States, on the E. and S. by Cochin-China, and on the S.W. by the Gulf of Siam. By the treaty of 3rd October 1893, between France and Siam, the latter bound herself not to maintain armed forces upon the great lake or in the adjoining provinces of Battambang and Siemrap. The whole of Cambodia lies in the lower Mekong valley, the delta of which commences at Pnom-penh. The characteristic feature of Cambodian geography is the presence of an immense lake, Tonle-Sap, in a vast depression more than 68 miles long and 15 miles wide. During the annual overflow of the Mekong (when its waters rise to a height of 40-45 feet and flow violently towards the lake along a channel 62 miles long and 1640-4920 feet wide) this lake covers an area of about 770 square miles, but during the dry season the current reverses and the depression empties, so that the lake shrinks to an area of 100 square miles and its depth falls from 45-48 feet to 1½ and 5 feet in its shallowest parts. Tonle-Sap represents, in all probability, the chief wealth of Cambodia. It supports a fishing population of over 30,000, and provides a variable but always considerable quantity of dried fish and *nuoc-mam* (sauce composed of fermented fish) for exportation. The climate is hot and damp. Cotton and cotton-wool reach perfection. Cotton in the pod finds its chief market at Kobe (Japan) at an average rate of 20 piastres the picul of 150 lb. The area of Cambodia is about 38,600 square miles. Its population numbers about 1,500,000, of whom 208 are French (exclusive of the land and sea forces, which, however, are small, the defence of Cambodia being assured by Indo-China), 200,000 Annamese, and 1,300,000 Cambodians of Khmer origin. Cambodia became a French protectorate by the treaty with France of 11th August 1863, and the convention of 17th June 1884. It is an absolute monarchy, and its king (by divine right) bears a very long series of laudatory titles. As in all countries the inhabitants of which have a Khmer origin, there are in Cambodia two kings, the second being a general, the younger brother of the first king and his heir-presumptive. King Norodom was born in 1834, crowned in

1860 at Udong, and the same year made Pnom-penh his capital. He has 14 sons and 22 daughters. The second king, *obbarach*, Prince Somdach Prea Maha, has 13 sons and 9 daughters. Since 1884 a French resident has lived near the king. In 1885 an insurrection, due to increased taxation, was utilized by the king's brother, Si-Votha, who claimed to have been despoiled of the crown, but was promptly suppressed. In 1891 M. de Lanessan, governor-general, concluded an agreement with King Norodom by which the Cambodian budget was to be combined with the general one of the protectorate. This budget was established from 1st January 1892, and immediately sent up the value by 500,000 piastres in a budget which in the previous period rose only to a total value of 800,000 piastres. The income and expenditure in 1899 practically balanced at 3,146,359 piastres. On the unification of Indo-China, Cambodia was represented on the Superior Council. On 16th August 1899 a Council of the Protectorate was instituted. The Superior Council of Indo-China sat at Pnom-penh in October 1899, the two kings being present. Cambodia is divided into seven districts, subdivided into numerous provinces administered by mandarins subject to the resident-general and vice-residents. Cambodian idiom has nothing in common with that of Annam. It is monosyllabic in character, a blend of Malayan and Chinese. The "king's language" and the royal writing, however, are apparently of Aryan origin and akin to *Pali*. Cambodian writing is syllabic. The books (manuscripts) are generally formed of palm-leaves upon which the characters are traced by means of a style. The gambling monopoly was condemned in 1887, and suppressed in consequence of the financial agreement of 1st January 1893. PNOM-PENH, the capital, is a town of about 45,000 people, 173 miles from the sea, on the branch of the Mekong which communicates with Tonle-Sap. It is a commercial centre of great importance. During low water the largest vessels can ascend the Mekong and drop anchor within a mile of the town. During the rest of the year they come alongside the quay below the town, in the arm of the lake. House-building is changing the appearance of the town, which has grown rapidly, new quays and numerous streets having been built. (See also INDO-CHINA.) (J. M. A. DE L.)

Camborne, a market town and railway station in the Camborne parliamentary division of Cornwall, England, 14 miles N.W. of Falmouth. Recent erections are a free library and mining, science and art schools; practical mining is now taught in South Condurrow mine. Area of civil parish (an urban district), 6931 acres; population (1881), 13,601; (1901), 14,737.

Cambrai, chief town of arrondissement, department of Nord, France, 37 miles S.E. of Lille, and an important junction on railway from Paris to Lille. Great improvements have been effected in the city. The fosses have been filled up and the ramparts in part levelled to make way, as the suburbs extended, for wide avenues stretching out on all sides. A new railway station has been constructed. Chicory is now manufactured very extensively, and one of the sugar factories is said to be the largest in the world. During the busy season 2000 persons are employed, during the rest of the year from 300 to 400. The consumption of beetroot amounts to from 200,000 to 250,000 tons annually. Port traffic on the Mons and Seine canal was 149,422 tons in 1899. Population (1881), 14,818; (1896), 14,306, (comm.) 21,948; (1901), 26,586.

Cambridge, a market and university town of England, capital of the county of Cambridge, stands on the river Cam, a tributary of the Ouse, 56 miles by rail N. by E. from London. Since the year 1876 several new colleges and hostels have been opened.

Cavendish College, which was founded in 1873 for the purpose of affording a cheaper course to students somewhat younger than the average of the older colleges, was declared a public hostel of the university in 1882, but was closed in 1891. The buildings, situated in Hills Road, were acquired by the authorities of Homerton College, Middlesex (founded in 1843), and under the name of *Homerton New College* equipped as an undenominational training college for schoolmistresses. *Selwyn College* was incorporated in 1882, and recognized as a public hostel in 1883, though the two blocks of the existing buildings, in Grange Road, were not erected until 1889; the chapel in 1895. The style is Tudor, from designs by Sir A. W. Blomfield. It is intended to afford a cheaper course to students belonging to the Church of England. *Ayerst Hall*, opened as a public hostel on Parker's Piece in 1884, was removed in 1893 to a new structure, in the Queen Anne style, on Mount Pleasant, and closed in 1896. It is now the Roman Catholic St Edmund's Hostel. *Girton College*, which was first opened at Hitchin in 1869, was removed to its present site, 2½ miles from Cambridge, on the Huntingdon Road, in 1873. It consists of plain red-brick structures. Additions were made in 1876 and 1883, and subscriptions were collected in 1901 for further enlarging it. *Newnham College* for women was founded in 1871. The buildings, which were added to in 1887 and 1893, consist of three halls, built from designs by Basil Champneys, and a library, added in 1898. *Ridley Hall*, at Newnham, was erected in 1879-82 as a training college for evangelical candidates for the ministry of the Church of England. New buildings, including the chapel, were added in 1892. *Westminster College*, the theological training college of the Presbyterian Church of England, was opened in 1899. The buildings are of brick, in the Jacobean style, and stand on the Madingley Road.

The following colleges, situated in parts of England other than Cambridge, have been duly affiliated to the university—University College, Nottingham; St David's College, Lampeter, Wales; Firth College, Sheffield; University College of Wales, Aberystwith; St Edmund's College, Old Hall, Ware; as also the Universities of New Zealand (1886), Adelaide (1891), Cape of Good Hope (1892), Allahabad (1895), Bombay (1896), Punjab (1896), Toronto (1896), Madras (1897), Sydney (1898), Montreal (1899), and Tasmania (1900).

Besides these, various additions have been made to the older colleges. A new east wing, of red Suffolk brick and Ancaster stone, was added to Jesus College in 1883-84; new buildings were added to Pembroke, from designs by G. G. Scott, Jun., in 1883; new rooms to St John's in 1887-88; a new hostel to Emmanuel in 1886 and 1894; new buildings (1887) and a chapel (1891) to Queens'; and a third court, from designs by J. L. Pearson, to Sidney Sussex; while St Catherine's Chapel was thoroughly restored in 1896. Amongst the new scientific equipments of the university may be mentioned the museum of archæology (1884), divided into two departments—one classical, the other general; it also contains the museum of the Cambridge Antiquarian Society. The new geological museum was erected in 1900-1901, and the Divinity School, a 15th-century Gothic structure, built from Basil Champneys' designs in 1878-79, out of the Selwyn fund, contains Bishop Lightfoot's library. A chemical laboratory (1887), new anatomical lecture-rooms, dissecting-rooms, and anatomical museum should also be mentioned. The university library was enlarged in 1889. The Fitzwilliam Museum has been

enriched by several valuable bequests of pictures, &c., since 1872, and now contains also valuable collections of engravings and etchings. In 1891 Mr Newall of Gateshead presented to the astronomical observatory a new equatorial telescope of 29 feet focal length and 25 inches' aperture. Addenbroke's Hospital was enlarged in 1878 and 1883, and now has over 150 beds. In the end of 1900 the university was attended by 2985 students, and the professorial staff numbered 88. The income of the university increased from £21,629 in 1879 to £45,614 in 1899. (For the history of the university, see under UNIVERSITIES.)

Turning to the town edifices, there has been considerable activity in church building and church restoration. To the former category belong St Barnabas' (1878-80), Early English, enlarged in 1887-90; St John's (begun in 1896); St Philip's (1890); the Roman Catholic Church of Our Lady (1887-90), Early Decorated, with a tower 220 feet high; and the Presbyterian church (1890-91). Amongst churches that have undergone restoration are St Mary's (1874-92); St Benet's (1874-82); St Botolph's (1874-87); St Giles's (rebuilt in 1875-76), of white brick in the Early French Gothic; and St Mary's the Less (1891). Baptists, Congregationalists, Wesleyans, Primitive Methodists, Quakers, and Salvation Army all have places of worship in the town. A free library was built in 1885, and a branch library on Mill Road in 1897; the Teachers' Training College, Wollaston Road, 1895; the Henry Martyn Memorial Hall in 1887; the Cambridge Technical Institute in 1894; the Working Men's Institute in 1884; the Beaconsfield (Working Men's) Club in 1884; the police station in 1901; the Theatre Royal in 1896; a hospital for infectious diseases in 1884; and a cattle market in 1885. In 1889-90 new buildings were erected for the Perse grammar school in Hills Road, and in 1893 a science building for Leys school. The principal industries are iron and brass foundries, brick and tile works, tobacco factories, breweries, maltings, flour mills, and nursery gardens The town is governed by a mayor, 10 aldermen, and 30 councillors representing the town, and 2 aldermen and 6 councillors representing the university. Population (1891), the census being taken during vacation, of municipal borough (area, 3233 acres), 36,983; (1901), 38,393; of parliamentary borough (area, 3975 acres) (1891), 44,330; (1901), 47,737.

See J. W. CLARK, *Cambridge, Historical and Descriptive Notes.* London, 1890.—J. BASS MULLINGER, *History of the University of Cambridge.* 1888.—R. WILLIS, *Architectural History of the University of Cambridge,* 4 vols. Cambridge, 1886.—T. D. ATKINSON. *Cambridge Described and Illustrated,* with Introduction by J. W. Clark (1897). See also CAMBRIDGESHIRE.

Cambridge, a town of Maryland, U.S.A., capital of Dorchester county, on the south bank of the Choptank river, on the eastern side of Chesapeake Bay, at the terminus of a branch of the Philadelphia, Wilmington, and Baltimore railway. Population (1890), 4192; (1900), 5747, of whom 52 were foreign-born and 1958 were negroes.

Cambridge, capital of Middlesex county, Massachusetts, U.S.A. Its area of 7 square miles formerly contained several villages, the chief of which were Old Cambridge, the seat of Harvard University, East Cambridge, and Cambridgeport, the last two being manufacturing and commercial centres. At present the entire area is built up, mainly in detached residences, and the city, although under independent government, is in effect a part of Boston, with which it is connected by several bridges and tramways. It has an excellent water-supply, and the waterworks, which belong to the city, cost more than $5,000,000. Although in the main residential, it has extensive manufactures. In 1890 the manufacturing capital was $20,331,585, employing 14,258 persons, with an output valued at $35,975,000. The principal items of production were iron and steel goods, furniture, soap, and candles, musical instruments and crackers. Cambridge is one of the chief publishing centres, containing nine publishing houses, with a capital of $1,600,000. The assessed valuation of property in 1900 was $94,465,930, or over $1000 per caput of the population, the net debt was $6,090,707, and the rate of taxation $16.90 per $1000. The receipts from all sources, including loans, were $3,626,883, and the expenditure, including loans repaid, $3,371,184. Old Cambridge, as the seat of Harvard University, is one of the literary and scientific centres of the United States. Population (1880), 52,669; (1890), 70,028; (1900), 91,886, of whom 3466 were foreign-born, and 3888 were negroes. The death-rate in 1900 was 18·5.

Cambridge, the county seat of Guernsey county, Ohio, U.S.A., on the Baltimore and Ohio, and the Cleveland and Marietta (controlled by the Pennsylvania) railways, at an altitude of 842 feet. Population (1880), 2883; (1890), 4361; (1900), 8241.

Cambridge, H.R.H. George William Frederick Charles (1819-——), 2ND DUKE OF, K.G. (earl of Tipperary, baron Culloden, and duke of Brunswick-Luneburg), only son of Adolphus Frederick, 1st duke of Cambridge, and grandson of King George III., was born at Hanover, 26th March 1819. He was thus about two months older than his cousin, Queen Victoria, and was for that period presumptive heir to the British throne. He was educated at Hanover by the Rev. J. R. Wood, a canon of Worcester. On 3rd November 1837, the rank of colonel in the British army was conferred upon him, and he was attached to the staff at Gibraltar from 10th October 1838 to 25th April 1839. After serving in Ireland with the 12th Royal Lancers as 2nd lieutenant-colonel, he was appointed in April 1842 colonel of the 17th Light Dragoons. For two years, April 1843 to April 1845, he acted as colonel on the staff in the Ionian Islands, and was then promoted major-general. In October 1846 he took command of the Limerick district, and shortly afterwards of the Dublin district. In 1850 his father died, and he succeeded to the dukedom. Being appointed inspector of cavalry in 1852 he held that post until 1854, when, upon the outbreak of the Crimean war, he was placed in command of the two brigades of Highlanders and Guards united to form the first division of the British army. In June of the same year he was promoted lieutenant-general, and was present at the battles of the Alma, Balaklava, and Inkerman, and at the siege of Sebastopol. On 15th July 1856 he was appointed general commanding-in-chief, on 9th November 1862, field-marshal, and by letters patent, 1887, commander-in-chief. The period of thirty-three years during which H.R.H. held the command of the army was marked by many changes. The Crimean war brought to light great administrative defects, and led to a regrouping of the departments which, with the whole *personnel* of the army, were brought under the authority of the secretary of state for war. A constitutional development was thus involved, and the relations of the army to the Crown were gradually modified in some respects. Until 1870, however, the organization of the military forces was practically unaltered. The startling successes of the Prussian arms in the Austrian and French campaigns having created a profound impression, drastic changes were introduced by Mr Cardwell into the entire fabric of the army. The objects of the reformers of 1870 were undoubtedly wise; but some of the methods adopted were open to question, and were strongly resented by the

duke of Cambridge, whose views were shared by the majority of officers. The reforms of 1870-71 having largely failed to produce the results anticipated by their promoters, further changes were inaugurated in 1880, and again H.R.H. found much to criticize. His opinions stand recorded in the voluminous evidence taken by the numerous bodies appointed to inquire into the condition of the army. They contain much sound common-sense, and they show a strong attachment to the old regimental system, and a natural dread that *esprit de corps* might suffer from innovations. Throughout the period of change, H.R.H., while protesting, invariably accepted and loyally endeavoured to carry out the measures on which the Government decided. In a memorandum addressed to Mr Childers in 1880 he defined his attitude as follows:—"Should it appear, however, that for reasons of state policy it is necessary that the contemplated changes should be made, I am prepared to carry them out to the best of my ability." This attitude H.R.H. consistently maintained, and while his training and associations led him to deprecate changes the need for which was not apparent to him, his military judgment was sometimes indisputably correct. This was notably the case in regard to the ill-advised reduction of the artillery carried out by Mr. Stanhope. Under the Order in Council of February 1888, the whole responsibility for military duties of every kind was for the first time centred upon the Commander-in-Chief. This, as pointed out by Lord Hartington's commission in 1890, involved "an excessive centralization" which "must necessarily tend to weaken the sense of responsibility of the other heads of departments, and thus to diminish their efficiency." The duke of Cambridge, whose exalted position entailed many duties apart from those strictly appertaining to a Commander-in-Chief, could not give personal attention to the vast range of matters for which he was made nominally responsible. On the other hand, the adjutant-general, as "chief staff officer," could act in his name, and the Secretary of State could obtain military advice given behind his back by officials charged with no direct responsibility. The effect was to place the duke in a somewhat false position in the eyes of the Army and of the country, while power accumulated in the hands of this adjutant-general. If the administration of the army suffered after 1888, this was due to a system which violated principles.

Throughout his long term of office the duke of Cambridge evinced a warm interest in the welfare of the soldier, and great experience combined with a retentive memory made him master of military details. While quick to condemn deviations from the letter of regulations, and accustomed to insist upon great precision in drill, he was never a martinet, and his natural kindliness made him ready to bestow praise. Belonging to the pre-scientific period of the British army, he could not easily adapt himself to the new conditions, and in dispensing patronage he was somewhat distrustful of originality, while his position as a member of the royal family tended to narrow his scope for selection. He was thus inclined to be influenced by considerations of pure seniority, and to underrate the claims of special ability. The army, however, always recognized that in the duke of Cambridge it had a Commander-in-Chief devoted to its interests, and keenly anxious amid many difficulties to promote its well-being. The duke resigned the Commandership-in-Chief 1st November 1895, being succeeded by Lord Wolseley. H.R.H. was colonel of the Scots Fusiliers from 1852 to 1861, of the Royal Artillery, 1861, and colonel of the Grenadier Guards since 1862. He was made Ranger of Hyde Park and St James's Park in 1852, and of Richmond Park in 1857; governor of Woolwich Academy in 1862, and its president in 1870, and personal aide-de-camp to Queen Victoria in 1882. The chief honours conferred upon him were: G.C.H., 1825; K.G., 1835; G.C.M.G., 1845; G.C.B., 1855; K.P., 1861; K.T., 1881.

Cambridgeshire, a south midland county of England, bounded on the E. by Norfolk and Suffolk, on the S. by Essex and Hertford, on the W. by Bedford, Huntingdon, and Northampton, and on the N. by Lincoln.

Area and Population.—In 1891 the area of the ancient (geographical) county was 549,749 acres, and the population 188,961, of whom 92,513 were males, and 96,448 females, an increase of 3367 persons since 1881 (185,594), or an increase of 1·8 per cent., as compared with a decrease of 0·7 per cent. (namely 1312 persons) in the period 1871-81. In 1891 there were 0·34 persons to an acre, and 2·91 acres to a person. In the same year the area of the registration county was 565,737 acres, and the population 196,269, of whom 96,219 were males, and 100,050 females; in 1881 the registration county contained 191,289 inhabitants (94,002 males, 97,287 females). In 1901 the population of the ancient county was 190,687. Particulars of the birth-rate, death-rate, and illegitimacy-rate, and the number of persons married per 1000 inhabitants are given in the subjoined table:—

	1871-80.	1881-90.	1887-97.	1898.
Birth-rate . .	32·3	29·3	27·2	25·4
Death-rate . .	18·8	17·3	16·6	15·6
Illegitimacy-rate .	57	54	51	48
Marriage-rate .	13·0	12·8	13·4	14·1

In 1891 the county contained 494 persons of Scottish birth, 438 of Irish birth, and 260 foreigners. At the same date there were 174 blind persons, 80 deaf and dumb, and 664 insane.

Administration.—The ancient county is for parliamentary purposes divided into three divisions (Northern or Wisbech, Western or Chesterton, and Eastern or Newmarket), and embraces also the parliamentary borough of Cambridge, each returning one member. The University of Cambridge also returns two members. Administratively the ancient county embraces the two counties of Cambridge and the Isle of Ely. There are two municipal boroughs, Cambridge and Wisbech; courts of quarter sessions at Cambridge and Ely; and ten petty sessional divisions. The boroughs of Cambridge and Wisbech have each a separate commission of the peace; and the University of Cambridge exercises disciplinary jurisdiction over its own members. The two administrative counties contain together 172 entire civil parishes and parts of 4 others. The ancient county contains 181 entire ecclesiastical parishes or districts, with parts of 12 others, most of them in the diocese of Ely. Spring assizes are held at Ely, summer assizes at Wisbech.

Education.—There is a day training college for schoolmasters at Cambridge, and in the same town also the New Homerton undenominational training college for women (see CAMBRIDGE). At Ely a theological college was founded in 1876, the building being opened in 1881. The number of elementary schools in the county, including also the Isle of Ely, on 31st August 1898 was 224, of which 66 were board schools and 158 voluntary schools, the latter including 146 National Church of England schools. The average attendance during the year at the board schools was 8920, and at the voluntary schools 18,996. The total school board receipts for the year ending 29th September 1898 was £23,984. The income under the Technical Instruction Act was £467, and under the Agricultural Rates Act £2283.

Agriculture.—In the period 1875-99 the area under corn crops decreased, as did also the area of the green crops, chiefly miscellaneous roots and fodder plants. Potatoes, on the other hand, showed a very considerable increase. Since the year 1875 there has been a very noticeable decline in the number of sheep. The number of acres farmed by tenants was 402,450 in 1889, and 402,438 in 1899; whilst in 1889, 86,202 acres were farmed by their owners, and in 1899, 87,822 acres.

The table immediately following shows the area under the different kinds of crops at the periods named:—

Year.	Area in Cultivation.	Under Corn Crops.	Under Green Crops.	Bare Fallow.	Under Permanent Grass.
1875	483,340	261,327	85,793	16,776	...
1880	485,482	251,479	82,735	20,422	...
1885	487,496	241,777	82,102	20,040	90,894
1890	491,153	238,414	75,494	15,940	108,468
1895	488,524	222,073	76,526	18,776	117,058
1899	490,260	222,434	76,174	12,896	117,722

The next table shows the number of live stock at the periods named:—

Year.	Cows and Heifers.	Other Cattle.	Total Cattle.	Horses.	Sheep.	Pigs.
1875	...	...	47,507	26,959	321,993	43,687
1880	14,105	32,385	46,490	29,387	309,250	39,459
1885	15,276	35,299	50,575	27,476	274,493	44,858
1890	16,568	35,975	52,543	28,759	259,426	55,511
1895	15,519	32,618	48,137	31,055	213,482	56,191
1899	17,928	38,195	56,123	31,505	214,422	48,472

AUTHORITIES.—S. H. MILLER and S. B. J. SKERTCHLY. *The Fenland.* Wisbech, 1878.—F. R. C. READ. *Handbook to the Geology of Cambridgeshire.* Cambridge, 1897.—A. KINGSTON. *East Anglia and the Great Civil War.* London, 1897.—C. C. BABINGTON. *Ancient Cambridgeshire.* Cambridge, 1883.—R. BOWES. *Catalogue of Books printed at or relating to Cambridge.* Cambridge, 1891, *et seqq.* (J. T. BE.)

Cambuslang, a town of N.W. Lanarkshire, Scotland, near the Clyde, about 5 miles S.E. of Glasgow by rail, inhabited for the most part by Glasgow business men. There are 13 coal-mines in the vicinity, a turkey-red dyeing establishment, and the largest steel works in the kingdom. Recent structures are United Free churches, an institute and library, a public hall, a new bridge over the Clyde, and an Established church hall. Electric light is supplied. Population (1881), 5538; (1891), 8323; (1901), 20,212.

Camden, a city and port of entry of New Jersey, U.S.A., and capital of Camden county, situated in 39° 57′ N. lat. and 75° 07′ W. long., on the Delaware, opposite Philadelphia, of which it is a suburb. It is entered by three railways—the Pennsylvania, the Atlantic City, and the West Jersey and Seashore. It has extensive manufactures, in which there was invested, in 1890, a capital of $15,244,500, employing 10,362 persons, with an output valued at $21,145,637. The principal manufactures were iron and steel, shipbuilding, woollen and worsted goods, oil-cloth, and boots and shoes. In 1900 the assessed valuation of property, real and personal, was $27,607,810. The net debt was $2,453,475, and the rate of taxation $21.40 per $1000. Population (1880), 41,659; (1890), 58,313; (1900), 75,935, of whom 10,097 were foreign-born, and 5576 were negroes. The death-rate in 1900 was 16·3.

Camera Obscura.—The invention of this instrument has generally been ascribed, as in the ninth edition of this work, to the famous Neapolitan savant of the 16th century, Giovanni Battista della Porta, but, as a matter of fact, the principle of the simple camera obscura was well known and it was in practical use long before his time. He was anticipated in the discoveries he claimed to have made regarding it, and all he seems really to have done was to popularize it. The increasing importance of the camera obscura as a photographic instrument makes it desirable to bring together what is known of its early history, which is far more extensive than is usually realized. In southern climes, where during the summer heat it is usual to close the rooms from the glare of the sunshine outside, we may often see depicted on the walls vivid inverted images of outside objects formed by the light reflected from them passing through chinks, or small openings, in the shutters. We do not, however, find many allusions to this appearance in the ancient writers, but the correlated problem of the image of the sun passing through a quadrilateral aperture always appearing round is explained by Aristotle (*Probl.* sect. xv. cap. 5), and he further describes the appearance of the eclipsed sun or moon in the same manner through the interstices of foliage or lattice-work. These problems regarding the passage of light through small apertures and their practical application in the camera obscura occupied the attention of many of the master minds of the period between the 13th and 17th centuries, in which the foundations of modern science were laid. Among them were the following:—

Roger Bacon, about 1260
John Peckham
Vitellio
} Optical problems.

Leon Baptista Alberti, the architect, 1437. Show-box.
Leonardo da Vinci, end of 15th, or early in 16th century.
Don Papnutius, or Panuce, before 1521.
Franciscus Maurolycus, 1522. Optics.
Erasmus Reinhold, 1540
Gemma Frisius, 1544
} for observing eclipses.
Jerome Cardan, 1550. Camera obscura with speculum.
Giov. Batt. Porta, 1558. Camera without lens and with speculum.
Daniele Barbaro, 1568. Camera with lens as an aid for drawing.
Egnatio Danti, 1573. Reflecting mirror for erecting images.
Ferderic Risner, before 1580. For copying maps.
Giov. Batt. Benedetti, 1585. Camera obscura with lens.
Giov. Batt. Porta, 1589. Camera obscura with lens.
Johann Kepler, 1600. Optical theory and solar observations.
Johann Fabricius, 1611. Observations of sun-spots.
Christopher Scheiner, 1611-30. Helioscope for solar observations.
Gaspar Schott, 1657. Optical theory.
Johann Zahn, 1685. Box forms of camera and optics.

That Roger Bacon was acquainted with the principle of the camera obscura is shown by his solutions of the optical problems relating to the passage of light through small round or multiangular apertures given in his *Perspectiva*, which are better and clearer than Peckham's or Vitellio's, but there is nothing to be found in his published writings to show clearly that he had constructed any instrument for viewing outside objects on that principle, though it seems possible from a passage of the *Perspectiva*, upon which Friend, in his *History of Physick*, gives him the credit of the invention. The arrangement of concave and plane mirrors, by which the realistic images of objects inside the house or in the street could be rendered visible, though intangible, there alluded to, may apply to a camera on Cardan's principle, or to a method of aerial projection by means of concave mirrors with which Bacon was quite familiar, and indeed was known long before his time.

There is no clear evidence that Alberti invented or described the camera obscura, but it appears from an extract from an anonymous biography of him, quoted by Vasari, that he constructed little boxes in which painted pictures were viewed through a small hole with great verisimilitude. He had two kinds, one for use at night, showing the moon and bright stars, and the other for day scenes. The account is vague, and seems to refer more to a magic lantern or show-box than to the camera obscura—though some forms of the latter can be used as show-boxes (Harris's *Optics*). Kircher mentions some arrangement of this kind made by an Albertus, whom he distinguishes from Albertus Magnus. Libri, in the history of the invention of the camera obscura in Italy, given in his *Histoire des sciences mathématiques en Italie*, iv. 303, makes no mention of Alberti, but he draws attention to an unpublished MS. of Leonardo da Vinci, which was first brought to light by Venturi, in his *Essai sur les ouvrages physico-mathématiques de Leonardo da Vinci* (Paris, 1797), in which the appearance of the reversed images of outside objects on a piece of paper held in front of a small hole in a darkened room is quite clearly described and explained, with a diagram, as well as its application to illustrate the phenomena of vision. This is probably the earliest distinct account of the camera obscura, though Leonardo does not mention it as an invention of his own. The first published account, however, appears, as Libri has shown, in a translation, with commentary, of the *Architecture* of Vitruvius, published at Como, in 1521, by C. Cæsariano, in which he mentions an experiment made by a Benedictine monk and architect, Don Panuce, of the same kind as Leonardo's, but without the demonstration

About the same time Maurolycus, the eminent mathematician of Messina, in his *Theoremata de Lumine et Umbra*, fully investigated the optical problems connected with vision, the passage of rays of light through small apertures with and without lenses. Risner says he has described the application of the darkened room to the observation of eclipses. In any case his theoretical work was a great advance on that of his predecessors. It is possible that Reinhold got this method of observing eclipses from Maurolycus, through Pürbach. He is said to have used it to observe an eclipse of the sun at Wittenberg, in 1540, and he certainly did so in 1544 and 1545. He has described his method in his edition of Pürbach's *Theoricæ Novæ Planetarum*, and says it can also be applied to observing terrestrial objects, though he only used it for the sun. Gemma Frisius has fully described the application of Reinhold's method to making measurements and drawings of the sun during eclipses, or otherwise, and gives a figure of the arrangements he adopted in observing the eclipse of January 1544 at Louvain, in his *De Radio Astronomico et Geometrico* (1545), p. 31. He says it can also be used for observations of the moon and stars and for longitudes. Moestlin adopted the same method later, and handed it on to Kepler. It had the advantage of being simple and avoiding injury to the eyes. It is interesting to note this early application of the camera obscura to the field of astronomical research, in which its latest achievements have been of such pre-eminent value.

The addition of optical appliances to the simple dark chamber seems to have been first described by Cardan, in a passage in his treatise *De Subtilitate* (1550), p. 107, which Libri has noted: "Quod si libeat spectare ea quod in via fiunt, sole splendente, in fenestra orbem è vitro collocabis, inde occlusa fenestra videbis imagines per foramen translatas in opposito plano . . . atque alia mira non solum sphæricum sed et conicum ac cylindricum." From this it would appear that he used spherical mirrors, and not a lens, which might be implied by the use of the word "orbem."

We now come to Porta. In his first account of the camera obscura in the *Magia Naturalis*, in four books, Naples, 1558, no mention is made of a lens, but he discloses as a great secret, that by a proper arrangement of a concave speculum in front of the aperture the colours of objects could be seen much better. This seems, however, to be very similar to Cardan's arrangement published eight years earlier. Porta also alludes to the application of the method to painting by persons ignorant of drawing who could lay on colour. His second edition, in which he in the same words claims the discovery of the use of a convex lens in the aperture as his own, and a secret he intended to keep, was not published till 1589, thirty-one years after the first. In this interval the use of the lens was discovered and clearly described by Daniele Barbaro, a Venetian, Patriarch of Aquileia, in his work on geometrical perspective, *La Pratica della Prospettiva*, p. 192, published in 1568, or twenty-one years before Porta mentioned it. The lens used by Barbaro was an ordinary convex, or old man's, spectacle glass; concave, he says, will not do. He shows how the paper must be moved till it is brought into the focus of the lens, the use of a diaphragm to make the image clearer, and also the application of the method for drawing objects in true perspective. That Barbaro was really the first to apply the lens to the camera obscura is supported by Bettinus in the *Apiaria*, and by Schott in his *Magia Universalis*, the former taunting Porta with the appropriation. In an Italian translation of Euclid's *Optics*, published by Egnatio Danti in 1573, after discussing the effects of plane, convex, and concave reflectors, he gives a full description of the method of showing reversed images passing through an aperture in a darkened room, and shows how by placing a mirror behind the aperture unreversed images might be obtained, illustrating the two effects with diagrams.

Risner, who died in 1580, has also in his *Opticæ* (1606) very clearly explained the reversal of the images in the camera obscura. He notes the conveniences of the method for solar observations, and its previous use by the observers already mentioned. He further points out its advantages for easily and accurately copying on an enlarged or reduced scale, especially for chorographical or topographical documents. This seems to be the first notice of the application of the camera to cartography and reproduction of drawings on various scales, which, perhaps more than anything else, is its prime use at the present day. In the *Diversarum Speculationum Mathematicarum et Physicarum*, written in 1585 by the Venetian nobleman Benedetti, there is a letter to Pirro de Arzonis, in the course of which, after discussing the destruction or weakening of the images of the camera obscura by the admission of extraneous light, he tells him of an improvement in that sort of thing some one had carried out by the use of a double convex glass in the aperture of the dark room, and that the images could be made erect by reflexion from any plane mirror. This was four years before Porta published it, and may refer to Barbaro. The account of the camera obscura given in Porta's second edition of the *Magia Naturalis*, in 1589, is expanded from the first. The use of the lens, which is given as a great secret, in place of the concave speculum of the first edition, is not so clearly described as by Barbaro; the concave speculum is used for making the images larger and clearer, and also for making them erect, but no details are given. He describes some peep-show arrangements, and indicates how the camera with a concave speculum can be used for observing eclipses. There is no mention of a portable box or construction beyond the darkened room. In his treatise *De Refractione Optices Parte* (1593), he goes into the theory of vision and the optics of the camera. He brought forward no novelty in the camera obscura, he did not improve it, his descriptions of it are vague, but were published in a book which became popular, and so he acquired credit for the invention.

The first to take up the camera obscura after Porta's second edition was Kepler, who used the method for solar observations in 1600, and in his *Ad Vitellionem Paralipomena* (1604) discusses all the old problems of the passage of light through small apertures and the rationale of the camera obscura. He was the first to make up an instrument fitted with a sight and paper screen for observing the diameters of the sun and moon in a dark room. In his later book *Dioptrice* (1611) he fully discusses refraction and the use of lenses, showing the action of the double convex lens in the camera obscura, and the principles which regulate its use, with the reason of the reversal of the image. He also shows that enlarged images can be produced by using a concave lens at a suitable distance behind the convex, as in modern telephotography. He extended the work of Maurolycus, and demonstrated the exact analogy between the eye and the camera and the arrangements by which an inverted image is produced on the retina.

About this time the telescope came into use, and the danger of observing the sun with it was soon discovered. In 1611 Fabricius published his observations of sun-spots, and describes how he and his father fell back on the old method of observing the sun's image through a small hole in a darkened room, finding that they could observe the spots just as well as in the telescope. They do not seem to have used a lens, or thought of using the telescope for projecting an enlarged image. This was done by Scheiner, who has fully described and illustrated his method in the

Rosa Ursina, published in 1636. He demonstrates very clearly and practically the advantages and disadvantages of the different methods, without a lens, with a single convex lens, and with a telescope, as used in his heliioscope, which was a telephotographic arrangement on a stand on Kepler's principle. Here we first find the dark chamber constructed of wooden rods covered with cloth or paper, used separately to screen the observing tablet.

Bettinus in his *Apiaria* (1645) has described several methods of measuring the sun and terrestrial objects by the images projected through an aperture, and also methods for erecting the inverted images formed by lenses in the camera obscura. In 1646, Fr. Kircher published his well-known *Ars Magna Lucis et Umbræ*, and in it has gathered most of the information then available on the principle and use of the camera obscura and methods of optical projection. It is noticeable that he first uses the word *conclave*, a box or cage, like Scheiner's, as alternative to *camera*. The optical principles of the camera obscura with and without lens were very fully treated by Schott in the first part of his *Magia Universalis Naturæ et Artis* (1657), and he has discussed the nature and manner of production of the image on the paper, the similarity of the eye to the camera, and the phenomena of vision. In his preface there is a useful list of early writers on optics.

It is difficult to ascertain when the camera first came to England. The translation of Porta's book, *Natural Magick*, was published in 1658, and in the same year there is a mention of a portable tent camera obscura for sketching, in a work called *Graphice, or the Most Excellent Art of Painting*. In this the object glass of a "prospective image trunk," or telescope, was used alone to throw the image on a sheet of paper on which the outline could be drawn. William Molyneux has given a number of optical problems relating to lenses in his *Treatise of Dioptrics*, 1692. He states the relative proportions between the diameters of the object and the image, and their distances from the lens, and proves it geometrically by the case of the camera and lens. The analogy of the eye and the camera is also discussed, as well as the optical theory of the dark chamber or camera with and without a lens.

The first notice of a box, or portable camera with lens, appears to be in Zahn's *Oculus Artificialis Teledioptricus* (1702). He gives figures and descriptions of two forms: one a wooden box with a projecting tube, in which two or three lenses could be fitted, the image from which was thrown on a screen of oiled paper and viewed through a hole in the back of the camera about two or three inches away. The second was fitted with a reflector to throw up the image on a horizontal screen on which it would be viewed unreversed. There is also a great deal of theoretical and practical information on lenses in connexion with the camera and other optical instruments. From John Harris's *Lexicon Technicum* (1704), we find that the camera obscura fitted with the arrangement called the "scioptric ball," and known as *Scioptricks*, was on sale in London, and after this must have been in common use, either as a sketching instrument or as a show. Many patterns are described in Joseph Harris's *Treatise on Optics*, 1775, Hutton's *Philosophical and Mathematical Dictionary*, and other books on Optics and Physics of that period.

The camera obscura was first applied to photography by Thomas Wedgwood about 1802. (J. WA.*)

Camerino, a town and archbishop's see of Italy, the Marches, province of Macerata, 24 miles S.W. from Macerata, on an E. spur (1139 ft.) of the Apennines. It is the seat of a "free" university, founded in 1727, and attended in 1898 by 234 students; 18 professors. Population, about 12,000.

Cameron, Verney Lovett (1844-1894), African traveller, was born at Radipole, near Weymouth, 1st July 1844. He entered the navy in 1877, and was employed for a considerable time in the suppression of the East African slave-trade. The experience thus obtained led to his being selected to command an expedition sent out by the Royal Geographical Society in 1873, to succour Dr Livingstone. Soon after the departure of the expedition from Zanzibar, Livingstone's servants were met bearing the dead body of their master, but Cameron continued his march, reached Ujiji, on Lake Tanganyika, in February 1874, and, after solving the principal geographical problems connected with that lake, proceeded south-west, continually making discoveries in regions never before visited by any European. His travels were published, under the title *Across Africa*, in 1876. The remainder of Cameron's life was chiefly devoted to projects for the commercial development of Africa, and to writing tales for the young. He also visited the Euphrates valley in connexion with the proposed railway, and accompanied Sir Richard Burton in his West African exploration in 1882. He wrote on both subjects. He was killed by a fall from horseback when returning from hunting, 24th March 1894.

Cameroon, or KAMERUN, in West Central Africa, forms the north-west corner of the great Central African plateau. This becomes evident in its eastern section, where are wide-spreading plains, which farther west assume an undulating character, and gradually merge into a picturesque mountain range. This range, running from north to south, is flanked by a second lower parallel range in the west, with a wide valley between. In the north-west the Upper Guinea mountains send their eastern spurs just across the boundary, and from a volcanic rift, which runs south-west to north-east, the Cameroon peak rises to an elevation of 12,480 feet. Inland the Chebchi and Mandara mountains indicate the direction and extent of the rift. Geologically, these three mountain groups belong to so many different periods. The first is composed of Archaic rocks, the part belonging to the Guinea mountains is of more recent age, showing sandstones and clay schists, while the rift mountains and Cameroon peak are purely volcanic. The mountains of the plateau lose their meridional direction, sweeping grandly round to the east on reaching the eighth degree of N. lat. Here they give rise to a number of small rivers, which collect in the rift and form the Benue, that passes between the two chief groups of the rift mountains, and leaves the protectorate to join the Niger. Cameroon is thus a mountainous country, which has only, on the coast, a strip of low land. In the south, near Batango, this is very narrow; it widens towards the north. Here, at the foot of the peak, a number of estuaries cut deep bays which form excellent harbours. The small rivers which empty into them can be ascended for some miles by steam-launches. The chief rivers of the protectorate are the Lom and Nyong, next to them the Lokunja and Kribi. The two former rise on the central plateau, down which they leap in splendid cascades; through the parallel coast range they break in rapids, which indicate the extent of their navigability. It is most probable that the Sannaga, an arm of the Lom, will also prove navigable for launches in its upper course on the plateau. Through the Logone and Shari the country becomes tributary to Lake Chad, through the Sanga to the Congo.

Climate.—Cameroon has a very considerable rainfall, and though this is greater in a certain part of the year, there is hardly a month without rain. In the interior four seasons can be distinguished; a comparatively dry

and a wet one alternating. Although on the northern hemisphere, the seasons show a south equatorial character. July to October are the coldest months, and also bring most rain. On the coast the temperature is high all the year round, but in the interior it falls as the country rises. Malarial fever is frequent, and even the natives, especially imported Africans, suffer from it.

Flora and Fauna.—The southern part of the low coast is chiefly grass-land, while the river mouths and arms of the bay are lined with mangrove. The mountainous region is covered with primeval forest, in which timber and valuable woods for cabinet-making are plentiful. Most important are the *Elaeis guineensis*, *Sterculia acuminata*, and the wild coffee-tree. On Cameroon peak the forest ascends to 8000 feet; above it is grass-land. Towards the east the forest gradually grows thinner, assumes a park-like appearance, and disappears, and wide grass uplands take its place. Animals of all kinds are plentiful, including the great pachyderms and carnivora. The latter prey on the various kinds of antelopes which swarm on the grass-lands, and two kinds of buffaloes are found in the forests, which are the home of the gorilla and chimpanzee. Large rodents, like the porcupine and cane rat, are frequent. Of birds there are 316 species, and several of venomous snakes.

Ethnology.—The north of Cameroon is inhabited by Sudan negroes, the south by Bantus. The former only recently came from the north and north-east, gradually driving the Bantu before them. They are a fine race, probably of Hamitic origin; they brought horses and horned cattle with them, which were unknown in these regions until then, and they founded well-organized states, like that of Adamawa, of which Yola is the capital. The Chief, or Emir, who resides here, is nominally a subject of the so-called Emperor of Sokoto, but exercises rather independent authority over the people under his rule. He has a strong military force, consisting chiefly of well-mounted cavalry. In the lower parts of the country, in the vicinity of the rivers Benue, Faro, and Mao Kebbi, the people, who are good agriculturists, cultivate extensive fields on the hills, which, north of the river, form disconnected ranges; while south of it they represent the slope of the great central African plateau, and stock-raising forms the chief pursuit of the inhabitants. Hand in hand with the labours of the field a considerable industry is carried on. The people forge their own arms, and manufacture their own stuffs for clothing out of the native cotton. Common villages are built in the Sudanese zeriba style, surrounded with thorn fences; more important places are enclosed by a well-built wall and strongly fortified. Being of warlike disposition, the people often wage war with their neighbours and also amongst themselves. The Bantu negroes inhabit the country south of about 7° of N. lat.; they are active traders, who well understand how to keep the intertribal barter entirely in their own hands. They build square houses, and are ruled by independent chiefs, but in no case has an attempt at political organization been observed amongst them, though they quickly adapt themselves to civilization. Among the Duallas a curious system of drum signals is noteworthy.

Area and Population.—The western boundary of Cameroon was laid down in an agreement between Germany and Great Britain on 15th November 1893, and runs as follows:—From the mouth of the Rio del Rey to the rapids of the Old Calabar or Cross river under 9° 8′ E. long. Thence in a straight line towards Yola, as far as the confines of that township. This, in the east, forms part of a circle, of which the radius is a line drawn from the centre of the town to a spot fully 3 miles west of where the Faro river joins the Benue. From this point, on the left bank of the river, the line goes to the point of intersection of 13° E. long. with 10° N. lat., from here to the border of Lake Chad, 35 miles east of the meridian of the town of Kuka. The south and east boundaries were laid down by agreements between Germany and France on 24th December 1885 and 15th March 1894. The south boundary goes in an almost straight line from the mouth of the Campo river to the river Sanga. And the eastern boundary runs irregularly north to 10° N. lat., and thence eastwards to the Shari river, which it follows to Lake Chad. The protectorate measures about 191,130 square miles, and is estimated to have 3,500,000 inhabitants. In 1899 there were 425 whites, of whom 348 were German and 36 English. The principal town is Cameroon; and Buëa, Victoria, Bibundi, Batanga, and Campo are important trading stations; Aquatown and Belltown are the principal native settlements.

Administration.—Cameroon is divided into three districts, each with an administrative official, subordinate to the *Landeshauptmann* or commissioner. The forces consist of 32 Germans and 554 natives, who are distributed on a number of stations in the interior. There are two courts of law and a court of arbitration for native officers.

Education.—The Bantu are Pagans, the Sudanese Mahommedans. There are four missionary societies (American Presbyterian, Roman Catholic, Baptist, and Protestant). There are several well-attended schools, and it is a hopeful sign that the natives eagerly desire their children to learn to read and write. There are the Government schools with 500 pupils, while the missionary schools are attended by 5000 pupils.

Finance.—The revenue for 1898-99 was 1,251,387 marks, including imperial grant in aid. The budget revenue for 1899-1900 (including imperial contribution) and expenditure was 1,713,000 marks; the imperial contribution for 1900-01 is 1,197,700 marks. There are the ordinary export and import taxes, and various other dues.

Shipping.—There is regular steamship communication between Hamburg and Cameroon. The Woerman line steamers leave Hamburg monthly, and call at most of the ports of the protectorate. The African Steamship Company's and the British and African Steam Navigation Company's steamers also call once a month. In 1898-99, 66 vessels of 81,891 tons called at the ports.

Post and Telegraph.—There is no railway. Roads are gradually being built. On the rivers which run into the bay, small steam-launches ply, and communication with the Government stations in the interior is kept up through native runners. Mails are carried by German and British steamers three times a month. The protectorate belongs to the Postal Union, and the cable is connected with the British Telegraph Station at Bonny on the Niger.

Production.—Cameroon is rich in natural products; ivory is among the export articles, of which the chief are palm-oil, palm kernels, and cocoa. Rubber is collected from the Landolphia and various species of *Ficus*. Copal, copra, Calabar beans, and kola-nuts are exported in large quantities. There are several kinds of finely grained wood, amongst which a very dark ebony is specially remarkable. Cotton, indigo, and various fibres of plants deserve notice. The natives grow several kinds of bananas, yams and batatas, maize, pea-nuts, sugar-cane, sorghum, and pepper. Valuable minerals have not yet been found in paying quantities, though signs of gold have been discovered. Iron is smelted by the natives, who, especially amongst the Sudanese, are very clever smiths, and manufacture fine lance- and arrow-heads, knives and swords, and also hoes. Smithwork is

about the only useful form of existing industry. The natives round the bay are clever carvers of wood, and make highly ornamental figure-heads for their canoes, which also sometimes show very fine workmanship. In the interior the people use the wild-growing cotton and fibres of plants to manufacture coarse drapery and plait-work. In 1898-99 the imports were valued at 10,638,955 marks, and exports at 5,145,822 marks. Of the exports, palm-oil was valued at 893,361 marks; palm kernels, 1,365,608 marks; gum, 1,928,080 marks; ivory, 598,470 marks; cocoa, 813,115 marks.

Development.—Of old Cameroon and the neighbouring coast were known as the Oil Coast, and trading settlements were established at an early period. The trade, however, was always confined to the coast, because the Dualla and other tribes had become recognized intermediaries between the coast factories and the tribes in the interior, whither they allowed no strange trader to proceed. They took a quantity of goods on trust, visited the tribes in the forest, and bartered for ivory, rubber, and other produce. This method had become so universal, that it was called the trust system, under which name, though in a safer form, it still exists. It hampered the coast trade seriously, and had to be abolished before it was possible to open up the interior to settlers and traders. With the utmost difficulty, and not without bloodshed, this barrier was broken down, and direct communication with the higher parts of the country established, and traders from the interior induced to visit the coast. The great labour question came next. In order to lay out plantations, workers had to be brought from the interior, for the coast tribes will only trade, and not work. But the plantations have proved a success, and though coffee, tobacco, ginger, and other plants thrive well, the best article seems to be cocoa, of which more than half a million trees have been planted, which yield yearly large quantities of excellent cocoa.

AUTHORITIES.—E. ZINTGRAPH. *Nord Kamerun*, Berlin, 1895.—F. WOHLTMANN. *Der Plantagenbau in Kamerun und seine Zukunft*, Berlin, 1896.—FR. PLEHN. *Die Kamerunküste, Studien zur Klimatologie, Physiologie, und Pathologie in den Tropen*, Berlin, 1898.

(J. VON P.)

Camiling, a town of 23,000 inhabitants, in the northern part of the province of Tarlac, Luzon, Philippine Islands, on a branch of the river Agno. Its products are rice, Indian corn, sugar, and indigo. Fine timber grows in the vicinity. The principal language is Pangasinan.

Cammarata, a commune of the province of Girgenti, Sicily, Italy, 28 miles N. from Girgenti by the railway to Palermo. It lies at the N.E. foot of Mount Cammarata (5181 feet), one of the loftiest summits in Sicily. It has mines of rock-salt and sulphur springs, with a bath-house. Population, about 6500.

Campagna di Roma, in the wider sense, means the plains which stretch around the city of Rome, and, in the more restricted sense, the coast-belt which extends from Civitavecchia to Terracina. By action of the Italian parliament in 1882, 1886, and 1893, great efforts have been made to cure the waterlogged condition of the marshy grounds. The methods employed have been three—(i.) the cutting of drainage channels and clearing the marshes by pumping, the method principally employed; (ii.) the system of warping, *i.e.* directing a river so that it may deposit its sedimentary matter in the lower-lying parts, thus levelling them up and consolidating them, and then leading the water away again by drainage; (iii.) the planting of firs and eucalyptus trees, *e.g.*, at Tre Fontane and elsewhere. These efforts have not been without success, though it cannot be affirmed that the malarial Campagna is anything like healthy yet. Its bare, treeless, sun-browned expanses are still given over to herds of oxen, horses, sheep (from October to June), and buffaloes; but some fruit and wine are produced. The regulation of the rivers, more especially of the Tiber, is probably the most efficient method for coping with the problem. Since 1884 the Italian Government have been systematically enclosing, pumping dry, and generally draining the marshes of the Agro Romano, that is, the tracts around Ostia; the Isola Sacra, at the mouth of the Tiber; and Maccarese. Of the whole of the Campagna less than one-tenth comes annually under the plough. As regards the Pontine Marshes, the worst district of all, in the south, the government drainage schemes have so far reclaimed them that they are now in great part adapted for pasturage, or are even cultivated. The evil in this tract arises chiefly from the insignificant slope of the ground, so that the surface-waters are unable to find their way readily to the sea.

See Field-Marshal Count MOLTKE'S *Wanderbuch* (6th ed., Berlin, 1892).

Campania, a territorial division of Italy, bordering on the Tyrrhenian (Mediterranean) Sea, both N. and S. of Naples, and embracing the provinces of Avellino, Benevento, Caserta, Naples, and Salerno, with an area of 6289 sq. miles, and a population (1881), 2,896,577; (1901), 3,142,378. The Campania proper, immediately N. of Naples, is one of the most fertile as well as one of the most densely-peopled regions in the world. The principal products are wheat, maize, olives, wine, oranges, lemons, chestnuts, tobacco, potatoes, hemp, beans, and pease. Sulphur is mined. The coast is studded with towns and villages (*e.g.*, Naples, Castellamare, Amalfi, Sorrento, Barra, San Giorgio, Resina, Cava dei Tirreni, &c.), which are much visited for sea-bathing in summer and as health resorts in winter. The modern history is generally coincident with the history of Naples.

Campanology (from late Lat. *campana*, a bell), in its widest sense, includes the history of bells and their uses, *i.e.*, bell-lore; the scientific construction of bells, *i.e.*, bell-founding and tuning; and the science and art of bell-ringing. The two former of these heads are treated under "Bell" (*Encyclopædia Britannica*, ninth edition), and the present article will deal mainly with the third and most commonly accepted meaning of the term, viz., the science and art of change-ringing as practised upon church bells or hand bells.

1. When a given number of bells are rung over and over again in the same order, from the highest note, or "treble," to the lowest, or "tenor"—1, 2, 3, 4, 5, 6, 7—they are said to be rung in "rounds." "Changes" are variations of this order—*e.g.*, 2 1 3 5 4 7 6, 2 3 1 4 5 6 7; and "change-ringing" is the art of ringing bells in "changes," so that a different "change" or rearrangement of order is produced at each pull of the bell-ropes, until, without any repetition of the same change, the bells come back into "rounds." The general principle of all methods of change-ringing is that each bell, after striking in the first place, or "lead," works gradually "up" to the last place, or "behind," and "down" again to the first, and that no bell ever shifts more than one place in each change. Thus the ringer of any bell knows that whatever his position in one change, his place in the next will be either the same, or the place before, or the place after. He does not have to learn by heart the different changes or variations of order; nor need he, unless he is the "conductor," know the exact order of any one change. He has to bear in mind, first, which way his bell is working, viz., whether "up" from

Change-ringing; General principles.

first to last place, or "down" from last to first; secondly, in what place his bell is striking; thirdly, what bell or bells are striking immediately before or after him—this being ascertained chiefly by "rope-sight," *i.e.*, the knack, acquired by practice, of seeing which rope is being pulled immediately before and after his own. He must also remember and apply the rules of the particular "method" (§ 3) which is being rung. The following table representing the first twenty changes of a "plain course" of "Grandsire Triples" (for these terms, see § 3) illustrates the subject-matter of this section :—

1 2 3 4 5 6 7 "Rounds."	7 5 6 1 4 2 3 (10th change.)
2 1 3 5 4 7 6 (1st change.)	5 7 1 6 2 4 3
2 3 1 4 5 6 7	5 1 7 2 6 3 4
3 2 4 1 6 5 7	1 5 2 7 3 6 4
3 4 2 6 1 7 5	1 2 5 3 7 4 6
4 3 6 2 7 1 5 (5th change.)	2 1 5 7 3 6 4 (15th change.)
4 6 3 7 2 5 1	2 5 1 3 7 4 6
6 4 7 3 5 2 1	5 2 3 1 4 7 6
6 7 4 5 3 1 2	5 3 2 4 1 6 7
7 6 5 4 1 3 2	3 5 4 2 6 1 7
	3 4 5 6 2 7 1 (20th change.)

It will be observed that at the 1st change the third bell, and at the 15th the fifth bell, according to the rule of this "method" (see § 3), strikes a second blow in the third place ("makes third's place"). This stops the regular work of the bells which at the previous change were in the 4th, 5th, 6th, and 7th places ("in 4, 5, 6, 7"), causing them to take a step backwards in their course "up" or "down," or as it is technically called, to "dodge." Were it not for this, the bells would come back into "rounds" at the 14th change. It is by the use of "place-making" and "dodging," according to the rules of various "methods," that the required number of changes, upon any number of bells, can be produced. But in order that this may be done, without the bells coming back into "rounds" (as, *e.g.*, in the "plain course" of Grandsire Triples, above given, they will do in seventy changes), further modifications of the "coursing order," called technically "Bobs" and "Singles," must be introduced. In ringing, notice of these alterations as they occur is given by one of the ringers, who acts as "conductor," calling out "Bob" or "Single" at the right moment to warn the ringers of certain bells to make the requisite alteration in the regular work of their bells. (Hence, in ringing language, to "call" a peal or touch = to conduct it.) Particulars of these, as of other details of change-ringing, may be gathered from books dealing with the technique of the art (see § 7); but they are best mastered in actual practice. The term "single," applied to five-bell ringing, meant that, as the first three bells remained unchanged, only a single pair of bells changed places, *e.g.*, 1 5 4 3 2, 1 5 4 2 3. On larger numbers of bells it loses this meaning; but the effect of this "call" is that the "coursing order" of a single pair of bells is inverted. The origin of "Bob" is unknown. As a "call" it was perhaps adopted as a short, sharp sound, easily uttered, and easily heard by the ringers. As applied to a "method" or system of ringing (§ 3), it *may* refer to the evolution of "dodging," *e.g.*, in "Treble Bob" to the zigzag "dodging" path of the treble bell; but none of the old writers attempt to explain it.

Number of Changes; Peals.

2. The number of *possible* "changes" on any given series of bells may be ascertained, according to the mathematical formula of "permutations," by multiplying the number of the bells together. Thus on three bells, only 6 changes or variations of order ($1 \times 2 \times 3$) can be produced; on four bells, $1 \times 2 \times 3 \times 4 = 24$; on five, $24 \times 5 = 120$; on six, $120 \times 6 = 720$; on seven, $720 \times 7 = 5040$. A "peal" on any such number of bells is in ordinary language the ringing of all the possible changes. But technically, only the full extent of changes upon *seven* bells (usually rung with a "tenor behind," § 3) is called a "peal"; a shorter performance upon seven or more bells, or the full extent upon less than seven, being, in ringing parlance, a "touch." On six bells the full extent of changes must be repeated continuously seven times ($720 \times 7 = 5040$), and on five bells forty-two times ($120 \times 42 = 5040$) to rank as a "peal." On eight or more bells 5000 changes in round numbers is accepted as the *minimum* standard for a peal; and on such numbers of bells up to twelve (the largest number used in change-ringing), peals are so arranged that the bells come into rounds at, or at some point beyond, 5000 changes. As many as 16,000 changes, occupying from nine to ten hours, have been rung upon church bells. But the great physical strain upon the ringers—to say nothing of the effect upon those who are within hearing—makes such performances exceptional. The word "peal" is often, though incorrectly, used (1) for a set of church bells ("a peal of six," "a peal of eight"), for which the correct term is "a ring" of bells; (2) for any shorter performance than a full peal (*e.g.*, "wedding-peal," "muffled peal," &c.), called in ringing language a "touch." Its use as = "method" (§ 3), found in old campanological works, is now obsolete.

Methods of Change-ringing

3. Change-ringing upon five bells is called "Doubles," upon seven bells, "Triples," upon nine, "Caters" (Fr. *quatre*), and upon eleven, "Cinques," from the fact that at each change two, three, four or five pairs of bells change places with each other. "Doubles" can be and are rung when there are only five bells: but as a rule these "odd-bell" systems are rung with a "tenor behind," *i.e.*, struck at the end of each change; the number of bells in a tower being usually an even number—six, eight, ten, or twelve. In "even-bell" systems the tenor is "rung in" or "turned in," *i.e.*, changes with the other bells, and a different terminology is employed; change-ringing on six bells being called "Minor"; on eight bells, "Major"; on ten bells, "Royal"; and on twelve, "Maximus." The principal "methods" of change-ringing, each of which has its special rules, are—(1) "Grandsire"; (2) "Plain Bob"; (3) "Treble Bob"; (4) "Stedman," from the name of its inventor, Fabian Stedman, about 1670. In "Grandsire" the treble and one other bell, in "Plain Bob" the treble alone, has a "plain hunt," *i.e.*, works from the first place, or "lead," to the last place, or "behind," and back again, without any dodging; in "Treble Bob" the treble has a uniform but zigzag course, dodging in each place on its way up and down. This is called a "Treble Bob hunt"; and under these two heads, according to the work of the treble, are classified a variety of "plain methods" and "Treble Bob methods," among the latter being the so-called "Surprise" methods, the most complicated and difficult of all. "Stedman's principle," which is *sui generis*, consists in the three front bells ringing their six possible changes (§ 2), while the remaining pair or pairs of bells dodge. It is thus an "odd-bell" method adapted to five, seven, nine, or eleven bells; as also is "Grandsire," though occasionally rung on even numbers of bells. "Treble Bob" is always, and "Plain Bob" generally, rung on even numbers—six, eight, ten, or twelve. In ringing, whenever the treble has a uniform course, unaffected by "Bobs" or "Singles," it serves as a guide to the other changing bells, according to the place in which they meet and cross its path from "behind" to the "lead." The order in which the different dodges occur, and the "course bell," *i.e.*, the bell which he follows from behind to lead, are also useful, and on large numbers of bells indispensable, guides to the ringer.

4. Quite distinct from the art of change-ringing is the science of "composing," *i.e.*, arranging and uniting by the proper "calls" (§ 1), subject to certain fixed laws and conditions, a number of groups of changes, so that no one change, or series of changes represented in those groups, shall be repeated. A composition, long or short, is said to be "true" if it is free from, "false" if it involves, such repetition; and the body of ascertained laws and conditions governing true composition in any method constitutes the test or "proof" to be applied to a composition in that method to demonstrate its truth or falseness. Many practical ringers know little or nothing of the principles of composition, and are content with performing compositions received from composers, or published in ringing books and periodicals. An elaborate statement of the principles of composition in the "Grandsire" method may be found in an appendix to Snowdon's *Grandsire* (Wells Gardner and Co., 1888), by the Rev. C. D. P. Davies, M.A. Those which apply to "Treble Bob" are explained in Snowdon's *Treatise on Treble Bob*, Part I. But, so far as can be ascertained, there is no treatise dealing with the science of composition as a whole; nor is it possible here to attempt a popular exposition of its principles.

Composition.

5. One of the objects kept in view by composers is musical effect. Certain sequences or contrasts of notes strike the ear as more musical than others; and an arrangement which brings up the more musical changes in quicker succession improves the musical effect of the "peal" or "touch." On seven bells all the possible changes (§ 2) must be inserted in a true peal; but on larger numbers of bells, where the choice is from an immense number of possible changes, the composer is free to select those which are most musical. Unless, however, the bells of any given "ring" are in perfect tune and harmony with each other, their musical effect must be impaired, however well they are rung. This gives importance to the science and art of bell-tuning, in which great progress has been made. The researches of the late Canon Simpson, of Fittleworth in Sussex, carried out in practice by Messrs Taylor, bell-founders, of Loughborough (who have erected special machinery for the purpose), have made it possible to tune the largest bells into perfect harmony, not only with other bells, but with themselves. A good bell, fairly struck, should give out three distinct notes—a "fundamental" note or "tonic"; the octave above, or "nominal"; and the octave below, or "hum-note." [It also gives out the "third" and "fifth" above the fundamental; but of these it is less necessary to take notice.] Very few bells, however, have any two of these notes, and hardly any all three, in unison; the "hum-notes" being generally a little sharper, and the "fundamentals" a little flatter, than their respective "nominals." In tuning a "ring" or series of bells, the practice of founders has hitherto been to take one set of notes (in England usually the nominals, on the Continent the fundamentals), and put these into tune, leaving the other tones to take care of themselves. But in different circumstances, different tones assert themselves. Thus, when bells are struck at considerable intervals, the fundamental notes, being fuller and more persistent, are more prominent; but when struck in rapid succession (as in English change-ringing, or with the higher bells of a Belgian "carillon," which take the "air"), the higher tone of the "nominal" is more perceptible. The inharmonious character of many Belgian carillons, and of certain Belgian and French rings in England, is ascribed by Canon Simpson (in his pamphlet, *Why Bells sound out of Tune*, 1897) to neglect of the "nominals," the fundamentals only being tuned to each other. To tune a series of bells properly, the fundamental tone of each bell must be brought into true octave with its nominal, and the whole series of bells, thus rectified, put into tune with each other. The "hum-note" of each, which is the tone of the whole mass of metal, should also be in tune with the others. If flatter than the nominal, it cannot be sharpened: but if sharper (as is more usual), it may be flattened by thinning the metal near the crown of the bell. The great bell ("Great Paul") cast by Messrs Taylor for St Paul's Cathedral, London, has all its tones in true harmony, except that the tone next above the fundamental (E♭) is a "fourth" (A♭) instead of a "third" (G or G♭). The great bell cast by the same founders for Beverley Minster is in perfect tune; and with the improved machinery now in use, there is no reason why this should not henceforth be the case with all church bells.

Harmony; Bell-tuning.

6. The art of scientific change-ringing, peculiar to England, does not seem to have been evolved before the middle of the 17th century. Societies or guilds of ringers, however, existed much earlier. A patent roll of 39 Henry III. (1255) confirms the "Brethren of the Guild of Westminster, who are appointed to ring the great bells there," in the enjoyment of the "privileges and free customs which they have enjoyed from the time of Edward the Confessor." In 1602 (as appears from a MS. in the library of All Souls' College, Oxford) was founded a society called the "Scholars of Cheapside." In 1637 began the "Ancient Society of College Youths," so called from their meeting to practise on the six bells at St Martin's, College Hill, a church destroyed in the Great Fire of London, 1666. At first only "rounds" and "call-changes" were rung, till about 1642, 120 "Bob Doubles" (§ 3) were achieved; but slow progress was made till 1677, when Fabian Stedman of Cambridge published his *Campanalogia*, dedicating it to this society, his method (§ 3) being first rung about this time by some of its members. Before the end of the 17th century was founded the "Society of London Scholars," the name of which was changed in 1746 to "Cumberland Youths" in compliment to the victor of Culloden. These two metropolitan societies still exist, and include in their membership most of the leading change-ringers of England: one of the oldest provincial societies being that at Saffron Walden in Essex, founded in 1623, and still holding an annual ringing festival. In the latter half of the 18th and first half of the 19th century change-ringing, which at first seems to have been an aristocratic pastime, degenerated in social repute. Church bells and their ringers, neglected by church authorities, became associated with the lower and least reputable phases of parochial life; and belfries were too often an adjunct to the pothouse. In the last half of the 19th century there has been a great revival of change-ringing, leading to improvements in belfries and in ringers, and to their gradual recognition as church workers. Diocesan or county associations for the promotion of change-ringing and of belfry reform are spreading knowledge of the art and arousing church officials to greater interest in and care for their bells. A central council of delegates from these various societies meets annually in London or at some provincial centre to discuss ringing matters, and to collect and formulate useful knowledge upon practical questions—*e.g.*, the proper care of bells and the means of preventing annoyance from their use in the neighbourhood of houses, rules for the conduct of belfries, etc. It is now less likely than ever that the Belgian carillons, extravagantly lauded by some writers on campanology, will be

History of Change-ringing.

preferred in England to the peculiarly English system of ringing bells in peal; by which, whatever its difficulties, the musical sound of bells is most fully brought out, and their scientific construction best stimulated.

7. The literature of campanology consists chiefly of scattered treatises or pamphlets upon the technique of different methods of change-ringing, or upon the bells of particular counties or districts. The earliest that deal with the science and art of change-ringing are *Campanalogia, or the Art of Ringing Improved* (1677), and a chapter of "Advice to a Ringer" in the *School of Recreations, or Gentleman's Tutor* (1684), showing that in its early days (§ 6), campanology was a fashionable pastime. Then follow *Campanalogia, or the Art of Ringing made Easy* (Monk, 1766), *Clavis Campanalogia, a Key to Ringing* (1788), and Shipway's *Campanalogia* (1816). The revival of change-ringing in recent years has produced many manuals: *e.g.*, Snowdon's *Rope-Sight* (explaining the "Plain Bob" method), *Grandsire, Treatise on Treble Bob, Double Norwich Court Bob Major*, and *Standard Methods* (with a book of diagrams); Troyte on *Change-Ringing*; *The Duffield Method*, by Sir A. P. Heywood, Bart., its inventor. Somewhat prior to these are various works by the Rev. H. T. Ellacombe, inventor of a chiming apparatus which bears his name, and a pioneer in belfry reform. Among these are accounts of the church bells of Devon, Somerset, and Gloucester, and pamphlets on *Belfries and Ringers, Chiming*, &c.; much of their contents being summarized in *The Ringer's Guide to the Church Bells of Devon*, by C. Pearson (1888). A *Glossary of Technical Terms* used in connexion with church bells and change-ringing was published (1901) under the auspices of the Central Council of Church Bell Ringers (§ 6). On the history of church bells and customs connected with them much curious information is given in North's *English Bells and Bell Lore* (Leek, 1888). By the same author are monographs on the church bells of Leicestershire, Northamptonshire, Lincolnshire, and Hertfordshire. There are similar works on the church bells of Suffolk and Cambridgeshire, by Dr Raven; and of Huntingdonshire, by the Rev. T. M. N. Owen; and one on the church bells of Essex, by the Rev. C. Deedes. See also *Quarterly Review*, No. cxc. (September 1854); *Windsor Magazine*, December 1896; and two papers in the *Guardian*, 20th June and 1st August 1900. (T. L. P.)

Campbell-Bannerman, Sir Henry, (1836-——), British politician, was born on 7th September 1836, being the son of the late Sir James Campbell, Bart., of Stracathro, and assumed the additional name of Bannerman in 1872, in compliance with the provisions of the will of his maternal uncle. He was educated at Glasgow University and at Trinity College, Cambridge; was returned to Parliament for Stirling in 1868; was financial secretary at the War Office from 1871 to 1874, and again from 1880 to 1882; Secretary to the Admiralty from 1882 to 1884; and Chief Secretary for Ireland from 1884 to 1885. In Mr Gladstone's short-lived administration of 1886, he was Secretary for War, and filled the same office in the Radical Government of 1892-95. In June 1895 an imputed omission on the part of the War Office to provide a due supply of small-arms ammunition for the army led to the sudden overthrow of the Rosebery ministry. A still more unexpected incident affecting his political career, was the retirement of Sir William Vernon Harcourt from the leadership of the Liberal party in the House of Commons, in December 1898; Sir Henry Campbell-Bannerman being elected to fill that position with the general assent of his party, but in circumstances which hardly made it a bed of roses. Wealthy, popular, and possessed of a vein of oratorical humour, Sir Henry Campbell-Bannerman had earned, before his somewhat embarrassing elevation to the leadership, the general respect of all parties; and in 1895, when Mr Speaker Peel retired, he was marked out in the opinion of a large body of politicians for the Speakership, but it was understood that he declined to stand. As leader of the Opposition in the House of Commons from 1899 onwards, Sir Henry had a difficult task to perform, and he interpreted his duty as chiefly consisting in the effort to keep the Radical party together in the midst of pronounced differences. In the case of the South African war, however, his opposition to the Government was combined with a distinct tendency to favour the anti-war section. The result was that in 1901 the Liberal Imperialists showed signs of restiveness; but at a party meeting on 9th July 1901 Sir Henry was unanimously confirmed in the leadership.

Campbellton, an incorporated town in Ristigouche county, New Brunswick, situated on the Ristigouche river, 15 miles from its mouth. The Intercolonial railway passes through it, and it is the eastern terminus of the Ristigouche and Victoria railway. It contains 5 churches, 2 branch banks, 2 newspapers, a good water system, several large saw-mills and factories for the manufacture of lumber, and is a distributing centre for northern New Brunswick. Population, 4000.

Campbeltown, a royal and parliamentary burgh (Ayr group) of Argyllshire, Scotland, at the head of a bay near the southern end of the peninsula of Kintyre. Shipbuilding is now of some importance. The registered shipping at the end of 1898 was 37 vessels of 2391 tons. Vessels entered in 1888 were 1117 of 91,204 tons; in 1898, 1232 vessels of 108,882 tons. Of whisky 1,159,567 gallons were exported in 1889, and 1,199,376 in 1899. The port is the head of a fishery district (for statistics, see Argyllshire). The value of the fish landed at the port in 1899 was £41,176. There is a large net factory. A Jubilee Commemoration drill hall has been built. One of the schools is an academy. Population of parliamentary burgh (1881), 7558; (1901), 8234.

Campeachy (Span. *Campeche*), a state of Mexico, bounded on the N. and N.W. by the Gulf of Mexico, on the N.E. by Yucatan, on the S. and S.E. by the republic of Guatemala, and on the S. and S.W. by the state of Tabasco. Its area is 18,095 square miles. The population in 1879 numbered 90,413, and in 1895 it was 88,302. The climate is hot and unhealthy. The principal industries are the exploitation of campeche or logwood, and of cabinet woods, agriculture, stock-raising, fisheries, salt deposits, extraction of henequen and its manufacturing. There are barely 30 miles of railway in operation. The state is divided into 5 *partidos*. Amongst the principal towns, besides the capital, are Champoton, El Carmen, Bolonchen Ticul, Calkini, Hecelchakan—all with populations of less than 5000 inhabitants.

Campeachy, or Campeche de Baranda, capital of the state of the same name, on the Gulf of Mexico, 825 miles from the city of Mexico. The city is one of the richest and most beautiful on the gulf. The wharf is 150 feet long, but as the harbour is only 10 feet deep, large ships cannot approach it. Among the principal buildings are the City Hall, the Government building, the hospital, theatre, the market, and several churches. There are also a fine park and public garden, a public library, and a museum. There are several lines of street railways. Population, 16,647.

Camphausen, Otto von (1812-1896), Prussian statesman, was born at Hünshoven in the Rhine Provinces 21st October 1812. Having studied jurisprudence and political economy at the universities of Bonn, Heidelberg, Munich, and Berlin, he entered the judicial career at Cologne, and immediately devoted his attention to financial and commercial questions. Nominated assessor in 1837, he acted for five years in this capacity at Magdeburg and Coblenz, became in 1845 counsellor in the ministry of finance, and was in 1849 elected a member of the second chamber of the Prussian diet, joining the Moderate Liberal party. In 1869 he was appointed Minister of Finance. On taking office, he was confronted with a deficit in the revenue, which he successfully cleared off by effecting a conversion of a greater part of the state loans. The French war indemnity enabled him to redeem a considerable portion of the state debt and to remit certain taxes. He was, however, a too warm adherent of free trade principles to enjoy the confidence either of the Agrarian party or of Prince Bismarck, and his antagonism to the tobacco monopoly and the general economic policy of the latter brought about his retirement. Camphausen's great services to Prussia were recognized by his sovereign in the bestowal of the order of the Black Eagle in 1895, a dignity carrying with it a patent of nobility. He died at Berlin on 18th May 1896.

Campi Bisenzio, a town of the province of Florence, Tuscany, Italy, 7 miles N.W. from Florence, with a fine castle. Population, about 14,000.

Campion, Thomas (1566?-1620), English poet and musician, whose works have only received due recognition within the last few years. The resuscitation of his fame is largely due to the enthusiastic labour of Mr A. H. Bullen. No light has been thrown over his parentage, or the time of his birth, except that he seems to have been about twenty years of age, in 1586, when he was admitted a member of Gray's Inn. Without proceeding to the Bar, he adopted the profession of medicine, and studied for his M.D. at Cambridge, where he was "soundly learned" and "gentlemanlike qualified." Campion is first mentioned as a poet in Peele's *Honour of the Garter*, 1593; the earliest verses of his which we possess have come down to us in a MS. dated 1596. But before this he had published a collection of Latin epigrams (in 1595), no copy of which is now believed to exist. The text is, however, supposed to be that reprinted in the second book of the *Epigrammata* of 1619. In 1601 appeared *A Book of Airs*, in which the songs are believed to be entirely written by Campion, the music by him and by Rossiter. Next year Campion appeared as a critic of prosody, with his *Observations in the Art of English Poesy*, a treatise in favour of abandoning the "vulgar and unartificial custom of rhyming," in favour of accentuated, unrhymed verse. Samuel Daniel immediately replied with his *Defence of Rhyme*, published in 1602, and Ben Jonson attacked both Campion and Daniel in a tract which has been lost. Campion was chosen to write the Masque at Court, on occasion of Sir James Hay's marriage in 1607; this he dedicated to the king, and published in quarto; it is one of the best existing examples of this class of composition. In 1613 Campion was engaged on three Court masques, all of which were printed, and it is probable that he wrote many other such lyrical and musical entertainments, which served their purpose, and were not preserved. He worked, we know, with Inigo Jones, and apparently escaped those perturbations of temper which marked Ben Jonson's dealings with the irascible architect. In 1613, also, Campion issued in folio, with music, a perfunctory collection of *Songs of Mourning* for Prince Henry; and a second collection of songs, *Two Books of Airs*, probably belongs to the same year. *A Third and Fourth Book of Airs* is undated, but has been shown by Mr Bullen to belong to 1617, and Campion published about the same time a technical treatise on counterpoint. In 1619 he republished what we suppose to be his *Poemata* of 1595, but with very large additions. On 1st March 1620, "Thomas Campion, Doctor of Physic, was buried," at St Dunstan's in the West, Fleet Street. He was probably in his fifty-fourth year. Campion's genius was recognized in his own age, and the complete oblivion into which it immediately sank is difficult to account for. This eclipse lasted, however, until a few years ago. It was dispersed by Mr Bullen, who in 1887 was the first to claim for Campion a place among the foremost lyrical poets of the Elizabethan age. The same critic persevered in drawing attention to Campion's merits, and was encouraged, in 1889, to edit a complete edition of his works. Since then, the claim of Campion has been acknowledged by competent judges. Of all the poets who in the reigns of Elizabeth and James I. made a practice of contributing words to the popular music-books, Campion was by far the greatest, whether as artist in verse or as an improvisator. He had a very wide range; he excelled as much in an elaborate ode or epithalamium as in a simple trill of unpremeditated song. As a masque-writer, he has only one rival in English, namely Ben Jonson, and Campion's best entertainment, that on the marriage of "The Lord Hayes," is able to bear comparison with the finest of Jonson's masques. It is a curious fact that Campion, who rhymed with equal elegance and ease, and whose best songs are remarkable for their verbal music, was, at all events during some part of his career, averse from the employment of rhyme in English. The experiments he wished to introduce, his iambics, anacreontics and sapphics, are unfitted to the genius of our language, and of Campion's examples of these heresies the best that can be said is that they are more nearly successful than those of his contemporaries. But even from his remarkably adroit "Rose-cheeked Laura," we turn with eagerness to such of his rhymed pieces as that in which "White Iopë" is mentioned, or to "I care not for these ladies." (E. G.)

Campoamor y Campoosorio, Ramon de (1817-1901), Spanish poet, was born at Navia in the province of Asturias on 24th September 1817. Abandoning his first intention of entering the Jesuit order, he studied medicine at Madrid, found an opening in politics as a supporter of the Moderate party, and, after occupying several subordinate posts, became governor of Castellón de la Plana, of Alicante, and of Valencia. His Conservative tendencies grew more pronounced with time, and his *Polémicas con la Democracia* (1862) may be taken as the definitive expression of his political opinions. His first appearance as a poet dated from 1840, when he published his *Ternezas y flores*, a collection of idyllic verses, remarkable for their technical excellence. His *Ayes del Alma* (1842) and his *Fábulas morales y políticas* (1842) sustained his reputation, but showed no perceptible increase of power or skill. An epic poem in sixteen cantos, *Colón* (1853) is no more successful than modern epics usually are. Campoamor's theatrical pieces, such as *El Palacio de la Verdad* (1871), *Dies Iræ* (1873), *El Honor* (1874), and *Glorias Humanas* (1885), are interesting experiments; but they are totally lacking in dramatic spirit. He has always shown a keen interest in metaphysical and philosophic questions, and has defined his position in *La Filosofía de las leyes* (1846),

El Personalismo (1855), *Lo Absoluto* (1865), and *El Ideismo* (1883). These studies are chiefly valuable as embodying fragments of self-revelation, and as having led to the composition of those *doloras*, *humoradas*, and *pequeños poemas*, which the poet's admirers consider as a new poetic species. The first collection of *Doloras* was printed in 1846, and from that date onwards new specimens have been added to each succeeding edition. It is difficult to define a *dolora*. One critic has described it as a didactic, symbolic stanza which combines the lightness and grace of the epigram, the melancholy of the *endecha*, the concise narrative of the ballad, and the philosophic intention of the apologue. The poet himself declares that a *dolora* is a dramatic *humorada*, and that a *pequeño poema* is a *dolora* on a larger scale. These definitions are unsatisfactory. The humoristic, philosophic epigram is an ancient poetic form to which Campoamor has given a new name; his invention goes no farther. It cannot be denied that in the *Doloras* Campoamor's special gifts of irony, grace, and pathos find their best expression. Taking a commonplace theme, he will render in four, eight, or twelve lines a perfect miniature of condensed emotion. By his choice of a vehicle he has avoided the fatal facility and copiousness which have led many Spanish poets to destruction. It has pleased him to affect a vein of melancholy, and this affectation has been reproduced by his followers. Hence he gives the impression of insincerity, of trifling with grave subjects, and of using mysticism as a mask for frivolity. The genuine Campoamor is a poet of the sunniest humour who, under the pretence of teaching morality by satire, is really seeking to utter the gay scepticism of a genial, epicurean nature. His influence has not been altogether for good. His formula is too easily mastered, and to his example is due a perfect plague of *doloras* and *humoradas* by very minor poets who have caricatured their model. Campoamor, as he himself has said, does not practise art for art's sake; he uses art as the medium of ideas, and in ideas his imitators are poor. Campoamor died at Madrid on 12th February 1901. Of late years a deep silence had fallen upon him, and we are in a position to judge him with the impartiality of another generation. The overwhelming bulk of his work will perish; we may even say that it is already dead. His pretensions, or the pretensions put forward in his name, that he has discovered a new poetic *genre* will be rejected later, as they are rejected now by all competent judges. The title of a philosophic poet will be denied to him. But he will certainly survive, at least in extract, as a distinguished humorist, an expert in epigrammatic and sententious aphorism, an artist of extremely finished execution. (J. F.-K.)

Campobasso, capital of the province of Campobasso, Abruzzi e Molise, Italy, situated amongst the southern Apennines, 52 miles by rail N. from Benevento. It is famous for its cutlery and arms. Population of town (1881) 14,824, (1901) 15,046; of province (1881) 365,434, (1901) 366,341.

Campos, Arsenio Martinez de (1831-1900), Spanish Marshal, Senator, and Knight of the Golden Fleece, was born at Segovia on 14th December 1831. He entered the staff college, graduated as a lieutenant in 1852, and for some years was attached to the college as an assistant professor. He took part in the Morocco campaign of 1859-60, and distinguished himself in sixteen fights, obtaining the Cross of San Fernando, and the rank of lieutenant-colonel. He then returned to the staff college as a professor. Afterwards he joined the expedition to Mexico under Prim. In 1869 he was sent to Cuba, where he was promoted to the rank of general in 1872. On his return to the Peninsula, the Federal Republican Government in 1873 confided to General Campos several high commands, in which he again distinguished himself against the Cantonal Republicans and the Carlists. About that time he began to conspire with other partisans of the Alfonsist branch of the Bourbons, with a view to restore the son of Queen Isabella. Though he made no secret of his designs, Marshal Serrano, in 1874, appointed him to the command of a division which took part in the relief of Bilbao on 2nd May of that year, and in the operations around Estella in June. On both occasions General Campos tried in vain to induce the other commanders then and there to proclaim Alfonso XII., but he was rebuked by Marshal Concha at Bilbao, and at Tafalla by General Echague. He then affected to hold aloof, and would have been arrested, had not the Minister of War, Ceballos, answered for his good behaviour, and quartered him in Avila under surveillance. He managed to escape, and after hiding in Madrid, joined General Daban at Sagunto on 29th December 1874, where he proclaimed Alfonso XII. king of Spain. From that date he never ceased to exercise great influence in the politics of the restoration. He was considered as a sort of Supreme Councillor, being consulted by King Alfonso, and later by his widow, the queen-regent, in every important political crisis, and on every international or colonial question, especially when other generals or the army itself became troublesome. He took an important part in the military operations against the Carlists, and in the negotiations with their leaders, which put an end to the civil war in 1876. In the same way he brought about the pacification of Cuba in 1878. On his return from that island he presided over a Conservative Cabinet for a few months, but soon made way for Canovas, whom he ever afterwards treated as the leader of that party. In 1881, with other discontented generals, he assisted Sagasta in getting into office. After the death of King Alfonso, Campos steadily supported the regency of Queen Christina, and held high commands, though declining to take office. In 1893 he was selected to command the Spanish army at Melilla, and went to the court of Morocco to make an advantageous treaty of peace, which averted a war. When the Cuban rising in 1895 assumed a serious aspect, he was sent out by the Conservative Cabinet of Canovas to cope with the rebellion, but he failed in the field, as well as in his efforts to win over the Creoles, chiefly because he was not allowed to give them home rule, as he wanted. Subsequently he remained aloof from politics, and only spoke in the Senate to defend his Cuban administration and army interests. After the war with America, and the loss of the colonies in 1899, when Señor Silvela formed a new Conservative party and Cabinet, the old marshal accepted the presidency of the Senate, though his health was failing fast. He held that post up to the time of his death in 1900, during the summer recess, at Zarauz, a village on the coast of the Basque province of Guipuzcoa, where he was buried, very modestly, at his own request. His death was generally considered a great loss for the monarchy and for the Conservative party, and events soon proved this to be correct, as within a month the divisions in the party and the Cabinet brought about the fall of Silvela on the one hand, and the reappearance of Castilian militarism with Generals Weyler and Linares on the other. (A. E. H.)

Campu Lung, a town in Rumania, chief town of the district of Muscel, pleasantly situated on the right bank of the river Oltu. The purity of the air and the picturesqueness of the surroundings have made it a popular summer resort. It contains twenty-four churches.

Fairs are held annually on 20th July and 24th October. In the neighbourhood are to be found the remains of an old Roman camp, called by the peasants Jidovi or Gradistea. Near the town is the monastery of Campu Lung, founded by Radu Negru. Population (1895), 12,000; (1900) 13,033.

CANADA.

Geography and Statistics.

THE Dominion of Canada, comprising the northern half of the continent of North America and its adjacent islands, excepting only Alaska (a dependency of the United States) and Newfoundland (still a separate colony), has an estimated area of 3,654,000 square miles. Its physical features are comparatively simple, and drawn on a large scale. Its main structural watershed is in part coincident with the Rocky Mountain range proper, or eastern member of the Cordillera, but to the northward falling back to ranges situated farther to the west in the same great mountain region. As in the southern half of the continent, however, an important modification of this general idea connects itself with the river systems of the great central zone. These, to the south, join themselves with the Mississippi, reaching the Gulf of Mexico; to the north with the Mackenzie, flowing to the Arctic Ocean, or with the Churchill and Nelson emptying into Hudson Bay. The boundary line between Canada and the United States, in the central part of the continent, in the main nearly coincides with this subsidiary east and west watershed. The most important river, whether historically or commercially, is the St Lawrence. With the great lakes from which it flows, and the magnificent system of canals constructed to overcome the natural obstacles to its navigation, it forms a great waterway to the centre of the continent. The Mackenzie, practically inaccessible to commerce at its mouth, the Yukon, or that part of it which is included in Canada, the Nelson, the Churchill, and other rivers of great length and volume, are either long sealed by ice and interrupted by rapids, or, because they traverse regions as yet unsettled, are of minor interest except to the physical geographer. From his point of view, however, there is nothing more remarkable than the intricate and comprehensive system of rivers by which almost the entire area of Canada is covered.

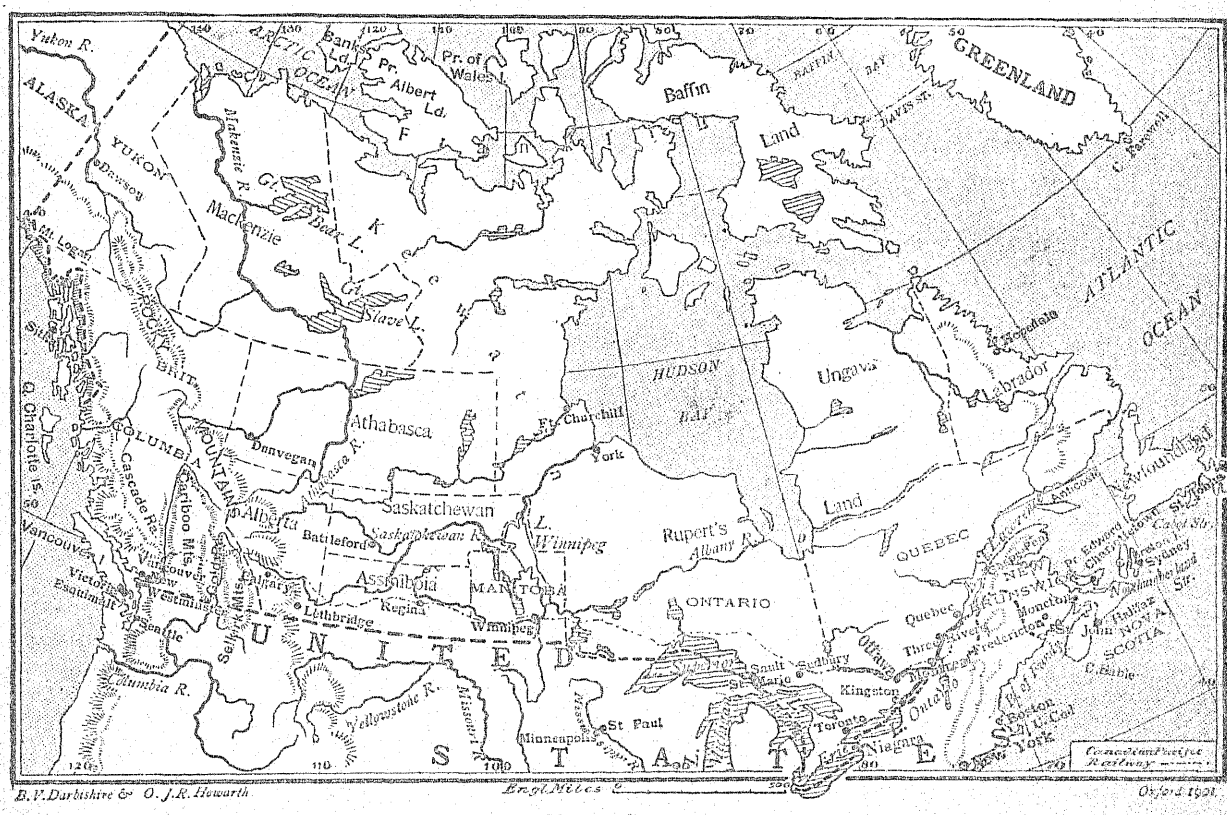
The Laurentian Plateau.—The ruling geological and physical feature of the North American continent is the great Laurentian plateau, or "Canadian shield," in which the shallow basin of Hudson Bay occupies a central position. This consists of very ancient crystalline rocks, resembling those of Scandinavia in age and character. It occupies the Labrador peninsula, and spreading round the southern extremity of Hudson Bay, extends north-westward to the Arctic Ocean. This constitutes the "protaxis" or nucleus of the continent. Around its borders the later geological series, from the Cambrian upwards, have been deposited, and against it these later strata have been crushed and elevated into mountain ranges at various periods in the course of geological history. It is, therefore, the initial feature from which the chronological development of the physiography of the continent may be deduced, and this is particularly apparent in Canada, within the limits of which it is included, and of which much of the remaining territory may be regarded as bordering upon it. From the vantage-point of this Laurentian plateau the main physical features of Canada may be briefly noted, with some reference to the geological conditions upon which these respectively depend. The Laurentian plateau itself, although constituting so large a part of Canada, may, from a physiographical point of view, be regarded as a unit. It is somewhat monotonous in character, but constitutes a great drainage area for the supply of numerous rivers, the water-power of which, as they descend from its borders, is now beginning to be utilized on a large scale in connexion with various industries, either directly or by means of electricity generated at favourable places. It is only in a very general way that this region can be described as a plateau or tableland, for its surface is hilly, or at least mammillated, in almost every part of its extent. Its average height is about 1500 feet above the sea. In the centre of the Labrador peninsula it is about 1700 feet, but it attains considerably greater elevations along a narrow border of this peninsula where it fronts upon the Atlantic. Elsewhere it is lower, and in at least one place between Hudson Bay and the Ottawa river the watershed does not exceed 1000 feet in height. The Churchill and Nelson rivers traverse its western part in a wide depression on their way to Hudson Bay. To the north and west of these rivers its general height is about 1100 feet. Innumerable lakes and ponds, resembling those of Finland, with winding streams and rivers, characterize the main extent of the plateau. The rivers generally fall rapidly along the margins of the plateau, there cutting deep valleys, but elsewhere appear to wander irregularly without defined channels. Where not wooded, the surface often consists largely of solid rounded rock-masses. The rocks are chiefly granites and gneisses, referable to the Laurentian system, with crystalline schists of the Huronian and occasional outliers of Cambrian. Although small in comparison to its vast area, the economic importance of the Laurentian region is in the aggregate considerable. Besides the water-powers already mentioned, its southern part affords the greatest remaining forests of Eastern Canada, and mines, particularly of gold, nickel, and copper, are now being extensively developed in some of the tracts characterized by Huronian rocks.

Geology.

The Acadian Region.—The "maritime provinces" of Eastern Canada, including Nova Scotia, New Brunswick, and Prince Edward Island, may be considered together; and to these provinces as politically bounded may be added, from a physical point of view, the analogous south-eastern part of Quebec—the entire area being designated the Acadian region. Taken as a whole, this eastern part of Canada, with a very irregular and extended coast-line on the Gulf of St Lawrence and the Atlantic, may be regarded as a northern continuation of the Appalachian mountain region that runs parallel to the Atlantic coast of the United States. The rocks underlying it have been subjected to successive foldings and crumplings by forces acting chiefly from the direction of the Atlantic Ocean, with alternating prolonged periods of waste and denudation. The main axis of disturbance and the highest remaining land runs through the south-eastern part of Quebec, forming the Notre Dame Mountains, and terminates in the Gaspé peninsula as the Shickshock Mountains. The first-named seldom exceed 1500 feet in height, but the Shickshocks rise above 3000 feet. The province of New Brunswick exhibits approximately parallel but subordinate ridges, with wide intervening areas of nearly flat Silurian and Carboniferous rocks. The peninsula of Nova Scotia, connected by a narrow neck with New Brunswick, is formed by still another and more definite system of parallel ridges, deeply fretted on all sides by bays and harbours. A series of quartzites and slates referred to the

Cambrian, and holding numerous and important veins of auriferous quartz, characterize its Atlantic or south-eastern side, while valuable coal-fields occur in Cape Breton and on parts of its shores on the Gulf of St Lawrence. In New Brunswick the Carboniferous rocks occupy a large area, but the coal seams so far developed are thin and unimportant. Metalliferous ores of various kinds occur both in Nova Scotia and in this province, but with the exception of the gold already mentioned, have not yet become the objects of important industries. Copper and asbestos are the principal mineral products of that part of Quebec included in the region now under description, although many other minerals are known and already worked to some extent. Extensive tracts of good arable land exist in many parts of the Acadian region. Its surface was originally almost entirely wooded, and the products of the forest still continue to hold a prominent place. Prince Edward Island, the smallest province of Canada, is low and undulating, based on Permo-Carboniferous and Triassic rocks affording a red and very fertile soil, much of which is under cultivation.

The St Lawrence Plain.—The lowlands or plain of the St Lawrence valley, extending from the vicinity of the city of Quebec to Lake Huron, with an extreme length of over 600 miles, constitute the greatest connected spread of arable land in Eastern Canada, included partly in the province of Quebec and partly in Ontario, with a total area of some 38,000 square miles. This fertile region, bounded to the south-east by the Notre Dame ranges already referred to, is limited on the south, farther west, by the St



MAP OF CANADA.

Lawrence river and Lakes Ontario and Erie. To the north it ends along the base of the Laurentian plateau. As its uniform topographical features would indicate, it is underlain by nearly horizontal and undisturbed rocks. These range in age from Ordovician to Devonian (the latter chiefly developed in the peninsular part of Ontario), and are mainly limestones. Superposed on these rocks, the eastern part of this plain, to a line which may be drawn some distance west of Ottawa, are marine clays and sands of Pleistocene age. Farther west these are replaced by similar deposits of the same period, but without evidence of marine origin. Petroleum and natural gas occur in the rocks underlying this plain in Ontario, but metalliferous deposits are almost wanting. The continuing wealth of this region lies in its fertile soil, and within its area the largest and oldest centres of population are situated. The greater part of the length of Lake Huron and the whole northern margin of Lake Superior bathe the foot of the Laurentian plateau, which rises directly from these lakes. Continuing westward from Thunder Bay, on Lake Superior, a great southern spur of this plateau is crossed, after which we reach the eastern edge of the interior continental plain.

The Interior Continental Plain.—This plain runs north-westward between the border of the Laurentian plateau and the line of the Rocky Mountains. It includes part of Manitoba, the whole of Assiniboia, and the greater portions of Saskatchewan, Alberta, and Athabasca. To the north-west it becomes narrowed and interrupted, but preserves its main physical features to the Arctic Ocean about the mouth of the Mackenzie. This great region of plain is 800 miles in width from east to west along the international boundary. Seven degrees of latitude farther north, it is still about 400 miles in width. To the south it constitutes the vast prairie region of Canada, with an aggregate area more than twice as large as that of Great Britain. North of the Saskatchewan river it becomes generally wooded, by reason of the greater humidity of the climate, but without essentially changing its physiographic features. From the vicinity of the Winnipeg group of lakes, where its elevation is about 800 feet above the sea, it rises gradually to the west or south-west until it attains an elevation of from 3000

to over 4000 feet along the base of the Rocky Mountains. This interior plain of the continent represents the area of an ancient sea by which it was occupied in Mesozoic times. The Cretaceous and early Tertiary rocks by which it is in the main floored still lie nearly unaltered and undisturbed where they were deposited, although now raised far above the sea-level, particularly along that border impinging upon the Rocky Mountains where they are broken into foothills along the base of the range. These strata have been subjected to great denudation, but owing to their comparatively soft character this has been, in the main, nearly uniform, and has produced no very bold features of relief. Coals and lignite coals are the principal minerals of economic value met with in the area of this central plain, but its chief value lies in its vast tracts of fertile soil or of well-grassed uplands affording perennial pasturage for cattle, horses, and sheep.

The Cordilleran Belt.—The wide mountainous Pacific border of the continent, constituting the "Rocky Mountain region," may best be named as a whole the Cordillera or Cordilleran belt. The Rocky Mountains proper in Canada comprise only the well-defined eastern system of ranges of this belt. The Cordillera includes nearly the entire province of British Columbia, with the whole of the Yukon district of the North-West Territories. Its width is about 400 miles, and it is throughout essentially a mountainous country, very complicated in its orographic features and interlocking river systems, but as yet in the main very imperfectly delineated on any maps. Two principal mountain axes may, however, be defined as its ruling features—the Rocky Mountains proper, above referred to, and the coast ranges of British Columbia. These run nearly parallel, and in a direction corresponding to that of the Pacific coast. Between them are many other ranges, but less regular in trend and much shorter, such as the Selkirk Mountains, the Gold ranges, and the Cariboo Mountains. There is also, in the southern inland country of British Columbia, a region which has, because of its essential difference from the adjacent mountain ranges, and although itself rugged and broken in character, been described as the interior plateau. This, beginning near the 49th parallel of latitude or international boundary, runs north-westwards for about 500 miles, with a general width of about 100 miles. It affords the greatest areas of arable land and pasture land comprised in British Columbia. Similar wide tracts of less broken country occur to the southward, between the mountain ranges in the Western States, and beyond it, to the north-west, after traversing an entirely mountainous region in the northern part of British Columbia, its physical characters are again to some extent repeated in the country on the Yukon watershed, where wide valleys and rolling hills alternate with short mountain ranges of no great altitude. The Pacific border of the coast ranges of British Columbia is dissected by a system of fiords perhaps unequalled elsewhere in the world. These represent submerged valleys, worn out by rivers on the steep western slope of the continent, when the land stood at a high level. A bordering mountain system of the continent, now also in a partly submerged condition, forms Vancouver Island and the Queen Charlotte Islands. The highest known mountains in the Cordillera of Canada are Mount Logan (19,500 feet), and Mount St Elias (18,000 feet), both situated near the intersection of the 141st meridian with the Pacific coast and on the borders of Alaska. The Rocky Mountains proper stand next in regard to altitude, frequently attaining 12,000 feet in their southern part, and with Robson Peak, the highest yet accurately measured, reaching 13,700 feet. Several summits in the Selkirks are known to surpass 10,000 feet, and many points in the coast ranges reach 8000 or 9000 feet. Closely connected with the grand orographic features of this western region are its climate and its character as regards vegetation. It may, as a whole, be described as forest-clad, but forests of extraordinary luxuriance are found in the humid coast region. The conditions favourable to forest growth are to some extent repeated on the western slopes of the Selkirks, Rocky Mountains, and other main systems, on which the rainfall is ample. On the eastward slopes and in the intervening lower tracts the forests are less dense, and considerable areas of dry, open grass-land occur in the interior plateau and in many of the larger valleys. The geological structure of the Cordilleran belt is very complicated, inasmuch as the rocks of this region have been subjected to repeated flexure and disturbance, recurrent up to a late date in the geological time-scale, and therefore including all but the most recent deposits. Rocks of Archæan age occur, particularly in and near the Selkirk ranges, which, with their representatives farther to the northward, are much older than either the Rocky Mountains proper or the coast ranges. The Rocky Mountains proper are referable to folding and fracture caused by pressure of the earth's crust from the Pacific side, which has taken place chiefly at a date subsequent to the Laramie or closing stage of the Cretaceous. These mountains are mainly composed of Palæozoic rocks, ranging from early Cambrian to Carboniferous in age, and consisting in large part of limestones. The coast ranges and that of Vancouver Island, carrying with them in their elevation portions of the Cretaceous rocks, are referable, in their present form, to the same or a not much earlier date. They comprise, however, in their central parts, and particularly in the case of the coast ranges, great masses of granite that have welled up as "bathylites" along the axis of elevation. The coast ranges of British Columbia may, in fact, be considered in the main as a granitic belt, over 900 miles in length, and with a width of over 100 miles in many places. The interior plateau of British Columbia presents considerable areas of formations still nearly horizontal, and referable to various stages of the Tertiary or Cainozoic. These include the products of great volcanic activity, ending in the later Miocene in wide basaltic flows. Tertiary rocks are likewise found in some places fringing the Pacific coast, but with a limited spread. The Cordilleran belt, or Rocky Mountains region, as a whole, is the most important part of Canada in regard to mining. It constitutes the continuation to the north of the mining country of the western states of the American Union, and its length in Canada is equal to that in the United States. Its economic development has only begun in any systematic way, but great advances have already been made; means of communication have been provided in its southern part, and gold, silver, copper, lead, and other ores are now being worked on a large scale in that region. Coal has long been an important product of Vancouver Island, and valuable coalfields are now also beginning to be worked in the Rocky Mountains proper, in the valley of the Bow river, and along the line of the Crow's Nest Pass. Attention was first directed to British Columbia as a mining country about 1858, when placer gold deposits began to be worked. The development of the rich Cariboo district followed with that of other districts less commonly known. Within the last few years the placer gold of the Yukon basin, and more particularly that of the Klondyke division, has attracted world-wide attention, and all this northern mountain country, once valued only for its scanty harvest of rich furs, is being traversed and examined by the prospector. The alluvial gold deposits are naturally those first developed, but the lodes and veins from which these have been derived, together with the deposits of other

minerals of less intrinsic value, will all in the near future be likewise utilized.

Turning back to the general physiographical features and geological history of Canada as a whole, after the above review of its several districts, it will be observed that the Laurentian plateau, with its surrounding areas of old rocks in the east, may be regarded broadly as constituting an area of which the history extends to the end of the Palæozoic era, since which it has remained comparatively unaffected by orographic movements and relatively stable. This great region stretches westwards to Manitoba and the south-western edge of the Laurentian plateau along its course to the Arctic Ocean. From this dividing line the Cretaceous and Tertiary formations become important and widespread. During the early stages of these later times the sea, extending from the Pacific side, covered much of what is now the western part of the continent, from which it was gradually excluded by recurrent movements of elevation and mountain-making that did not affect the already stable eastern half of the continent. (G. M. D.)

Climate.—It is misleading to speak of the climate as a whole for there are many climates. Not only do the several provinces and territories differ materially, but there are great variations according to locality within most of the provinces themselves. But it may be said, in a general way, that the climates in the neighbourhood of the oceans are milder and damper than in the interior, and that the western or sea-coast portion of British Columbia is milder and damper than the maritime provinces of the Atlantic. Throughout the greater part there are extremes of temperature in winter and summer, but in summer the nights are cool and in winter the atmosphere is dry, bracing, and healthy. The rain and snowfall of the several provinces are shown for five years in the following table:—

Year.	Ontario.		Quebec.		Nova Scotia.		New Brunswick.		P. E. Island.		Manitoba.		British Columbia.		N. W. Territories.	
	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
1894	23·30	55·1	22·39	84·8	29·31	80·3	23·74	103·3	28·65	10·58	12·62	47·9	41·92	70·4	9·24	41·7
1895	20·65	81·4	25·09	93·0	36·71	75·1	31·34	88·9	32·32	99·6	14·64	44·4	35·07	67·0	10·54	31·3
1896	22·36	73·3	25·68	124·0	36·88	64·8	25·56	91·1	28·86	56·7	16·00	62·9	36·38	58·5	10·57	60·3
1897	28·31	73·0	28·09	91·4	38·94	86·5	33·76	80·3	33·63	56·4	9·66	59·1	41·10	42·6	11·84	53·2
1898	30·14	89·8	26·47	105·3	44·46	89·0	32·26	112·0	34·82	65·4	16·75	53·8	43·89	26·2	10·29	52·4

Note.—The articles on the several provinces should be consulted for close information as to climate. The case of British Columbia may be cited to show the need for this. The rain and snowfall for this province show an average of about 41 inches of rain and 53 of snow, yet in one large division of the province it may be said to rain during nearly every day in the winter, there being hardly a week of snow, while at the same time a division of many million acres is dependent on irrigation for raising its crops.

Tides.—The tides of the Atlantic and Pacific coasts, with the currents dependent upon them, possess a special importance in connexion with the navigation of the St Lawrence, which forms the main commercial avenue from the east. Of late years a systematic investigation of the tides and currents has been undertaken by the Canadian Government. The tides of the St Lawrence enter the Gulf from the Atlantic chiefly through Cabot Strait, between Cape Breton and Newfoundland, which has a width of 75 miles and a depth of 250 fathoms. The tide entering through Belle Isle Strait (12 miles wide and 30 fathoms deep) is comparatively little felt. The tide so expands in the Gulf of St Lawrence as to become almost inappreciable in places, and the greatest range is attained in Northumberland Strait and at the head of Chaleurs Bay, where it amounts to about 9 feet. At the entrance to the St Lawrence at Anticosti, it has again the oceanic range of some 6 feet, and it proceeds up the estuary with an ever-increasing range which attains its maximum of 19 feet at the lower end of Orleans Island, at 650 miles from the ocean at Cabot Strait. This must be considered as the true head of the estuary. At Quebec, 30 miles farther up, the range is nearly as great, but at 40 miles above Quebec it is largely cut off by the Richelieu rapids, and finally ceases to be felt at Three Rivers, at the lower end of Lake St Peter. On the Pacific coast the two tides of the same day are very unequal, so much so that for a month at a time there is practically only one high water and one low water during the twenty-four hours. This feature of the tide occurs widely on the western coast of America. In the Bay of Fundy the height of the tide while quite exceptional has been much exaggerated. From careful measurements made daily for four months by the engineers of the Chignecto Ship Railway, the extreme range in Cumberland basin at the head of the bay was 49·00 feet, and the average spring range was 42·21 feet. From the lowest level of low water then observed, to the level of the highest tide ever known, which flooded the country on 5th October 1869, during a severe storm, the greatest difference of level in Cumberland basin is 53 feet. At Noel Bay, near the head of the other arm of the Bay of Fundy, the range of ordinary spring tides as stated in the Admiralty charts is 50½ feet. A noteworthy tidal bore occurs at Moncton on the Petitcodiac river, at the extreme head of the Bay of Fundy. Attention has also been given to the establishment of the mean sea-level at a number of places and its reference to permanent marks. A case of special interest occurs in comparing the mean levels on opposite sides of the Chignecto Isthmus, with a range of nearly 50 feet on one side and only 8 feet on the other.

Flora.—The general flora of the Maritime Provinces, Quebec and Eastern Ontario is much the same, except that in Nova Scotia a number of species are found common also to Newfoundland that are not apparent inland. Professor Macoun gives us a few notable species—*Calluna vulgaris*, Salisb., *Alchemilla vulgaris*, L., *Rhododendron maximum*, L., *Ilex glabia*, Gray, *Hudsonia ericoides*, L., *Gaylussacia dumosa*, F. and G., and *Schezæa pusilla*, Pursh. In New Brunswick the western flora begins to appear as well as immigrants from the south, while in the next eastern province, Quebec, the flora varies considerably. In the lower St Lawrence country and about the Gulf many Arctic and sub-Arctic species are found. On the shores of the lower reaches *Thalictrum alpinum*, L., *Vesicaria arctica*, Richards, *Arapis alpina*, L., *Saxifraga oppositifolia*, L., *Cerastium alpinum*, L., *Saxifraga cæspitosa*, L. and S. have been gathered, and on the Shickshock Mountains of Eastern Canada *Silene acaulis*, L., *Lychnis alpina*, L., *Cassiope hypnoides*, Don., *Rhododendron laponicum*, Wahl, and many others. On the summit of these hills (4000 feet) have been collected *Aspidium aculeatum*, Swartz var., *Scopulinum*, D. C. Eaton, *Pellæa densa*, Hook, *Gallium kamtschaticum*, Sletten. From the city of Quebec westwards there is a constantly increasing ratio of southern forms, and when the mountain (so called) at Montreal is reached the representative Ontario flora begins. In Ontario the flora of the northern part is much the same as that of the Gulf of St Lawrence, but from Montreal along the Ottawa and St Lawrence valleys the flora takes a more southern aspect, and trees, shrubs, and herbaceous plants not found in the eastern parts of the Dominion become common. In the forest regions north of the lakes the vegetation on the shores of Lake Erie requires a high winter temperature, while the east and north shores of Lake Superior have a boreal vegetation that shows the summer temperature of this enormous water-stretch to be quite low. Beyond the forest country of Ontario come the prairies of Manitoba and the North-West Territories. In the ravines the eastern flora continues for some distance, and then disappearing gives place to that of the prairie, which is found everywhere between the Red River and the Rocky Mountains except in wooded and damp localities. Northwards, in the Saskatchewan country, the flora of the forest and that of the prairies intermingle. On the prairies and the foot-hills of the Rocky Mountains a great variety of grasses are found, several years' collection resulting in 42 genera and 156 species. Of the best hay and pasture grasses, *Agropyrum elymus*, *Stipa*, *Bromus*, *Agrostis*, *Calamagrostes* and *Poa*, there are 59 species. Besides the grasses there are leguminous plants valuable for pasture—*Astragalus*, *Vicia* (wild vetch), *Lathyrus* (wild pea) of which there are many species. The rose family is represented by *Prunus*, *Potentilla*, *Fragaria*, *Rosa*, *Rubus*, and *Amelanchier*.

About the saline lakes and marshes of the prairie country are found *Ruppia maritima*, L., *Heliotropium curassavicum*, L., natives of the Atlantic coast, and numerous species of *Chenopodium*, *Atriplex*, and allied genera. The flora of the forest belt of the North-West Territories differs little from that of Northern Ontario. At the beginning of the elevation of the Rocky Mountains there is a luxurious growth of herbaceous plants, including a number of rare, umbellifers. At the higher levels the vegetation becomes more Arctic. Northwards the valleys of the Peace and other rivers differ little from those of Quebec and the northern prairies. On the western slope of the mountains, that is the Selkirk and here at

ranges as distinguished from the eastern or Rocky Mountains range, the flora differs, the climate being damp instead of dry. In some of the valleys having an outlet to the south the flora is partly peculiar to the American desert, and such species as *Purshia tridentata*, D. C., and *Artemisia tridentata*, Nutt., and species of *Gilia*, *Aster*, and *Eriogonum* are found that are not met with elsewhere. Above Yale, in the drier part of the Fraser valley, the absence of rain results in the same character of flora, while in the rainy districts of the lower Fraser the vegetation is so luxuriant that it resembles that of the tropics. So in various parts of the mountainous country of British Columbia, the flora varies according to climatic conditions. Nearer the Pacific coast the woods and open spaces are filled with flowers and shrubs. Liliaceous flowers are abundant, including *Erythroniums*, *Trilliums*, *Alliums*, *Brodeæas*, *Fritillarias*, *Siliums*, *Camassias*, and others.

Fauna.—The larger animals of Canada are the musk ox and the caribou of the barren lands, both having their habitat in the far north; the caribou of the woods, found in all the provinces except in Prince Edward Island; the moose, with an equally wide range in the wooded country; the Virginia deer, in one or other of its varietal forms, common to all the southern parts; the black-tailed deer or mule deer and allied forms, on the western edge of the plains and in British Columbia; the pronghorn antelope on the plains, and a small remnant of the once plentiful bison found in Athabasca and Mackenzie districts, now called "wood buffalo." The wapiti or American elk at one time abounded from Quebec to the Pacific, and as far north as the Peace river, but is now found only in small numbers from Manitoba westwards. In the mountains of the west are the grizzly bear, black bear, and cinnamon bear. The black bear is also common to most other parts of Canada; the polar bear everywhere along the Arctic littoral. The large or timber wolf is found in the wooded districts of all the provinces, and on the plains there is also a smaller wolf called the coyote. In British Columbia the puma or cougar, sometimes called the panther, and the American lion still frequently occur; and in all parts the common fox and the silver fox, the lynx, beaver, otter, marten, fisher, wolverene, mink, skunk, and other fur-bearing animals. Mountain and plain and Arctic hares and rabbits are plentiful or scarce in localities, according to seasons or other circumstances. In the mountains of British Columbia are the bighorn or Rocky Mountain sheep and the Rocky Mountain goat. The birds of Canada are mostly migratory, and are those common to the northern and central states of the United States. The wildfowl are, particularly in the west, in great numbers; their breeding-grounds extending from Manitoba and the western prairies up to Hudson Bay, the barren lands, and Arctic coasts. The several kinds of geese—including the Canada goose, the Arctic goose or wavey, the laughing goose, the brant, and others—all breed in the northern regions, but are found in great numbers throughout the several provinces, passing north in the spring and south in the autumn. There are several varieties of grouse, the largest of which is the grouse of British Columbia and the pennated grouse and the prairie chicken of Manitoba and the plains, besides the so-called pine partridge and willow partridge, both of which are grouse. While the pennated grouse (called the prairie chicken in Canada) has always been plentiful, the prairie hen (or chicken) proper is a more recent arrival from Minnesota and Dakota, to which states it had come from Illinois and the south as settlement and accompanying wheatfields extended north. In certain parts of Ontario the wild turkey is occasionally found and the ordinary quail, but in British Columbia is found the California quail, and a larger bird much resembling it called the mountain partridge. The golden eagle, bald-headed eagle, osprey, and a large variety of hawks, are common in Canada, as are the snowy owl, the horned owl, and others inhabiting northern climates. The raven frequently remains even in the colder parts throughout the winter; these, with the Canada jay, waxwing, grosbeak, and snow bunting, being the principal birds seen in Manitoba and northern districts in that season. The rook is not found, but the common crow and one or two other kinds are there during the summer. The sea-birds include a great variety of gulls, guillemots, cormorants, albatrosses (four species), fulmars, and petrels, and in the Gulf of St Lawrence the gannet is very abundant. Nearly all the sea-birds of Great Britain are found in Canadian waters, or are represented by closely allied species.

Area and Population.—The following table shows the present division of the Dominion into provinces, with the capital and, as accurately as computation on such points is possible, the area and population of each:—

Provinces.	Area: Square Miles.	Population.		Official Capital.	Lat. N.	Long. W.
		1881.	1901.			
Ontario	220,000	1,926,922	2,167,978	Toronto	43° 39′	79° 23′
Quebec	347,000	1,359,027	1,620,974	Quebec	46° 48′	71° 13′
Nova Scotia	20,600	440,572	459,116	Halifax	44° 39′	63° 36′
New Brunswick	28,200	321,233	331,093	Fredericton	45° 57′	66° 38′
Manitoba	73,956	62,260	246,464	Winnipeg	49° 53′	97° 70′
British Columbia	383,300	49,459	190,000	Victoria	48° 24′	123° 19′
Prince Edward Island	2,000	108,891	103,258	Charlottetown	46° 14′	63° 10′
North-West Territories	2,330,540[1]	25,515	220,000	Regina	50° 27′	104° 37′
The Yukon	198,300			Dawson	...	...
The Dominion	3,603,896[2]	4,293,879	5,338,883	Ottawa	45° 26′	75° 42′

In 1874 Canada included nearly the whole of British America, but there still remained the Arctic islands and other districts within the Arctic circle that became a portion of the Dominion only in 1880, when all British possessions in North America, excepting Newfoundland, were annexed to Canada. West of the province of Ontario, then inaccurately defined, the provinces of Manitoba and British Columbia were the only organized divisions of the western territory, but in 1882 the provisional districts of Assiniboia, Athabasca, Alberta, and Saskatchewan were formed, leaving the remainder of the north-west as unorganized territories, a certain portion of the north-east, called Keewatin, having previously been placed under the governor of Manitoba. These territories were placed under a lieutenant-governor and council appointed by the Federal Government, but from time to time the principle of self-government was expanded until they now live under almost the same political conditions as the several provinces. In 1898, owing to the influx of miners and others, an Act was passed constituting the Yukon territory under a form of government specially created for its management. The other unorganized territories are only sparsely inhabited, and almost entirely by Indians, the people of the Hudson Bay Company's posts, and a few missions. Newfoundland, and with it Labrador, will probably be united to Canada before many years, as the objections on either side are disappearing, and in that event Canada will embrace the whole of British North America.

Population.—The census of the Dominion is taken every ten years (Manitoba every five), and the growth of population, which, however, had not at the last enumeration quite come up, in certain instances, to expectations formed on the opening up of the North-West Territories, is shown by the following figures:—1871, 3,518,411; 1881, 4,336,504; 1891, 4,839,239; 1901, 5,338,883.

The density of population is greatest in Prince Edward Island, where it is 51·6 to the square mile; in Nova Scotia it is 22·3; New Brunswick, 11·6; Ontario, 9·9; Quebec, 4·7; Manitoba, 3·3; British Columbia, 0·5; Territories, 0·1; the Dominion, 1·3. This is not an indication of the density *in settled parts*; as in the cases of Quebec, Ontario, and British Columbia there are enormous districts where there is no population at all, but the area of which enters into the calculation. The population is composed mainly of English- or French-speaking people. There are German settlements of some extent in Ontario, and of late years there has been a large immigration of people from other parts of Europe, including Russians, Doukhobors, Galicians, and Polish and Russian Jews, as well as a large number of Icelanders and Mennonites. English and Scots and their descendants form the bulk of the population of Ontario, French Canadians of Quebec, Scots of Nova Scotia, the Irish of a large proportion of New Brunswick. Manitoba is largely peopled from Ontario, together with the decreasing numbers of half-breeds—French and English—who originally comprised the bulk of its inhabitants. The Territories, particularly the ranching districts, have a larger proportion of English than of other classifications, and British Columbia contains an assorted population, of which a

[1] i.e., disregarding the figures for Franklin district as "unknown." [illegible] estimated that the area of this division is, approximately, [illegible] 000 square miles.

[2] The total area of the Dominion, however, disregarding Franklin district, is officially returned as 3,653,946 square miles, the great lakes and rivers 47,000 square miles.

many ps is the sum of the areas attributed in the table to the several provinces.

large proportion in the mining districts are Americans, and in the cities Chinese with some Japanese. The mixed nationality of the population is also remarkable in the town of Lethbridge, in South Alberta, as well as in the city of Victoria, British Columbia. Since 1876 there has been a great change throughout the west, *i.e.*, from Lake Superior to the Pacific. Then Manitoba was principally inhabited by English and French half-breeds (or Metis), descendants of Hudson Bay Company's employees, or adventurous pioneers from Quebec, together with Scots settlers, descendants of those brought out by Lord Selkirk, some English army pensioners and others, and the van of the immigration that shortly followed from Ontario. Beyond Manitoba bison were still running on the plains, and British Columbia having lost its mining population of 1859 and 1860 was inhabited by Indians, and its white population were principally Englishmen and others who had drifted westwards. Domestic cattle and grain have taken the place of the bison, while a rapidly increasing English-speaking population is supplemented by 7000 Doukhobors, and about 18,000 Galicians. French is the language of the people of Quebec, though English is much spoken in the eastern townships and equally with French in the cities, both languages being officially recognized in that province as in the Federal courts and parliament. Elsewhere English is exclusively used, except by the newly-arrived foreigners. The male sex was at the census of 1891 predominant in all the provinces except Quebec (where the sexes were about equal), the males in the Dominion numbering 2,460,471 and the females 2,372,768. The greatest discrepancies were in British Columbia with a surplus of 27,833 males, Ontario with 24,653, Manitoba with 16,178, and the Territories 8603, though this order would be entirely changed were the discrepancy to be exhibited with a percentage of the people. The figures of the census of 1891 for the occupations of the people are used here, and to them should be added about 7½ per cent. to agree with the later population. The percentage of miners, however, is necessarily disturbed by the recent aggregations in British Columbia and the Yukon:—persons engaged in agriculture, 735,207; in mining, 15,168; in fishing, 27,079; in lumbering, 12,756; in manufacturing, 320,001; in transportation, 186,495; professional, 63,280; students for professions, 10,867. In the non-productive classes:—Indian chiefs, 143; members of religious orders, 9239; paupers, 16,950; pensioners, 179; retired persons, 15,607.

The following table (1891) shows the population by creeds:—

Provinces.	Church of England.	Methodists.	Presbyterians.	Baptists.	Other Denominations.	Total.	Roman Catholics.	Grand Total.
Ontario	385,999	654,033	453,147	106,047	156,795	1,756,021	358,300	2,114,321
Quebec	75,472	39,544	52,673	7,991	21,146	196,826	1,291,709	1,488,535
Nova Scotia	64,410	54,195	108,952	83,122	17,265	327,944	122,452	450,396
New Brunswick	43,095	35,504	40,639	79,649	6,415	205,302	115,961	321,263
Manitoba	30,852	28,437	39,001	16,112	17,533	131,935	20,571	152,506
British Columbia	23,619	14,298	15,284	3,098	21,031	77,330	26,843	104,173
Prince Edward Island	6,646	13,596	33,072	6,265	1,662	61,241	47,837	109,078
The North-West Territories	15,966	8,158	12,558	1,555	46,386	84,623	14,344	98,967
Canada	646,059	847,765	755,326	303,839	288,233	2,841,222	1,998,017	4,839,239

Indians.—The Indian population numbers about 100,000. Except in British Columbia and the unorganized Territories, nearly all of these are on reservations, where they are under Government supervision, receiving an annuity in money and a certain amount of provisions; and where, by means of industrial schools and other methods, civilized habits are superseding the former mode of life. The Indian population slightly increased in the decade 1890-1900. British Columbia has about 25,000, most of whom are along the coast, though one of the important tribes, the Shuswaps, are in the interior. Manitoba and the North-West Territories have the next largest number of Indians. Ontario has 20,610. They are entirely civilized, and many of them are good farmers. Quebec has 10,677; Nova Scotia, 2027; New Brunswick, 1627; Prince Edward Island, 314. The Peace River Indians number about 900, and the number computed for the outside territories is 17,648, in which are included the Eskimo of the barren lands and Arctic coasts. The Government acts as trustees for the Indians, investing their moneys accruing from the sale of lands, timber, &c., which in 1898 amounted to $3,725,747, and parliament annually makes a large appropriation for the payment of their annuities, schools, expenses of management, &c.

Chinese and Japanese.—The Chinese and Japanese are nearly all in British Columbia. By an Act of 1895 the Chinese are compelled to pay a fee of $50 on entering Canada. From 1896 to 1898, 20,017 paid this fee, and 351 entered exempt from payment. In 1897 the British Columbia legislature passed an Act to prevent the underground employment of Chinese and Japanese in the coal and other mines, but the Federal Government disallowed the Act so far as it related to Japanese.

Births, Marriages, and Deaths.—In the absence of a uniform system of registration, a complete return of births, deaths, and marriages is not obtainable. The following are the figures for 1897:—

Provinces.	Births.	Deaths.	Marriages.	Illegitimate.
Ontario	47,232	27,633	15,293	728
Quebec	58,433	34,287	10,291	...
Nova Scotia	...	...	2,044	...
New Brunswick	6,026	2,877	3,872	...
Manitoba	3,426	1,933	2,930	...
British Columbia	1,331	1,013	1,258	...

The four cities showing the largest rates (1897) are:—

Cities.	Births.	Deaths.	Marriages.
Montreal	9152	7584	1851
Toronto	4078	3122	1501
Quebec	2310	1755	418
Ottawa	1273	1242	479

Constitution.—The Dominion is a federation of the British colonies in North America (Newfoundland excepted), with the addition of Rupert Land and other territories formerly under the rule of the Hudson Bay Company. It is governed by a parliament consisting of the Sovereign, represented by a Governor-General, an Upper House called the Senate, and a House of Commons. The members of the Senate are appointed for life by the Government of the day, and they are 81 in number—being 24 members each from Ontario and Quebec, 10 each from Nova Scotia and New Brunswick, 4 each from Prince Edward Island and Manitoba, 3 from British Columbia, and 2 from the organized Territories. The number of representatives in the House of Commons is re-arranged after each decennial census in such a way that the province of Quebec shall always have 65 members, and every other province such number as will give the same proportion of representatives to its population as the number 65 is to the population of Quebec. By the terms of union with Canada, British Columbia was never to have less than 6 members. Each province is presided over by a lieutenant-governor appointed by the Governor-General in Council for a term of 5 years, and has its own legislature and executive council, the jurisdiction of the provincial legislatures being described and limited by the imperial Act of 1867 federating the colonies. At this date Quebec and Nova Scotia were given two chambers—a legislative council and legislative assembly—the one appointed and the other elected; and on the creation of Manitoba (1870), two chambers were given to that province. Quebec and Nova Scotia are the only provinces now retaining a legislative council. These legislatures have exclusive jurisdiction over their own range of subjects, but their Acts are nevertheless subject to disallowance (within one year of their passage) by the Federal Government, in the same way that the Acts of the parliament of the Dominion are subject (within two years) to disallowance by the imperial Government. This power has been used, though rarely, in both cases. Matters of purely local interest are dealt with by the municipalities into which the several provinces are divided. The organized Territories were at

first governed by the lieutenant-governor of Manitoba and a separate council for the North-West, then by an appointed governor and council (1875), until by successive developments in the direction of self-government they obtained an almost full measure of responsible government in 1897. The power of local taxation has, however, not yet been granted. The Yukon district of the North-West Territories was, in 1898, politically separated from the rest of the territories and given a government of its own, consisting of a commissioner and appointed advisory council. The unorganized Territories are under the governance of the Dominion Government. The franchise for the Dominion electors is at present the same as that for the provinces, and is so wide as almost to amount to residential manhood suffrage. The limits of the federal and provincial powers are defined by the British North America Act (1867) with the residue of power vested in the Federal parliament, the opposite principle to that of the United States and the commonwealth of Australia. In some points the two jurisdictions overlap, but decisions of the Supreme Court of Canada and the judicial committee of the British Privy Council are gradually settling disputable points. In the working of the several Governments the customs and practices of the imperial Parliament are followed. The following is a list of the Governor-Generals since confederation: Viscount Monk, 1st June 1867; Sir John Young (afterwards Baron Lisgar), 29th December 1868; the earl of Dufferin, 22nd May 1872; the marquis of Lorne (afterwards duke of Argyll), 5th October 1878; the marquis of Lansdowne, 18th August 1883; Lord Stanley of Preston (afterwards earl of Derby), 1st May 1888; the earl of Aberdeen, 22nd May 1893; the earl of Minto, 20th July 1898.

Justice.—The Supreme Court is the highest in the Dominion. It has appellate, criminal, and civil jurisdiction as well as appellate jurisdiction in cases between the Dominion and any of the provinces, and between one province and another on condition that legislatures pass Acts agreeing to such jurisdiction. By Act of Parliament the Governor-General in Council may refer to the Supreme Court for an opinion upon any matter which he deems advisable in the public interest. There is a chief justice and five puisne judges, and except in criminal cases an appeal lies from the Supreme Court to the Privy Council in England. The Exchequer Court, presided over by a single judge, has exclusive jurisdiction in cases in which a claim for money is made against the Crown or any of its officers, and also in cases where it is desired to enforce any law relating to the revenue, and it is a colonial court of Admiralty. In the provinces the superior courts have various distinctive names and varying numbers of judges, in addition to the county courts with limited jurisdiction. In the Territories there are no county court judges; police magistrates and appointed justices taking their places. The provinces create their own courts, but the Federal Government appoints and pays the judges. The commissioner and the assistant commissioner of the North-West Mounted Police exercise the power of a stipendiary magistrate, the inspectors that of a justice of the peace. In the unorganized Territories the law of England so far as applicable is in force.

There are five penitentiaries in Canada, containing, on 30th June 1898, 1414 male prisoners and 32 females. All convictions for two years or over go to the penitentiaries.

Insane.—The census of 1891 showed 13,355 insane in the Dominion, of which 7162 were males and 6193 females, the greatest number, 5369, being between the ages of 40 and 69 years. The percentage showed that in every 10,000 males there were 29·1 insane, and 26·1 in every 10,000 females. Of the whole number 3044 were foreign-born and 2793 were born in Canada, both parents being foreigners. There are 18 asylums for the insane, most of which are supported by the Government, aided in some cases by the municipalities.

Education.—The British North America Act imposes the duty of legislating on educational matters on the provincial legislatures, the privileges of the minority in Ontario and Quebec—that is, the separate schools—being specially safeguarded. In other provinces this limitation does not exist. In 1880 the New Brunswick legislature abolished the separate school system, and a contest arose which was finally settled by the authority of the legislature being sustained, but certain concessions were made to the Roman Catholic dissentients which practically met their objections. Subsequently a similar difficulty occurred in Manitoba, when the legislature in 1890 abolished the system of separate schools which had been established in 1871. Owing to ambiguity in the Acts the power of the legislature was disputed, and after going through the courts with opposing decisions the case went to the Privy Council in England. Their decision was ambiguous, but practically relegated the matter to the Dominion Government. An attempt was made by it to restore the separate schools, but was successfully resisted by the Manitoba Government, and at the general election for the House of Commons in 1896 the Manitoba school question became a principal issue, with the result of overturning the Government. Though the dissentient Roman Catholics did not acquiesce in this verdict, the question is practically settled against the restoration of the separate school system. In Canada there are public schools or common schools, high schools, model and normal schools, denominational schools, colleges, and degree-granting universities, private schools, agricultural and art colleges. The public schools are under the control of local boards of trustees, elected by the ratepayers, and at these only certificated teachers are employed. The high schools, grammar schools, and colleges have a higher curriculum than the public schools, and are not free. The model schools are for the training of teachers desiring a 2nd or 3rd class certificate; the normal schools for those requiring a 1st class certificate. In addition to these there are night schools and kindergartens, and a few schools for the deaf and dumb. The general outline of education in the Dominion may be seen from the following tabular statement:—

Provinces.	Year.	Schools.		Pupils in.		Attendance in Public Schools.	
		Public.	Other.	Public.	Other.	Average.	Percentage.
Ontario	31st Dec. 1897	6,009	203	482,777	27,079	273,544	56·66
Quebec	30th June 1898	5,167	690	204,259	101,260	143,665	70·33
Nova Scotia	31st July 1898	2,385	20	101,203	2,046	57,771	57·08
New Brunswick	30th June 1898	1,778	15	63,333	1,143	38,874	61·38
Manitoba	31st Dec. 1897	1,068	4	39,841	1,044	21,500	53·96
British Columbia	30th June 1898	257	4	17,189	459	10,779	62·71
Prince Edward Island	Do.	468	included	21,285	included	13,377	61·22
The Territories	31st Dec. 1898	426	...	16,754	...	8,827	52·69
The Dominion	...	17,558	936	946,641	133,031	568,337	60·00

Provinces.	Teachers.		Revenue.		Expenditure.
	Public Schools.	Other Schools.	Government.	Other Sources.	
Ontario	9,128	626	$1,626,593	$3,361,562	$4,215,670
Quebec	5,909	3643	304,410	1,425,986	1,730,396
Nova Scotia	2,510	60	245,837	592,973	838,810
New Brunswick	1,864	39	188,104	320,807	483,829
Manitoba	1,197	13	156,747	525,482	805,417
British Columbia	410	12	290,255	...	290,255
Prince Edward Island	579	included	129,818	33,215	163,033
The Territories	483	,,	133,643	not given	not given
The Dominion	22,080	4393	3,075,407	6,260,025	8,527,410

In every province there are denominational colleges and institutions for higher education, and there are universities, most of which have degree-conferring powers. Some of them are of old standing. With the exception of St Joseph's College University, New Brunswick, and the University of Ottawa, all are endowed either with money or land in amounts varying from $50,000 to $2,750,000. There are also a number of so-called classical colleges in Quebec, educating both boys and men, and most of these are affiliated with Laval University. As an adjunct to education may be mentioned the libraries (mechanics' institutes are now "public libraries"), of which there are law, 21; legislatures, 9; public, 325; collegiate, 62; medical and historical, 29; special, 2; Y.M.C.A., 32.

Finance.—The revenue is derived mainly from customs and excise duties, with subsidiary amounts from mining licenses, timber dues, post office, &c. Both the revenue and expenditure fluctuate considerably, the revenue for the decade 1890-99 ranging from 35 to nearly 47 millions. The receipts on consolidated fund account for 1899 amounted to $46,743,249 against an expenditure chargeable to consolidated fund of $41,903,500, showing an apparent surplus of $4,839,749. In 1899 the expenditure chargeable to capital, with railway and other charges, brought up the total disbursements to $51,542,635. The revenue of 1899 was derived from customs, $25,178,785; excise, $9,641,227; post office (gross), $4,336,278; public works, railways, and canals, $369,044; weights and measures, $91,059; interest on investments, $1,590,447; fisheries, $85,502; miscellaneous, $5,450,907. The expenditure of the consolidated fund covers payments peculiar to Canada, including payments to Indian tribes and subsidies to provinces. The debt of the Dominion in 1879, 1889, and 1899 was:—

	1879.	1889.	1899.
Gross debt .	$179,483,871	$287,722,062	$345,160,902
Assets . .	36,493,654	50,192,021	78,887,456
Net debt . .	142,990,217	237,530,041	266,273,446

A large part of the debt arises from the assumption of certain debts of the provinces as they entered the confederation, other debts subsequently assumed, and expenditure on canals and assistance given to railways. This debt does not include the debts of the provinces since confederation, a matter which concerns each province only. The canals, including the deepening of the channel of the St Lawrence, represent an amount of $75,000,000; the railways, including the building of the Intercolonial and Prince Edward Island railway, $941,297,037, of which amount the Dominion Government contributed in money $151,509,812. The money circulation consists of Dominion notes (legal tender) and the notes of the chartered banks, together with gold, silver, and copper coin. Gold, however, is little used in daily business. The Dominion notes are of the following denominations: $1, $2, $4, $500, $1000, the two last being exclusively used by the banks. English bank-notes, gold, and silver are subject to a variable rate of exchange, but United States notes are usually received at par in the larger cities, though subject to a discount when received in Government institutions. The average monthly circulation of Dominion notes of all denominations in 1899 was $23,229,779, against which the Treasury held specie, guaranteed sterling debentures, and unguaranteed $32,441,074. The only direct taxation is that imposed by the several cities, towns, and municipalities on their own inhabitants, and this taxation necessarily varies according to the needs and circumstances of each locality.

Defence.—The naval forces, which at present consist of a fishery protection service, are under the minister of marine and fisheries; the militia is managed by the minister and department of militia, and is always commanded by a general who is an imperial officer. There are three small bodies of permanent troops, called schools, designed to serve as an educational source for the militia. They number 161 dragoons, 430 artillery, and 395 infantry, but can be increased as occasion warrants. The active militia numbers 36,650, comprising all branches of the regular army. At Kingston, Ontario, there is a military college, to the successful graduates of which a variable number of commissions in the British army is annually awarded. Though not strictly belonging to the militia, the North-West Mounted Police is a body of highly efficient cavalry, about 700 strong. There are always some imperial troops at Halifax under the command of a general, who on the absence from Canada of the Governor-General becomes administrator of the Dominion. The harbours of Halifax in Nova Scotia, and Esquimalt in Vancouver Island, British Columbia, are fortified by the imperial Government.

Production.—Agriculture is the chief industry. Ontario, Manitoba, and sections of the Territories are the principal wheat-growing provinces, but though cattle, sheep, and horses are successfully raised in all the provinces, the districts in which the stock ranches are found are in Western Assiniboia, Southern Alberta, and some parts of British Columbia. All kinds of grain are raised in Canada, but not uniformly throughout the several provinces. In the Maritime Provinces, Quebec, Ontario, and British Columbia, much of the grain is sown in autumn, and comprises different varieties of wheat and of oats. The agricultural returns will necessarily increase year by year as immigration continues and new lands are opened up. The largest amount in value of agricultural produce exported in 1900 was wheat, $11,995,488, to which should properly be added wheaten flour, $2,791,885; cheese, $19,856,324; bacon, $12,803,034; cattle, $9,080,776; oats, $2,143,179; butter, $5,122,156; sheep, $1,894,012; pease, $2,145,471; horses, $898,063; apples, $2,789,125; eggs, $1,457,902; and other animal produce, $2,527,805. These are the only products of the farm that realized over one million dollars each, but their value, with that of other agricultural produce exported in 1900, amounted to $77,810,532, exclusive of horses. (See also under AGRICULTURE below.)

Mining.—The mineral districts occur from Nova Scotia to the islands in the Pacific, British Columbia and the Yukon being the chief producers of 1898. The following statement shows the value of all the minerals, metallic and non-metallic, produced in Canada during 1898:—

Metallic.		Non-metallic.	
Antimony .	$20,000	Asbestos .	$491,197
Copper . .	2,134,980	Chromite .	24,252
Gold . .	13,775,420	Coal . .	8,222,878
Iron ore .	152,788	Grindstones .	44,775
Lead . .	1,206,399	Gypsum . .	232,515
Nickel . .	1,820,838	Natural gas .	322,123
Platinum .	1,500	Petroleum .	1,061,749
Silver . .	2,593,929	Pyrites . .	128,872
		All others .	6,426,797
	$21,705,854		$16,955,158

The mineral fields of Southern British Columbia and the Yukon territory are only in the infancy of production, and the coal-fields opened up by the Canadian Pacific railway in the eastern part of British Columbia are of very great extent. The nickel mines are on the north shores of Lake Superior, and there are indications of a large undeveloped area in the neighbourhood of Sudbury, where the mines at present at work are situated.

Manufactures.—In 1898 Canada exported $31,179,113 worth of manufactures, a great proportion of this being the produce of the mine, the forest, the sea, and the farm, but since the adoption of the national policy the manufacture of goods for home consumption has very largely increased, such as cotton and woollen goods, boots and shoes, agricultural implements, and a variety of miscellaneous articles previously imported, and the countries sending the largest amounts, are, in their order, United States, Great Britain, Germany, France, and Holland. The principal classes of goods imported for home consumption are bread-stuffs, carriages, articles of cotton, articles of flax, hemp and jute, iron and steel, oils, leather, paper, provisions, silk and woollen goods. Bread-stuffs comprise rice, sago, tapioca, and other articles not of wheat product.

Fisheries.—The principal fisheries are those on the Atlantic coast carried on by the inhabitants of Nova Scotia, New Brunswick, Prince Edward Island, and to some extent by the people of the eastern section of Quebec. Cod, herring, mackerel, and lobsters are the chief product of the fisheries, though halibut, salmon, anchovies, and so-called sardines are also exported. In British Columbian waters the main catch is of salmon, in addition to which are halibut, oolachan, herring, sturgeon, cod, shell-fish, and fish taken for their oil value—namely, the dog-fish and basking shark and the rat-fish. Ontario and Manitoba produce white fish, sturgeon, and other fresh-water fish. In 1897 there were 78,959 persons engaged in the fishing industry, though only 27,079 were permanently so employed. The total production of fish in 1897 was in value $22,783,546, of which $10,841,661 was exported and the balance consumed at home, this being augmented (for bait and other purposes) by importations to the amount of $784,323.

The business of fur-seal catching is carried on to some extent in the North Pacific by sealers from Victoria, but the returns of the last few years show it to be a decreasing industry, as well as one causing some friction with the United States. In 1895 the catch by Canadian pelagic sealers was 73,614 seals; in 1896, 55,677; in 1897, 30,410; and in 1898, 28,552. Owing to the seizure of Canadian sealing vessels on the high seas, the contention that the United States were justified in making such seizures, and the repudiation of such claim by Great Britain, the question was submitted to an international commission sitting in Paris, with the result that a certain area (60 miles from shore) was prescribed round the sealing islands of Alaska in which pelagic sealing was forbidden, and damages to be settled by arbitration were awarded to the owners of vessels that had been unlawfully seized. This money was paid in 1899.

Commerce.—Since 1875 commerce has greatly expanded. The opening up of the fertile lands in the north-west, the increase of population, the discovery of new mineral fields, and the construction of railways have changed the conditions, methods, and channels

of trade. The development that has taken place may be seen from the figures in the following tabular statement :—

Year.	Total Exports.	Total Imports.	Entered for Consumption.	Duty.
	$	$	$	$
1880	87,911,458	86,964,747	71,782,349	14,138,849
1890	96,749,149	121,858,241	112,765,584	24,014,908
1900	191,894,723	189,622,513	180,804,316	28,889,110

The exports for the decades ending 1878, 1888, and 1898 are here shown :—

	1878.	1888.	1898.
	$	$	$
Produce of the mines	2,762,762	4,100,893	14,460,056
Fisheries	6,853,975	7,793,183	10,841,661
Forests	5,912,139[1]	5,091,546[1]	6,013,942[1]
Animals and their produce	14,019,857	24,719,297	44,301,470
Agricultural	18,008,754	15,436,360	33,063,285
Manufactures	17,780,776	20,383,594	31,179,113
Miscellaneous	401,871	773,877	61,405
Coin, bullion, and short returns at inland ports	2,418,755	3,101,856	9,250,868

The largest items of this export trade for 1898 were : *Minerals*—gold, quartz, dust, &c., $3,587,953 ; silver, $3,519,786 ; lead, $1,008,147 ; nickel, $970,531. *Fisheries*—cod, $2,595,005 ; lobsters, $2,627,597 ; salmon, fresh and otherwise, $3,624,212 ; mackerel, $76,502. *Forest*—pine logs, $1,616,671 ; spruce, $33,885 ; all other logs, $150,265. *Lumber*—pine deals, $3,814,947 ; spruce and other deals, $7,918,366 ; planks and boards, $5,611,537. Square timber : white pine, $1,536,067 ; red pine, $59,687 ; others, $28,882 ; and other products of wood, making a total of $26,511,539. *Animals and their produce*—cheese, $17,572,763 ; cattle, $8,723,292 ; horses, $1,497,444 ; sheep, $1,272,077 ; butter, $2,046,686 ; eggs, $1,255,304 ; hides, skins, &c., not fur, $1,072,028 ; bacon, $7,291,285 ; besides many other articles reaching less than one million dollars' worth. *Agricultural products*—wheat, $17,313,916 +$5,425,760 wheaten flour ; oats, $3,041,578 ; apples, $1,431,517 ; pease, $1,813,792, &c. *Manufactures*—agricultural implements, $1,443,140 ; boots, shoes, and articles of leather, $1,608,352 ; wood-pulp, $1,210,421 ; other articles of wood, $1,261,618. There is a large number of items in the export trade, but those are mentioned that exceed one million dollars.

Shipping.—The chief seaports from east to west are Halifax, N.S. ; St John, N.B. ; Quebec and Montreal on the Atlantic ; and Vancouver, Esquimalt, and Victoria, B.C., on the Pacific. Halifax is the ocean terminus of the Intercolonial railway ; St John the Atlantic terminus, and Vancouver the Pacific terminus of the Canadian Pacific railway. Esquimalt is the harbour and depot of the British squadron on the Pacific, but it is little used by merchant vessels. There are four graving docks in Canada :—

	Length.	Width at Coping.	Entrance.	At Bottom.	Water on Sills.
	Feet.	Feet.	Feet.	Feet.	Feet.
Esquimalt, B.C.	430	90	65	41	26½
Kingston, Ont.	280	79	55	47	16
Quebec	445	100	62	73	25¼
Halifax, N.S.	585	102	89¼	72	30

There are 1532 light stations, lighthouses, fog-whistles, and automatic horns. Of late the character of the shipping interest has much changed, owing to the substitution of iron and steel for wood. Shipbuilding has decreased from 490 vessels built and registered in 1874, to 278 vessels built and registered in 1898 ; the tonnage built from 183,000 in 1874 to 24,522 in 1898, but the general increase of tonnage employed in transportation has been larger during the same period, as the following table shows :—

Sea-going Tonnage arriving at and leaving Canadian Ports.

Year.	British.	Canadian.	Foreign.	Total Tons Register.
1874	3,945,822	included in British	2,105,539	6,051,361
1898	5,777,068	2,029,745	4,778,672	12,585,485

In 1874 there was but one regular passenger steamship line between Great Britain and Canada ; there are now four, with occasional less regular services. On the inland waters the tonnage of Canadian and American vessels arriving at and leaving Canadian ports has increased in the same period from 5,370,506 to 12,160,631 tons register, the Canadian in each case slightly preponderating. The tonnage engaged in the coasting trade increased in the twenty-four years from 8,700,000 tons to 29,700,000 tons.

Internal Communications.—The internal communications are carried on both by railway and canal, and in no particular has Canada undergone greater change than in her inter-provincial traffic. In 1878 there were 6143 miles of railway in operation, carrying 6,443,924 passengers and 7,883,472 tons of freight ; in 1898 there were 16,718 miles in operation, carrying 18,444,049 passengers and 28,785,903 tons of freight. There are 166 railways, but an amalgamation of 25 of these constitutes the Grand Trunk railway system, and of 23 the Canadian Pacific railway system. These two systems, with the Intercolonial (owned and operated by the Government), are the three principal railways. A short line across Prince Edward Island is also owned by the Government. In 1898 the condition of the railways was thus :—

	Mileage.	Capital Paid Up.	Passengers Carried.	Freight in Tons.	Total Receipts.	Total Expenses.
		$			$	$
Canadian Pacific	6,298	323,834,057	3,327,368	5,493,030	25,470,796	14,684,791
Grand Trunk	3,147	342,244,928	6,041,551	8,773,322	18,396,010	11,536,708
Intercolonial and Prince Edward Island	1,355	59,437,021	1,654,954	1,492,115	3,276,620	3,489,067
Total, all railways	16,717	941,297,037	18,444,049	28,785,903	59,715,105	39,137,549

It will be seen that the Government has not had equal success with public companies in the management of railways, and that the Grand Trunk's receipts are not in the same proportion to their capital as those of the Canadian Pacific. The ordinary share capital of the railways is $266,669,857 ; preference shares, $111,481,933 ; bonded debt, $354,946,866 ; together with aid from the Dominion and provincial Governments and other sources amounting to $208,193,381, making the total capital $941,297,037, exclusive of land grants given to the Canadian Pacific railway, the Calgarry and Edmonton, and other prairie railways. Only one railway runs across the continent. The average cost per mile of completed railways has been $55,797. There has been considerable development in the employment of electricity as a motive power in railways, especially in the cities and towns. In 1898 there were thirty-five electric railway companies which made returns. These showed that there were 635 miles of track, that 28,547,900 miles had been run during the year, and 94,616,344 passengers carried. Taking in the electric railways that failed to make full returns, the number of passengers carried by these railways is about 100,000,000.

Canals.—Despite the large increase in railway facilities, the waterways remain important factors in the transportation of the country. Though railways have to some extent supplanted water for internal passenger traffic, the great lakes and the St Lawrence constitute the route of the bulk of the grain trade of the west to the seaports. The logs and a portion of the timber, as well as of sawn lumber of the Ottawa, Lower St Lawrence and New Brunswick are carried to their destination for the most part by water, and for these two trades the canals are a necessity ; and in 1899 surveys were made with a view to connect the Georgian Bay arm of Lake Huron through the intervening water-stretches with the Ottawa river and its canals, and so to Montreal, the head of summer navigation on the Atlantic. On the great lakes route Lake Superior is connected with Lake Huron by canals round the rapids of Sault St Marie (two American, one Canadian lock). Lake Huron flows into Lake Erie by the St Clair and Detroit rivers, and this is connected with Lake Ontario by the Welland canal round Niagara (26¾ miles), and between Lake Ontario and Montreal there are five canals. These canals have a depth of 14 feet on the sills. Up to the end of 1898 Canada had spent on the construction, renewal, and maintenance of canals $160,075,900, of which $87,571,498 had been taken from earnings, but the canals of the St Lawrence are regarded as public works of general utility, and are practically free of tolls. Of the total expenditure, $20,692,244 was expended before confederation (1867), of which $4,173,921 was supplied by the imperial Government. The increasing use of the canals is shown by the tons of freight carried in the two years 1888 (2,761,597 tons), and 1897 (8,560,969 tons), the difference being due mainly to grain from the west, American as well as Canadian vessels having to pass through the Welland canal to reach the ports on Lake Ontario.

[1] This does not include sawn and other manufactured timber which are classed as manufactures.

Postal.—Canada is one of the dependencies of Great Britain that adopted the 2 cents per ½ oz. inter-imperial postage in force on 25th December 1898, and on 1st January 1899 the United States and Canada agreed to a uniform rate of 2 cents between the two countries. On the 1st June 1899 the internal rate of Dominion postage was reduced from 3 to 2 cents per oz. The growth of the postal business may be seen by comparing the estimated figures of the last two decades:—

Year.	Letters.	Post Cards.	Books, Circulars, &c.	Newspapers not from Office of Publication.	Parcels.	No. per Head.
1878	44,000,000	6,455,000	5,090,000	6,252,740	107,800	11·02
1888	80,200,000	16,586,000	17,810,000	10,850,000	763,900	18·22
1898	134,975,000	28,153,000	5,186,000[1]	26,595,000	349,414[1]	20·27

Telegraphs.—The telegraph lines are principally owned and operated by public companies, though the Government owns 2751 miles of land wire and 239 miles of cable which combined carry about 42,550 messages yearly. The bulk of the telegraph business is done by three companies, namely, the Canadian Pacific railway operating 8385 miles of wire, carrying in 1898, 1,650,000 messages; the Great North-Western, operating 18,228 miles, carrying 2,400,185 messages; and the Western Union (chiefly in the Maritime Provinces), 2935 miles, carrying 357,080 messages; the total being 29,548 miles, 4,407,265 messages. The telephone is in general use throughout the settled parts.

Banking.—The banking system has some peculiar features of its own, but is found to work admirably. Every chartered bank may issue notes to the extent of its unimpaired capital. It must hold 40 per cent. of its cash reserves in Dominion (Government) notes, and the shareholders are liable to the amount of twice that represented by the shares they hold. A person may call himself a banker, but may not call his business a bank or banking institution, unless duly chartered. A chartered bank, whether Canadian or otherwise, is required to deposit with the Government a sum of money, equal to 5 per cent. of its note circulation, to provide a fund for the redemption of the notes of any chartered bank that may suspend payment. On this amount it receives 3 per cent. per annum interest. When a bank fails, should its assets be insufficient to redeem its note issue—which is the first liability to be protected—the circulation redemption fund, or so much of it as may be necessary, is applied to redeem the notes, which until redeemed bear 3 per cent. interest. The banks are required to make the necessary arrangements to ensure the circulation of their notes at par, and are compelled to have agencies at the chief commercial city in each province for this purpose. The banks are required by law to make monthly returns to the finance minister, showing the condition of their business, and these are in due course published monthly in the official gazette. Once in every ten years the Banking Act is revised, for any amendments that experience may have shown to be necessary. There are 37 banks with 641 branches, besides unenumerated small private bankers in the lesser towns. The chartered banks had at the end of 1898 an aggregate paid-up capital of $62,571,920, with an average for the year of $37,873,934 in note circulation. Their liabilities were $281,076,656, with assets $370,583,991, a percentage of 75·86. The discounts given by the banks have steadily increased from $175,000,000 in 1888 to $245,670,000 in 1898. The reserve fund accumulated by the banks from earnings showed a total of $27,955,807 at the end of 1898. Clearing Houses were established in Halifax in 1887, Montreal in 1889, Toronto in 1891, Winnipeg in 1893, St John in 1896, and in Victoria and Vancouver, B.C., in 1898. The largest amount of banking business is done in Montreal, which in 1898 showed $731,264,677, or more than half of the whole clearings. Toronto comes next with $439,489,336, Winnipeg $90,754,276, Halifax $62,523,827, Hamilton $35,637,864, and St John with $30,349,264.

Savings Banks.—There are four kinds of savings banks in Canada: (1) the Post Office savings banks; (2) the Government savings banks of the Maritime Provinces taken over at confederation and being gradually merged with the other; (3) two special savings banks in the cities of Montreal and Quebec; (4) the savings bank departments of the chartered banks. The rate of interest allowed by the Government is now 3 per cent. (it was higher), and the chartered banks usually follow the Government rate. The amount deposited in the Government savings banks during 1898 was $14,121,630. The total amount of deposits held by the Government and the special savings banks at the end of the fiscal year 1898 was $65,593,219. This does not include the savings departments of the chartered banks, their returns not specifying the deposits on savings bank account.

[1] Prior to this year some change of regulation as to parcels, &c., affects the comparison. The subsidies paid for carrying the mails in 1898 amounted to $589,773.

Insurance.—The law governing insurance requires foreign fire insurance companies to deposit with the Government $100,000 as a protection for their policyholders, and life insurance offices $50,000. Canadian fire or life offices deposit $50,000. On these amounts interest at the rate of 3 per cent. per annum is allowed. A license is granted by the Dominion, but some of the provinces further tax insurance companies doing business in the province by a license or registration fee of $200 per annum. During 1898 there were 6 Canadian, 21 British, and 7 United States fire insurance companies doing business in Canada. The total amount of business done was $680,160,689, and premiums charged thereon amounted to $5,564,124. The total amount at risk on 31st December 1898 was $895,394,107. Of life insurance companies there were 15 Canadian, 8 British, and 10 United States, besides several mutual assessment companies and 26 companies for miscellaneous insurance, such as accident, guarantee, plate glass, &c. In 1898, life policies in force amounted to $368,523,982, against which latter business there was paid in death losses, endowments, dividends to policyholders, &c. $6,782,006. Several of the fire insurance companies do an inland marine insurance business, but ocean marine insurance is confined to two Canadian companies.

Weights and Measures.—The legal weights and measures are the imperial yard, imperial pound avoirdupois, imperial gallon, and the imperial bushel. The imperial gallon is equal to 4·54174 litres; the wine gallon used in the United States being equal to 3·785 litres. The capacity of a bushel measure varies according to the article measured, and is fixed by Act of parliament. In contracts a bushel measure, unless otherwise specially provided in the contract, means, of wheat 60 lb; indian corn, 56 lb; rye, 56 lb; pease, 60 lb; barley, 48 lb; malt, 36 lb; oats, 34 lb; beans, 60 lb; flax seed, 56 lb; hemp, 44 lb; blue grass seed, 14 lb; lime, 80 lb; castor beans, 40 lb; potatoes, 60 lb; turnips, 60 lb; carrots, 60 lb; parsnips, 60 lb; beets, 60 lb; onions, 50 lb; bituminous coal, 70 lb; clover seed, 60 lb; timothy seed, 48 lb; buckwheat, 48 lb. The statute fixing these weights abolished the English hundredweight of 112 lb, and the ton of 2240 lb, and declared the ton to be 2000 lb avoirdupois and the hundredweight 100 lb, thus assimilating the weights of Canada and the United States, a change of great convenience in view of the railway and other interchange of freights.

Public Lands.—The public lands are owned and administered by the several provinces, except in Manitoba, the North-West Territories, and in the railway belt of British Columbia. These are under the control of the Dominion. The public or "Crown" lands of the Dominion are open to actual settlers free, under certain conditions of settlement and the payment of a nominal registration fee. The mining rights in such lands, however, are reserved and are dealt with under different regulations. Large grants of Crown lands have from time to time been made to railways, and these are sold to settlers on liberal terms of deferred payments. Public lands are surveyed on the rectangular system in sections of 1 square mile each, with an allowance for roads, and these are again divided into quarter sections of 160 acres each—the amount a settler is allowed to enter free. Two sections in each township of 6 miles square are reserved for school purposes, *i.e.*, the proceeds of their sale belong to the school funds.

AUTHORITIES.—The annual reports to the Governor-General (blue books) of the several departmental ministers, and the census returns, together with the sessional papers or any particular subject, supply detailed information on the matters with which they deal. Amongst these are the trade and navigation returns, the public accounts, public works, railways and canals, fisheries, &c., but comprising the gist of all publications of the kind is the *Statistical Year Book of Canada*, and *Forest Wealth of Canada*, by GEORGE JOHNSON, Statistician of the Dominion, Ottawa, and the various reports and publications of the geological survey of the Dominion. For tides, currents, mean sea-level and the bore on the Bay of Fundy, see Reports of Marine Department 1894 to date, also *Trans. Royal Soc. Can.* vol. iii. sect. 3, p. 51. Amongst non-official publications are the *Handbook of Canada*, 1897 (Toronto); J. G. BOURINOT'S *Manual of the Constitution of Canada* (London, 1895); G. BRYCE'S *Manitoba* (London, 1882); W. KINGSFORD'S *History of Canada*, 9 vols. (London, 1887-98); CANON MOCKRIDGE'S *The Bishops of the Church of England in Canada and Newfoundland* (Toronto, 1897); A. J. MORGAN'S *Canadian Parliamentary Companion* (1897); *Dominion Annual Register and Review* (Ottawa, 1878-97); G. R. PARKIN, *The Great Dominion* (London, 1895). PARKMAN'S Works—*Pioneers of France in the New World, The Old Régime in Canada, Montcalm and Wolfe, The Jesuits in North America in the 17th Century, Count Frontenac and New France under Louis XIV.* (London, 1885); WARBURTON PIKES'S *Barren Grounds of Northern Canada* (London, 1896); A. R. SELWYN'S and G. M. DAWSON'S *Descriptive Sketch of the Physical Geography and Geology of the Dominion of Canada* (Montreal, 1854); A. B. WILLMOTT'S *Mineral Wealth of Canada* (London, 1897); BECCLES WILLSON'S *Great Company* (the A. B. C.'s) (Toronto, 1899).

(M. ST. J.)

Agriculture.

About 42 per cent. of the population of Canada belong to families whose heads or members are engaged in agriculture. A large number more are employed in industries arising out of agriculture; among these are millers of flour and oatmeal, curers and packers of meat, makers of cheese and butter, and persons occupied in the transportation and commerce of grain, hay, live stock, meats, butter, cheese, milk, eggs, fruit, and various other products. It is estimated that the annual value of all farm crops and products in Canada is not less than 600,000,000 dollars. The country is splendidly formed for the production of food. Across the continent there is a zone about 3500 miles long and nearly as wide as France, with a climate adapted to the production of foods of superior quality. In places which are now cultivated the soil has been found fertile. That of Manitoba is rich in the constituents of plant food to a degree that surpasses nearly all the soils of Europe. The freezing of the soil in winter, which at first sight seems a drawback, retains the soluble nitrates which might otherwise be drained out. The geographical position of Canada, its railway systems and steamship service for freight across the Atlantic, are favourable for the extension of the export trade in farm products to European countries.

Crops.

Of *wheat* many varieties are grown. The methods of cultivation do not involve the application of so much hand labour per acre as in Europe. The average yield of spring wheat in the province of Manitoba has varied from about 17 bushels per acre to 25 bushels per acre. The average yield of fall or winter wheat in the province of Ontario since 1883 has been 20 bushels per acre. As a rule the weather during the harvesting period permits the grain to be gathered safely without any damage from sprouting. Suitable machinery for cleaning the grain is everywhere in general use, so that weed seeds are removed before the wheat is ground. This gives Canadian wheat excellent milling properties, and enables the millers to turn out flour uniform in quality and of high grade as to keeping properties. Canadian *flour* has been steadily gaining ground in European markets. It is becoming known as flour from which bakers can make the best quality of bread, and also the largest quantity per barrel, the quantity of albuminoids being one-tenth greater in Canadian flour than in the best brands of European. In three tests by a leading firm of London bakers, Canadian flour gave 146 lb, 152 lb, and 151 lb of bread of excellent quality from 100 lb of flour, a better result than could be obtained from any other flour imported into the United Kingdom. There are not less than 2500 flour mills, employing over 6000 men. There is room for a great extension in the cultivation of wheat and the manufacture and exportation of flour. By the growing of crops of clover alternately with wheat one main constituent (nitrogen) required in the soil to keep it fertile may be renewed perpetually. There are many millions of acres of fertile land suitable for wheat culture unoccupied. The yield of wheat in Canada for 1901 was estimated at 85,000,000 bushels. If the area of available land only be considered, the yield might be ten times greater per annum, with plenty of fertile land still awaiting cultivation. *Oats* of fine quality are grown in large crops from Prince Edward Island on the Atlantic coast to Vancouver Island on the Pacific coast. The Canadian soil and climate are admirably adapted for producing oats of heavy weight per bushel, with thin husk. Canadian *oatmeal* is equal in quality to the best. It is prepared in different forms, and in various degrees of fineness; also as "rolled oats" and "oat flakes." As a rule, the weather is favourable for both the growth and harvesting of the crop. Consequently, oats and oatmeal do not become bitter from sprouted grain, or musty from the heating of the straw in stacks. *Peas* in large areas are grown free from serious trouble with insect pests. Split peas for soup, green peas as vegetables, and sweet peas for canning are obtained in perfection. *Barley* was formerly grown in enormous quantities for export to the United States for malting purposes. After the raising of the duty on barley under the McKinley and Dingley tariffs that trade fell off. Some varieties are cultivated with success for the making of pearl or pot barley. *Rye* is cultivated successfully, but is seldom used as food by the people. Flour from wheat, meal from oats, and meal from Indian corn are preferred. *Buckwheat flour* is used in considerable quantities in some districts for the making of buckwheat cakes, eaten with maple syrup. These two make an exquisite breakfast dish, characteristic of Canada and some of the New England states. There are also numerous forms of preparations from cereals, sold as breakfast foods, which, owing to the superiority of the grains grown in Canada and the care exercised in their manufacture, compare favourably with similar products in other countries.

Vegetables are grown everywhere, and form a large part of the diet of the people. There is a comparatively small export, except in the case of potatoes and vegetables which have been canned or dried. Besides potatoes, which thrive well and yield large quantities of excellent quality, there are turnips, carrots, parsnips, and beets. The cultivation of sugar beets for the manufacture of sugar has been begun in Quebec, Ontario, and Alberta. Among the common vegetables used in the green state are peas, beans, cabbage, cauliflowers, asparagus, Indian corn, onions, leeks, tomatoes, lettuce, radish, celery, parsley, cucumbers, pumpkins, squash, and rhubarb. *Hay*, of good quality of timothy (*Phleum pratense*), and also timothy and clover, is grown over extensive areas. For export it has been put up in bales of about 150 pounds each. Since 1899 a new form of pressing has been employed, whereby the hay is compressed to stow in about 70 cubic feet per ton. This has been a means of reducing the ocean freight per ton. The compact condition permits the hay to be kept with less deterioration of quality than under the old system of more loose baling. Austrian Brome grass (*Bromus inermis*) is grown for hay extensively in Manitoba and the North-West Territories.

Live stock.

The breeding of *horses* has been to some extent neglected since the use of electrical power became general. Heavy draught horses of the Clydesdale breed are reared principally in the provinces of Ontario and Quebec. Horses suitable for general work on farms, and for omnibuses, and grocery and delivery waggons, are plentiful for local markets and for export. Useful carriage horses and saddle horses are bred in a few localities, and animals for cavalry and mounted infantry remounts are produced in all the provinces and in the North-West Territories. Thoroughbred stallions of all breeds are kept by private individuals and by agricultural societies. There are no Government stud farms.

Cattle, sheep, swine, and poultry are reared in abundance. The bracing weather of Canadian winters is followed by the warmth and humidity of genial summers, under which crops grow in almost tropical luxuriance, while the cool evenings and nights give the plants a robustness of quality which are not to be found in tropical regions, and also make life for the various domestic animals wholesome and comfortable. In the North-West Territories there are vast areas of prairie land, over which cattle pasture, and from which thousands of fat bullocks are shipped annually. Throughout other parts bullocks are fed on pasture land and also in stables on nourishing and succulent feed such as hay, Indian corn fodder, Indian corn ensilage, turnips, carrots, mangels, ground oats, barley, peas, Indian corn, rye, bran, and linseed oil cake. The breeding of *cattle*, adapted for the production of prime beef, has received much attention. There is Government control of the spaces on the steamships in which the cattle are carried, and veterinary inspection to prevent the exportation of any animals that might be affected with disease. In recent years a trade has been growing up in the exportation of dressed beef in cold storage, and also in the exportation of beef preserved in hermetically sealed tins. *Sheep* thrive well on the hill pastures, and mutton and lamb of fine flavour are plentiful. *Swine* are reared and fattened in large numbers. The export trade in bacon grew rapidly between 1890 and 1900. Canadian hogs are fed, as a rule, on feeds suited for the production of what are known as "fleshy sides." Bacon with an excess of fat is not wanted, except in the lumber camps; consequently the farmers of Canada have cultivated a class of swine for bacon having plenty of lean and firm flesh. The great extension of the dairy business has fitted in with the rearing of large numbers of swine. Experimental work has shown that swine fattened with part of a ration of skim-milk were lustier and of a more healthy appearance than swine fattened wholly on grains. Slaughtering and curing are carried on chiefly at large packing-houses. The use of mechanical refrigerating plants for chilling the pork has made it practicable to cure the bacon with the use of a small percentage of salt, leaving it mild in flavour when delivered in European markets. Regular supplies are exported during every week of the year. Large quantities of lard, brawn, and pigs' feet are exported, and there is a growing trade in "lunch tongues." Turkeys thrive well, grow to a fine size, and have flesh of tender quality. Chickens are raised in large numbers, and of late years farmers have adopted the method of fattening them a few weeks before they are killed, thus increasing the proportion of edible material. Canadian *eggs* are usually packed in cases containing thirty dozens each. Cardboard fillers are used which provide a separate compartment for each egg. There are cold storage warehouses at various points in Canada, at which the eggs are collected, sorted, and packed before shipment. These permit the eggs to be landed in Europe in a practically fresh condition as to flavour, with the shells quite full.

Canada has been called the land of milk and honey. *Milk* is plentiful, and enters largely into the diet of the people. The healthy condition of the cows, the pure air of the country, and the cleanly habits of the people ensure the wholesome quality of the milk. There is no export trade in milk, but large quantities are now put up in hermetically sealed tins as condensed milk, for use in mining camps and on board steamships. The *cheese* is chiefly of a variety known as "Canadian Cheddar." It is essentially a food cheese rather than a mere condiment. 1 lb of it will furnish as much nourishing material as 2¼ lb of the best beefsteak. The industry is largely carried on by co-operative associations of farmers.

Dairy products. The number of cheese factories and creameries grew from 1733 in the year 1891 to 3649 in the year 1899. *Butter* for export is now made in creameries, where the milk, cream, and butter are handled by skilled makers. The creameries are provided with special cold storage rooms, into which the butter is placed on the same day in which it is made. From them it may be carried in refrigerator railway cars and in cold storage chambers on steamships to its ultimate destination. For the export trade it is packed in square boxes made of spruce or some other odourless wood. These are lined with parchment paper, and contain each 56 lb net of butter. The export trade of butter increased over seven-fold in six years, after cold storage facilities for its safe carriage were arranged for by the Government.

Fruits. In all settled districts of Canada lying eastward of the Great Lakes and westward of the Rocky Mountains apples of fine quality in flavour, in substance, in colour, and in size can be grown; and in areas containing hundreds of square miles, pears, peaches, and grapes are grown in quantities in the open air. The climate is favourable to the growth of small fruits, such as plums, cherries, strawberries, raspberries, currants, gooseberries, and there are great areas in which cranberries, blackberries, and blueberries grow plentifully.

Apples and *pears* are the chief sorts of fruit exported. The high flavour, the crisp, juicy flesh, and the long-keeping qualities of the Canadian apples are their chief merits. The comparatively tender, but very dainty and highly-flavoured "Fameuse" and "Gravenstein" varieties were exhibited in cold storage at the Paris Universal Exposition of 1900 during the summer succeeding the one in which they were grown. Apples are exported in barrels, and also in boxes containing about one bushel each. Large quantities are also evaporated and exported. Establishments for evaporating fruit are now found in most of the larger apple-growing districts, and canning factories and jam factories have been established in many parts of Canada, and are conducted with advantage and profit. In 1899 eight million pounds of evaporated apples were exported, largely to tropical countries.

Wine is made in considerable quantities in the principal vine-growing districts, and in several localities large vineyards have been planted for this purpose. An abundance of *cider* is also made in all the large apple-growing districts.

Honey is one of the minor food products of Canada. With clover blossoms perfuming the air for hundreds of miles, honey bees have plenty of pasturage. It is everywhere admitted that Canadian honey for colour, flavour, and substance is unsurpassed. *Maple sugar and syrup* are made in those areas of the country where the maple tree flourishes. The syrup is used chiefly as a substitute for jam or preserved fruits, and the sugar is used in country homes for sweetening, for cooking purposes, and the making of confectionery. During recent years the processes of manufacture have been improved by the introduction of specially constructed evaporators, and quantities of maple sugar and syrup are now available for the export trade.

State aid. The Department of Agriculture of the Federal Government renders aid in various ways. Chief among these are the maintenance of the branches of the public service under the Commissioner of Agriculture and Dairying, and the Dominion Experimental Farms. Under the former the Government promotes the extension of markets for farm products; it maintains several officers in the United Kingdom who make reports from time to time on the condition in which Canadian goods are delivered from the steamships, and also on what they can learn from importing and distributing merchants regarding the preferences of the market for different qualities of farm goods and different sorts of packages. Through this branch of the public service a complete chain of cold storage accommodation between various points in Canada and markets in Europe, particularly in Great Britain, has been arranged. The Government offered a bonus to those owners of creameries who would provide cold storage accommodation at them and keep the room in use for a period of three years. It also arranged with the various railway companies to run refrigerator cars weekly on the main lines leading to Montreal and other export points. The food products from any shippers are received into these cars at the various railway stations at the usual rates, without any extra charge for the icing or cold storage service. The Government offered subventions to those who would provide cold storage warehouses at various points where these were necessary, and also arranged with the owners of ocean steamships to provide cold storage chambers on them by means of mechanical refrigerators.

Information is given to farmers regarding the various breeds of horses, cattle, sheep, swine, and poultry which have been found most suitable for different districts, most profitable for keeping, and best adapted for the various markets to which they or their products can be sent. Besides furnishing technical and general information on the carrying on of dairying operations, the Government has established and maintained illustration cheese factories and creameries in different places for the purpose of introducing the best methods of carrying on co-operative dairying in both the manufacturing and shipping of butter and cheese. Inspectors are employed to give information regarding the packing of fruit, and also to see to the enforcement of the Fruit Marks Act, which prohibits the marking of fruit with wrong brands and packing in any fraudulent manner.

Experimental farms. Experimental farms were established in 1887 in different parts of the Dominion, and were so located as to render efficient help to the farmers in the more thickly settled districts, and at the same time to cover the most varied climatic and other conditions which influence agriculture in Canada. The Central Experimental Farm is situated at Ottawa, near the boundary line between Quebec and Ontario, where it serves as an aid to agriculture in these two important provinces. One of the four branch farms has been placed at Nappan, Nova Scotia, near the boundary between that province and New Brunswick, where it serves the farmers of the three maritime provinces. A second branch experimental farm has been established at Brandon, in Manitoba; a third at Indian Head, in Eastern Assiniboia, one of the North-West Territories; and the fourth at Agassiz, in the coast climate of British Columbia. At all these farms experiments are conducted to gain information as to the best methods of preparing the land for crop, and of maintaining its fertility, the most useful and profitable crops to grow, and how the various crops grown can be disposed of to the greatest advantage. To this end experiments are conducted in the feeding of cattle, sheep, and swine for flesh, the feeding of cows for the production of milk, and of poultry both for flesh and eggs. Experiments are also conducted to test the merits of new or untried varieties of cereals and other field crops, of grasses, forage plants, fruits, vegetables, plants, and trees; and samples, particularly of the most promising cereals, are distributed freely among farmers for trial, so that those which promise to be most profitable may be rapidly brought into general cultivation. Annual reports and occasional bulletins are published and widely distributed, giving the results of this work. Farmers are invited to visit these experimental farms, and a large correspondence is conducted with those interested in agriculture in all parts of the Dominion, who are encouraged to ask advice and information from the officers of the farms.

Agricultural organizations and education. The governments of the several provinces each have a department of agriculture. In Ontario, Quebec, and Nova Scotia there are special agricultural schools or colleges for the practical education of young men in farming; there are also dairy schools in most of the provinces, where practical instruction and training are given. Among other provincial agencies for imparting information there are farmers' institutes, travelling dairies, live-stock associations, farmers', dairymen's, and fruit-growers' associations, and agricultural and horticultural societies. These are all maintained or assisted by the several provinces. Parts of the proceedings and many of the addresses and papers presented at the more important meetings of these associations are published by the provincial governments and distributed free to farmers who desire to have them. There are also annual agricultural exhibitions of a highly important character, where improvements in connexion with agricultural and horticultural products, live stock, implements, &c., are shown in competition. The principles of agriculture are taught to some extent in the common schools in most of the provinces. Sir William C. Macdonald of Montreal recently gave a sum of 10,000 dollars to be distributed to boys and girls on Canadian farms as prizes in a competition in the selection of seed grain. The competitors grew seed grain on specially prepared plots of land, one-quarter of an acre in each plot, selecting seed each year from these plots to sow on the plot for the succeeding year. They gathered the large well-filled heads from vigorous plants before the grain was cut, after all the conditions of growth had been observed, and then threshed these heads. By screening and hand-picking the large well-developed grain from those selected heads, the seed for next year's seed grain plot was secured. The selecting of seed in this manner was conducted on over 800 Canadian farms, fairly well distributed throughout the Dominion, and was of immense benefit to agriculture. Sir William gave a further sum of 225,000 dollars for the improvement of education at rural schools. (J. W. R.)

History (*since Confederation*).

The four provinces of Ontario, Quebec, New Brunswick, and Nova Scotia were confederated as the Dominion of Canada in 1867. At the request of the Dominion parliament the territory ruled by the Hudson Bay Company was ceded to Canada by the imperial Government in 1870, on the payment of $300,000 to satisfy the Company's claims. From a portion of this territory the province of Manitoba was immediately formed, though it became necessary to quell by military force a rebellion among the half-breeds of the Red River district before the Dominion could finally take possession of the country. In the following year (1871) British Columbia joined the Dominion, the chief condition of the union being that a railway should be built within ten years to connect the Pacific coast with the eastern provinces. In 1873 Prince Edward Island entered the confederation. The Nelson River country to the west of Hudson Bay was in 1876 formed into the district of Keewatin. In the year 1880 all the remaining British possessions on the continent, except Newfoundland and the dependent district of Labrador, were formally annexed to Canada. Two years later the provisional districts of Assiniboia, Saskatchewan, Alberta, and Athabasca were created, and Regina was fixed upon as their capital. It was not till 1895 that the great unorganized tract to the north and west was divided into four districts —Ungava, Franklin, Mackenzie, and Yukon.

The problems with which the statesmen of confederated Canada have had to deal in connexion with the vast territory thus brought under their control have been numerous and of varied character. Immediately after confederation a serious agitation for repeal of the union arose in Nova Scotia, which had been brought into confederation by a vote of the Legislature, without direct appeal to the people; this danger was only averted after much negotiation, and considerable modification of the terms on which that province entered the Dominion. Much friction has arisen in defining accurately the division of power between the Federal and provincial Governments. The founders of confederation had, in the troubles of the United States, an object-lesson on the necessity of strengthening the central authority. The American constitution, after clearly defining the powers of the Federal Government, leaves all unstated authority to the sovereign states. Canada adopted the opposite course. While the range of legislative control for the province was clearly defined, the residuum of undelegated authority was given to the Federal Government. On this point several differences have arisen, the Dominion sometimes disclaiming, sometimes asserting, a right to interfere. When, in 1871, the New Brunswick legislature passed a Bill making public education non-sectarian, the opposition, on behalf of the Roman Catholic minority, appealed to the Ottawa Government to disallow the Act. This it refused to do, asserting that the province had acted within its rights. A similar policy was followed in 1888, when the Quebec legislature granted to the Jesuit order a sum of $400,000 in compensation for property forfeited to the Crown. The Dominion Government, urged to disallow this Act, ruled that it did not come within its jurisdiction. A difference of long standing was settled in 1898 by the Privy Council, which ruled that in the question of the control of fisheries, while the Dominion had exclusive power to make regulations, the issue of licenses and the collection of revenues from this source belong to the provinces, except in the case of Manitoba and the North-West Territories, where no prior rights existed. In 1878 the Federal Government passed the Scott Act, empowering municipalities to deal with the traffic in liquor. The right of the Federal parliament to pass this Act was questioned as an infringement of provincial powers, but on appeal to the Privy Council the right was maintained. It seems probable that most of the possible questions of difference between federal and provincial authority have now been settled by these and similar judicial decisions, and that Canadian experience in adapting a federal system to British methods of government will prove extremely useful in further applications of the federal idea to other parts of the empire, or to the empire itself. In this connexion it may be noted that dual representation, or the privilege of representing a constituency in the Dominion parliament and in a provincial assembly at the same time, was tried in the early years of confederation, but was abolished in 1872 as unsatisfactory.

Among matters demanding constructive legislation in the organization of the new state the following may be noted:—In 1871 a uniform system of *decimal currency* was established for the whole Dominion. The creation of a *Supreme Court*, after engaging the attention of the Canadian parliament for several years, was finally accomplished in 1876. This court is presided over by a chief justice and five puisne judges, and has appellate civil and criminal jurisdiction for the Dominion. By an Act passed in 1891 the Government has power to refer to the Supreme Court any important question of law affecting the public interest. The right of appeal from the Supreme Court thus constituted to the Judicial Committee of the Privy Council marks, in questions judicial, Canada's place as a part of the British empire. The appointment, first made in 1897, of the chief justices of Canada, Cape Colony, and South Australia, as colonial members of the Judicial Committee, still further established the position of that body as the final court of appeal for British people. The British North America Act of 1867 provided that the control of *elections for the Dominion parliament* should rest with the various provinces. This measure was necessary owing to the lack of machinery at the time for managing federal matters. This clause was superseded in 1885 by a franchise Bill, which provided for uniformity of suffrage and recognized property qualification as determining the right to vote. A later Act, passed in 1898, restored the provincial franchise as the basis for federal elections, thus reintroducing an element of variety in the qualifications of voters. Ontario, Manitoba, British Columbia, and Prince Edward Island have practically manhood suffrage; in Quebec, Nova Scotia, and New Brunswick a property qualification is required. A general election law was passed in 1874, which provided for vote by ballot, the holding of elections simultaneously throughout the Dominion, and the abolition of property qualification for members of parliament. In the North-West Territories, however, elections were held by open voting until 1885. In a country of vast distances with great areas to be opened for settlement, *railway development* was necessarily from the first a leading question of public policy. Two great national lines were projected as an essential part of confederation: the Intercolonial, built to connect the Maritime Provinces with the provinces on the St Lawrence; the Canadian Pacific to unite the Atlantic and the Pacific coasts of the Dominion. The first of these was completed in 1876; with the various extensions since built it now includes 1511 miles of road, and remains entirely under the control of the Government. The construction of the Canadian Pacific was entrusted to a private company, which received large subsidies of land, money, and completed railway. This system has grown to be one of the greatest in the world; it owns more than 7000 miles of road and controls about 3000 more; in its various ramifications it touches the most important points of Canada; it has established steamship communication with Japan and along the great lakes. The railway mileage of the whole Dominion

has grown from 4022 in 1874 to 17,250 in 1899; and new lines are still being built as new areas become settled. The question of subsidizing railways has at various times profoundly affected the politics of the country. The completion of the Canada Pacific railway, and the consequent opening-up of the prairie lands of the north-west, have been followed by a considerable increase in immigration. But at no time has this been excessive, nor is any foreign nation represented by numbers sufficiently large to prevent ultimate fusion with the English-speaking element. A considerable migration has lately taken place into the north-west from the western states of America. The exodus from Iceland, begun in 1875, has resulted in greatly decreasing the population of that island. In Southern Manitoba are settled large numbers of Mennonites, a thrifty and honest if somewhat exclusive folk, who fled from Europe to escape military service. For a similar reason the Doukhobors (*q.v.*), a peculiar religious sect from the Black Sea provinces of Russia, in 1899 emigrated to Canada in a body. Scottish crofters from the Highlands, English and Irish agricultural labourers, Americans, Norwegians, Galicians, and Danes, help to swell a varied but hardy and industrious population. The district of Alberta is largely occupied by Englishmen who are engaged in ranching. On the Pacific slope the Chinese, though discouraged by a heavy tax, are found in considerable numbers, while the influx of Japanese coolies is creating a problem in the labour market of British Columbia. On confederation Canada assumed the care of her own land *defences*. The Fenian raids of 1866 and 1870 delayed for a short time the removal of imperial regiments, but in the latter year all British forces were withdrawn except those stationed at Halifax. During the war in South Africa (1899-1902) these, too, were temporarily replaced by a Canadian garrison. On the other hand, within the last few years the imperial and the Canadian Governments have entered into an agreement for the joint defence of Esquimalt, a new coaling and naval station on the Pacific coast. By the Militia Act of 1868 and 1883 the Canadian militia is divided into three classes—the permanent, the active, and the reserve. The permanent force includes about 1000 men, exclusive of the garrison at Halifax. There is also a corps of North-West Mounted Police, numbering about 1000. The active Militia numbers 45,000 men, whose term of service is three years, and who drill for two weeks each year; while the Reserve includes all the remaining male citizens between the ages of sixteen and forty-five. The officer commanding the militia is appointed from the imperial army. A military college was established at Kingston in 1875, and in this officers are trained for both the Canadian and imperial services. Several commissions are given each year to selected candidates by the British Government, and a considerable proportion of the graduates of the college are now serving in the imperial army. The military forces of Canada were called upon to repel the Fenian attacks of 1866 and 1870, and to put down the insurrection of half-breeds in the north-west in 1885. The contribution made by Canada of two contingents of troops for service under imperial direction in South Africa is the most important military event in the later history of the Dominion. The forces sent by the Dominion were supplemented by a body of horse raised in North-Western Canada, and equipped and paid by a Canadian, Lord Strathcona. The sea *fisheries*, which are so important a source of wealth for Canada, have been the cause of no little international difficulty. With the termination of the Reciprocity Treaty of 1866 all American rights to fish in Canadian waters came to an end, but in spite of this American fishing schooners continued to carry on operations within the three-miles limit. Several were seized and confiscated, to the annoyance of New England fishermen. The joint commission, which met at Washington in 1871 to settle points of dispute between Great Britain and the United States, decided that Americans should be allowed to fish in Canadian waters on payment of an indemnity to be fixed by a later treaty. A commission met at Halifax six years afterwards to decide the amount of this indemnity, and awarded to Canada the sum of $5,500,000, which was paid with some reluctance. But in 1885 the fisheries clauses of the Washington treaty were terminated by the Americans themselves; a new treaty, signed at Washington in 1888, was rejected by the United States Senate, and fishing is now carried on by the Americans under a *modus vivendi* which provides for the payment of licenses. A dispute, arising out of the seizure by the Americans of several Canadian vessels engaged in the seal fishery in Bering Sea, was, in 1892, referred to a board of arbitration, which decided in favour of Canada, and awarded to the owners of these vessels damages to the amount of $464,000. This sum was paid in 1898. At the same time agreements were entered into for the future conduct of the seal fishery, with a view to preventing further disputes. The discovery of new *mineral deposits*, and the development of others previously known, have during the last few years given a great stimulus to Canadian prosperity. From the Yukon field alone there was taken in 1899 gold to the value of $16,000,000, while the gold output of the whole country increased from $1,000,000 in 1894 to $21,000,000 in 1899. A large area of country in southern British Columbia has proved extremely rich in gold, silver, and copper; large mining towns have sprung up with great rapidity; much capital has found profitable investment; several hundreds of miles of railway have been built to meet the needs of the increasing population; and this mining population has furnished a new and profitable market for the products of western farming. New and very extensive coal deposits, lately opened up in the Crow's Nest Pass, supplement and add to the value of other mineral discoveries. In the extreme east extensive ironworks have been constructed at Sydney, Cape Breton. Both here and in Nova Scotia the existence of iron ore, coal, and flux, within easy reach of each other, offers exceptional opportunities for the cheap production of iron and steel on a large scale. The most important nickel deposits yet discovered in the world are at Sudbury, in Ontario; and steps have been taken to increase the already large output of this metal.

Trade Policy.—Questions of trade policy have divided public opinion in Canada more deeply than almost any other. This arises from very exceptional trade relations. The chief commerce of the Dominion is carried on with two countries—Great Britain and the United States—of which the one has followed a free trade and the other a highly protectionist policy. Until 1866 Canada enjoyed great prosperity under a Reciprocity Treaty with the United States. In that year the treaty was abrogated, apparently with the intention of checking Canadian trade and fostering a desire for annexation. In the next seven years, however, the trade of Canada almost doubled, the opening of new markets in the West Indies and Europe having given new outlets for her products. Then followed a period of commercial depression without parallel in Canadian history. Manufactures languished, the agricultural classes were in great need, and the revenues of the country showed increasing deficits. Meanwhile the highly-protected industries of the United States offered a field for labour which drew thousands of Canadians over the border. Hence arose a keen conflict of opinion. It was urged, on the one hand, that a free trade policy would

leave the country at the mercy of the United States. On the other, it was claimed that protection would weaken the connexion with the mother country. In 1878 a protective policy was adopted by a popular vote. It had the effect of checking the exodus and restoring the national credit. With the return of prosperity, and the establishment of the finances on a sound basis, there arose a strong feeling that some discrimination should be made in favour of Great Britain as against foreign countries with their high tariffs. This feeling took definite shape in 1897, in the adoption of a preferential tariff in favour of British goods to the extent of 25 per cent. less than that levied on goods from foreign countries. This preference has now been increased to 33⅓ per cent.

Science.—In scientific research and achievement Canada has made much progress. This is particularly true of medical science, owing to the establishment of important medical schools in the principal university centres. The munificence of the wealthy citizens of Montreal has given to that city a school of practical science, with an equipment unrivalled perhaps in the world. Schools of the same character have been founded in Toronto and Kingston, and the Royal Military College also provides a course in civil and military engineering. The skill and energy of the Canadian engineer find ample room for exercise in the development of the country's mining resources, and in the construction of canals and railroads. The wide application of electrical energy has been especially marked. Every town of any importance has its electric street railway, its system of electric lighting, its supply of electric power for manufacturing purposes; its telephone connexion not only throughout its own area, but with places hundreds of miles away. Even the rural districts are becoming accustomed to look upon the telephone wire as a necessity. Every new labour-saving invention is quickly adopted, for skilled labour in Canada is still scarce and dear. Improved agricultural machinery has greatly lightened the burdens of the farmer, and Canadian implements of this class have secured a special reputation and market for themselves in other countries, owing to their lightness and durability. Twice since confederation has the British Association for the Advancement of Science selected Canadian cities for its annual meetings, thus furnishing a striking illustration of the contraction of the empire under the influence of steam and electricity.

Literature.—In the domain of letters, though no great names have appeared, Gilbert Parker, Charles Roberts, Bliss Carman, W. W. Campbell, Archibald Lampman, and a few other Canadians have in prose and verse interpreted their native land and its conditions with marked distinction. In 1880 the verse of Louise Frechette, the French Canadian poet, was crowned by the French Academy. Dr Drummond's dialect verse, embodying the speech and thought of the French *habitant*, has gained a wide popularity. Dr Goldwin Smith, who made his home in Toronto in 1871, and has issued thence several volumes of history and criticism, speaks of himself as a Canadian, and has devoted no small share of his time and his consummate mastery of English prose to Canadian journalism. Sir John Bourinot, Sir James Lemoine, Dr Kingsford, and the Rev. Abbé Casgrain have been chief among many laborious workers in the field of Canadian history. The Royal Society, founded in 1882, draws together at its annual meetings men of literature and science, and publishes each year a volume of transactions.

Education.—On confederation the control of education was entrusted to the provinces, with a stipulation that all rights then enjoyed by denominational schools should be respected. This has given rise to considerable diversity of management, though in all the provinces education is free, and the necessary funds are obtained from local taxation and Government grants. Ontario has a highly-organized school system, directed by a minister of education, who is a member of the provincial cabinet. The other provinces have superintendents and boards of education, who report to the provincial legislatures. In Quebec, where religious instruction is still considered the basis of education, most of the schools are controlled by the local Roman Catholic clergy. In Nova Scotia, New Brunswick, Prince Edward Island, Manitoba, and British Columbia the public schools are strictly undenominational; in Ontario and Quebec separate schools are allowed to Roman Catholics and Protestants. Education of children between the age of seven and thirteen is compulsory except in Quebec. Secondary education is provided for by high schools and collegiate institutes in all towns and cities. Each province has a number of normal and model schools for the training of teachers. For higher education there are also abundant facilities. While the older universities have increased greatly in influence and efficiency, the following new foundations have been made since confederation:—University of Manitoba, Winnipeg, 1877; Presbyterian College, Winnipeg, 1870; Methodist College, Winnipeg, 1888; Wesleyan College, Montreal, 1873; Presbyterian College, Montreal, 1868; School of Practical Science, Toronto, 1877; Royal Military College, Kingston, 1875; M'Master University, Toronto, 1888. All the larger universities have schools of medicine in affiliation, and have the power of conferring medical degrees. Since 1877 Canadian degrees have been recognized by the Medical Council of Great Britain. In her treatment of the Indians Canada has met with a success which is in marked contrast to the experience of the United States. Since indiscriminate slaughter deprived them of the bison, their natural means of subsistence, the north-west tribes have been maintained chiefly at the expense of the country. As a result of the great care used in watching over them, the last few years have shown a small but steady increase in their numbers. A most encouraging sign of the elevation of the Indian is the increasing interest taken by them in education. A system of industrial and boarding schools has been established in several of the provinces, and these, by separating the children from the degrading influences of their home life, have proved much more effectual than day schools in training them in the habits and ideas of a higher civilization. A tendency towards consolidation has been evident among the various religious bodies. In 1873 the different branches of the Presbyterians united under the name of the Presbyterian Church of Canada, and a similar step was taken by the Methodists in 1883. The first general congress of the Church of England in Canada was held at Hamilton, Ontario, in the same year, and since that time this church has completed a Dominion organization. A recognition of the increasing importance of the Roman Catholic Church in Canada was given in the appointment, in 1888, of Archbishop Taschereau as the first Canadian cardinal. Though naturally a temperate people, Canadians seem bent on controlling the traffic in intoxicants by coercive measures. The Canada Temperance Act, a local option law passed in 1878, proved abortive through the failure to provide suitable machinery for its enforcement. In 1900, however, it was still in force in twenty-eight electoral districts. Between the years 1892 and 1894 four of the provinces declared for prohibition by majorities aggregating 130,000; but a general plebiscite, held in 1898, resulted in a majority for legislative prohibition of only 13,000. This verdict was looked upon by the Government as inconclusive, and no further action was taken.

Political.—The Governor-Generalship of Canada

became on confederation one of the greatest official appointments in the gift of the Crown. It is agreed that the statesmen who have filled the post have been uniformly successful in holding evenly the balance between political parties, and Canadians are satisfied with the method of appointing the official head of the State. Canada's political history is interesting, as showing the gradual development of a policy strictly Canadian, and yet not divergent from that of the empire. The Liberal-Conservative party which gathered round Sir John A. Macdonald, the first premier, represented a practical school of statesmen. Drawn from the ranks of both parties, they adopted a system of compromise in political matters, and made the early and speedy development of the country the main object of their policy. Opposed to them were the reform party, who took as their watchword financial retrenchment, and therefore opposed the Government in its railway policy and other schemes of rapid development. On the overthrow of the Macdonald ministry in 1873, a reform Government was formed under the Hon. Alex. Mackenzie. Committed by their parliamentary record to a policy of economy, the reformers soon aroused discontent by their neglect of the Canadian Pacific railway project. As consistent believers in free trade, too, they seemed powerless in the face of the financial difficulties that then beset Canada and threatened the ruin of her manufactures. This led to their defeat in 1878. The Conservative party, on returning to power, adopted a highly protective tariff as a defence against American trade encroachment, and this has so far proved itself favourable to the commercial wellbeing of the country that it has been continued to the present day. The reform party, disorganized by defeat, remained in opposition until 1896. During this period it advocated several modifications of the trade policy of Canada, most of them looking to closer commercial relations with the United States. On the death of Sir John A. Macdonald in 1891, Sir John Abbott became premier, but resigned through ill-health in the following year. He was succeeded by Sir John Thompson, who died at Windsor Castle in 1894, while attending to be sworn in as a member of her Majesty's Privy Council. Sir Mackenzie Bowell then became premier and leader of the Conservative party until 1896, when he was succeeded by Sir Charles Tupper. Sir Wilfrid Laurier's leadership of the reformers, and the appearance of a more conservative tone in the counsels of the party, had restored public confidence; and in the general elections of 1896 the Conservatives, weakened by internal dissensions, met with a signal defeat, which was repeated in 1900. The reform administration has been marked by various measures tending to unite Canada more closely with the empire—such as the adoption of imperial penny postage; the denunciation of the German and Belgian treaties, with the subsequent preferential treatment accorded to British commerce; the carrying-out of plans previously made for cable connexion between Canada and Australia; the contribution of men for the South African war. These measures were stamped anew with popular approval by the elections of 1900, which gave Sir Wilfrid Laurier's Government another lease of power. It is manifest that the broad general result of confederation has been greatly to increase Canada's weight in the councils of the empire, and to draw still more closely the bonds with the motherland. (G. R. P.)

Canal Dover, a village of Tuscarawas county, Ohio, U.S.A., on the Tuscarawas river and the Ohio Canal. Population (1890), 3470; (1900), 5422, of whom 939 were foreign-born and 10 negroes.

CANALS AND INLAND NAVIGATION.

Ship Canals in Europe.

THE last quarter of the 19th century saw great improvements in inland navigation, more particularly in Germany, France, and Belgium. International Congresses have been held in the principal cities of Europe to discuss the question of the enlargement of existing canals, and the advantage of affording greater facilities for the water carriage of goods and minerals is now generally recognized. The fact that the cost of maintenance of canals rises but slightly with enlarged trade, while the wear and tear on railways, tramways, and roads increases in direct proportion with any increased weight of traffic, gives ship canals and other navigations a considerable advantage. The great saving effected in the consumption of coal in steamers by the use of triple or quadruple expansion engines enables large cargoes to be carried inland on ship canals at a rate per ton considerably below the cost on railways. The construction in England of the Manchester Ship Canal has been of great benefit to the district it serves not only by reducing the rates of carriage on seaborne traffic, but also by causing the railway rates to be lowered. The same results have occurred on other ship canals that enable large steamers to pass inland to centres of population and manufactories without transhipment of cargo at ports on the coast. Ship canals of early date have had to be enlarged in depth and width to meet the increased size of steamers.

Manchester Ship Canal.—The advantage of a waterway for the conveyance of goods between Lancashire and the sea was so obvious, that so far back as the year 1721 Mr Thomas Steers designed a plan for continuing to Manchester the barge navigation which then existed between Liverpool and Warrington. Parliamentary powers were then obtained to improve the rivers Mersey and Irwell from Warrington to Manchester by means of locks and weirs. This work was successfully carried out, and proved of great benefit to the trade of the district. The duke of Bridgewater, who had made a canal from his collieries at Worsley to Manchester, afterwards continued the canal to the Mersey at Runcorn; this extension was opened in 1722 and competed with the Mersey and Irwell Navigation, both routes being navigated by barges carrying about fifty tons of cargo. The Liverpool and Manchester railway at a later date afforded further facilities for conveyance of goods, but the high rates of carriage, added to heavy charges at the Liverpool docks, prejudiced trade, and the question was mooted of a ship canal to bring cotton, timber, grain, or goods direct to Manchester without transhipment. The first plan was made by Mr Wm. Chapman in 1825, and was followed by one designed by Mr Henry Palmer in 1840, but it was not until the year 1882 that the movement was originated that culminated in the opening of the Manchester Ship Canal by Queen Victoria on 21st May 1894.

In determining the plan of the canal the main point which arose was whether it should be made with locks or whether it should be on the sea-level throughout, and therefore tidal. The advantage of a still waterway in navigating large steamers, and the facilities afforded by one constant water-level for works on the banks and the quick discharge of goods at the terminal docks at Manchester, secured the adoption of the plans for a canal with locks as designed by Sir E. Leader Williams. The fresh-

water portion of the canal extended between Manchester and Runcorn, while from the latter place to Garston it was proposed to improve the upper Mersey estuary by constructing training walls and dredging to form a deep central channel. Powers to construct the canal were sought in the Session of 1883, when the Bill passed the Committee of the House of Commons, but was rejected by the Committee of the House of Lords. Brought forward again the next year, it was passed by the Lords but thrown out by the Commons. The opposition from Liverpool and the railway companies was very strong; to meet to some extent that of the former, a continuation of the canal was proposed from Runcorn to Eastham along the Cheshire side of the Mersey, instead of a trained channel in the estuary, and in this form the Bill was again introduced in the Session of 1885, and, notwithstanding strong opposition, was passed by both Houses of Parliament. The cost of this contest to promoters and opponents exceeded £400,000, the various Committees on the Bill having sat over 175 days. Owing to difficulties in raising the capital the works were not commenced until November 1887.

The total length of the canal is 35½ miles, and it may be regarded as divided into three sections. From Eastham to Runcorn it is near or through the Mersey estuary for 12¾ miles, and thence to Latchford near Warrington, 8¼ miles, it is inland; both these sections have the same water-level, which is raised by high tides. At Latchford the locks stop tidal action, and the canal from that point is fed by the waters of the rivers Mersey and Irwell to Manchester, 14½ miles from Latchford. The canal commences on the Cheshire side of the Mersey at Eastham, about 6 miles above Liverpool. The entrance is well sheltered, and adjoins a good low-water channel communicating with the Sloyne deep at Liverpool. Three entrance locks have been provided close to and parallel with each other, their length and width being 600 by 80, 350 by 50, and 150 by 30 feet. These locks maintain the water-level in the canal nearly to mean high-water level (14 feet 2 inches above the Liverpool datum); when the tide rises above that height the lock gates are opened and the tide flows up to Latchford, giving on high spring tides an additional depth of water of about 7 feet. On the ebb tide this water is returned to the Mersey through large sluices at Randles Creek and at the junction of the river Weaver with the canal, the level of the canal thus being reduced to its normal height. The canal throughout to Manchester has a minimum depth of 26 feet, the lock sills being placed 2 feet lower to allow of the channel being dredged to a depth of 28 feet if necessary hereafter. The minimum width at bottom is 120 feet, allowing large vessels to pass each other at any point on the canal; this width is considerably increased at the locks and other parts. The slopes are generally about 1½ to 1, but are flatter through some portions; in rock-cutting the sides are nearly vertical. From Eastham to Runcorn the canal is alternately inland and on the foreshore of the estuary, on which embankments were constructed to act as dams during the excavation of the canal to keep out the tide, and afterwards to maintain the water-level at low water in the estuary; both sides are faced with heavy coursed stone. The material for the embankments was principally clay excavated from the cuttings. In some places, where the foundation was of a porous nature, sheeting piles of timber had to be used. At Ellesmere Port, where the embankment is 6200 feet long on sand, 13,000 whole timber sheeting piles were driven, to secure the base of the embankment on each side; they were 35 feet long, water jets under pressure through 1¼ inch wrought-iron pipes being used at the foot of each pile to assist the sinking of the piles, which were found most difficult to drive by ordinary means. At the river Weaver ten Stoney roller sluices are built, each 30 feet span, with heavy stone and concrete piers and foundations; at Runcorn, where the river Mersey is narrow, a concrete sea wall 4300 feet long was substituted for the embankment. At various points under the canal cast-iron siphon pipes were laid to carry off any land drainage which was at a lower level than the canal; the largest of these siphons were constructed to allow of the tidal and fresh water of the river Gowy to pass under the canal at Stanlow Point, between Eastham and Ellesmere Port. Two 12-feet siphons are there placed close together; built of cast-iron segments, they are each 400 feet long, and were laid on concrete 4 feet below the bottom of the canal. From Runcorn to Latchford the canal is nearly straight, the depth of cutting varying from 35 to 70 feet, partly in rock, but generally in alluvial deposit. The whole length of the canal passes through the New Red Sandstone formation, with its overlying beds of gravel, clay, sand, and silt, which gave much trouble during the progress of the work; retaining walls of stone and brickwork had to be built in these places to maintain the sides of the canal from slips and injury from the wash of steamers. The canal from Latchford to Manchester is in heavy cutting through the valleys of the rivers Mersey and Irwell. As these rivers are circuitous in course, only very small portions could be utilized in forming the canal; a line as nearly straight as possible was therefore adopted, and involved many crossings of the river channels. During the whole progress of the work these had to be kept open for the discharge of floods and land water, and in some places temporary cuts of considerable length had to be made for the same object. In November 1890 and December 1891 high winter floods covered the whole of the river valleys, filling many miles of the unfinished canal and causing great damage to the slopes. Altogether 23 miles of canal had to be pumped out to enable the work to be completed. After the cuttings between the river channels were finished, the end dams were removed, and the rivers Irwell and Mersey were turned into the new channel now forming the upper portion of the ship canal. The total rise to the level of the docks at Manchester from the ordinary level of the water in the tidal portion of the canal below Latchford locks is 60 feet 6 inches; this is obtained by an average rise of about 15 feet at each of the sets of locks at Latchford, Irlam (7½ miles nearer Manchester), Barton (2 miles farther), and Mode Wheel (3½ miles above Barton locks at the entrance to the Manchester docks). For the greater part of this last length the canal is widened at bottom from 120 feet, its normal width, to 170 feet, to enable vessels to lie at timber and other wharves in that part of the canal without interfering with the passing of large vessels to or from the docks. The locks are in duplicate, one being 600 feet long by 65 feet wide, the other 350 feet long by 45 feet wide, with Stoney's sluices adjacent. They are filled or emptied in five minutes by large culverts on each side with side openings into the lock. Concrete with facings of blue Staffordshire bricks is largely used, and the copings, sills, hollow quoins, and fender courses are of Cornish granite. The lock gates are constructed of greenheart timber. The sluices near the locks take the place of the weirs used in the old Mersey and Irwell Navigation; they are 30 feet span each, four being generally used at each set of locks. In ordinary seasons any water not used for lockage purposes passes over the tops of the sluices, which are kept closed; in flood times the sluices are raised to a height which will pass off floods with a comparatively small rise in the canal. There are eight hydraulic installations on the canal, each having duplicate steam-engines and boilers; the mains exceed 7 miles in length,

the pressure being 700 lb to the inch. They work the cranes, lifts, and capstans at the docks, lock gates, and culvert sluices, coal tips, swing bridges, and aqueduct.

At Barton, near Manchester, the Bridgewater Canal crossed the river Irwell on the first navigable aqueduct constructed in England; it was the work of Brindley. Since it was only built at sufficient height to allow of barges passing under it, means had to be found to allow of this important canal being maintained, and yet to permit large steamers to use the ship canal below it. Brindley's canal is on one level throughout its whole length, and as its water supply is only sufficient for the flight of locks by which it descends at Runcorn to the Mersey, locks down to the ship canal would have involved the waste of a lock of water on each side and caused serious delay to the traffic. Sir E. Leader Williams surmounted the difficulty by means of a swing aqueduct for the Bridgewater Canal, which when closed allows of the traffic passing as heretofore, while it is opened to allow of ships crossing it on the lower level of the ship canal. The water in the swing portion of the aqueduct when opened is maintained by closing gates at each end, similar gates being shut at the same time across the fixed portion of the aqueduct. The swing portion is a large steel trough carried by side girders, 234 feet long and 33 feet high in the centre, tapering 4 feet to the ends; the waterway is 19 feet wide and 6 feet deep. The whole works on a central pier with similar arrangements to the largest swing bridges on the canal; it has two spans over the ship canal of 90 feet each. It is somewhat singular that the first fixed canal aqueduct in England should, after the lapse of 134 years, be replaced by the first swing aqueduct ever constructed. The swing aqueduct is moved by hydraulic power, and has never given any trouble in working, even in times of severe frost. The weight of the movable portion, including the water, is 1600 tons.

The manner of dealing with the five lines of railways that were cut through by the canal was one of importance, both in the interests of the travelling public and the trade on the canal; they are all important lines, including the main line of the London and North-Western Railway near Warrington, with its important route to Scotland. Hitherto no such alteration of a railway had been sanctioned by Parliament, and it was only the importance of a ship canal to Manchester that secured the requisite power against the strong opposition of the railway companies. Swing bridges, although in use on some lines to cross navigations, are dangerous and inconvenient, and high-level deviation lines were adopted for each railway crossing the canal. Embankments were made close to and parallel with the old lines, commencing about a mile and a quarter from the canal on each side, the canal itself being crossed by viaducts which give a clear headway of 75 feet at ordinary water-level. Vessels trading on the canal with high masts are provided with telescopic or sliding top masts. The gradients on the railways rising up to the viaducts are 1 in 135. The span of the viaducts is so arranged as to maintain the full width of the canal for navigation; and as the railways generally cross the canal on the skew, this necessitated girders in some cases of 300 feet span. There are nine main roads requiring swing bridges across the canal; all below Barton have a span giving a clear waterway of 120 feet. The width of these bridges varies with the importance of the roads from 20 to 36 feet, and they are constructed of steel, their weight ranging from 500 to 1000 tons each. They work on a live ring of conical cast-iron rollers, and are moved by hydraulic power supplied by steam, gas, or oil engines. The Trafford Road Bridge at the docks at Manchester is the heaviest swing bridge on the canal; being of extra width, it weighs 1800 tons.

The canal being virtually one long dock, wharves at various points have been erected to enable chemical or manufacturing works to be carried on, widenings being provided where necessary. At Ellesmere Port coal tips and sheds have been erected, and the canal is in direct communication with the docks there as well as at Weston Point and Runcorn, where a large trade is carried on with the Staffordshire Potteries and the Cheshire salt districts. At Partington branches from the railways connect the canal with the Yorkshire and Lancashire coal-fields, and the canal is widened out 65 feet on each side for six hydraulic coal tips. At Mode Wheel there are extensive abattoirs and lairages, erected by the Manchester Corporation; also large petroleum oil tanks, graving dock and pontoons, cold-air meat stores, and other accommodation for traffic. At Manchester the area of the docks is 104 acres, with 152 acres of quay space, having over 5 miles of frontage to the docks, which are provided with a number of three-storey transit sheds, thirteen seven-storey and seven four-storey warehouses, and a large grain silo. The London and North-Western and Lancashire and Yorkshire Railway Companies have made branch lines to the docks, the railways and sidings at which are over 30 miles in length. Much traffic is also carted, or dealt with by inland canals in direct communication with the docks. The substitution of a wide and deep canal, nearly straight, for comparatively shallow and narrow winding rivers, and the use of large sluices in place of fixed weirs to carry off the river water, have been of great advantage to the district in greatly reducing the height of floods.

The total amount of excavation in the canal, docks, and subsidiary work amounted to over 54 million cubic yards, nearly one-fourth of which was sandstone rock; the excavated material was used in forming the railway deviation embankments, filling up the old beds of the rivers, and raising low lands near the canal. As many men were employed on the works as could be obtained, but the number never exceeded 17,000, and the greater part of the excavation was done by about eighty steam navvies and land dredgers. For the conveyance of excavation and materials, 228 miles of temporary railway lines were laid, and 173 locomotives, 6300 waggons and trucks, and 316 fixed and portable steam-engines and cranes were employed, the total cost of the plant being nearly £1,000,000. The expenditure on the works, including plant and equipment, to 1st January 1900, was £10,327,666. The purchase of the Mersey and Irwell and Bridgewater Navigations (£1,786,651), land and compensation (£1,223,809), interest on capital during construction (£1,170,733), and parliamentary, superintendence, and general expenses brought up the total amount to £15,248,437.

The traffic on the canal has gradually increased from 925,659 tons in the year 1894 to 2,778,108 tons in 1899. After its opening considerable reductions were made in the railway rates of carriage and in charges at the Liverpool docks in order to meet the lower cost of conveyance by shipping passing up it. The result has been of great advantage to the trade of Lancashire and the surrounding districts, and the saving in the cost of carriage, estimated at £700,000 a year, assists manufacturers to meet the competition of their foreign opponents who have the advantage of low rates of carriage on the improved waterways of America, Germany, France, and Belgium. Before the construction of the canal, large works had left Manchester to establish themselves at ports like Glasgow, where they could save the cost of inland carriage. Since its opening, new industries have been started at Manchester and along its banks, warehouses and mills that were formerly empty are now occupied, while nearly 10,000 new

houses have been built for the accommodation of the work-people required to meet the enlarged trade of the city.

The Gloucester and Berkeley Canal.—The first Act authorizing the construction of this canal was passed in the year 1793; five subsequent Acts for making alterations in its route and raising funds were obtained, but the works were not completed until 1827. Mr Robert Mylne was the first engineer employed, but afterwards Mr Telford was called in to revise the plans, and they were carried out under his direction. It was originally proposed to make the entrance at Berkeley Pill, but it was afterwards constructed at a more sheltered position at Sharpness Point. The water supply is derived from the river Frome, which in its course to the Severn crosses the canal at a point where it is joined by the Stroudwater Navigation; this connects it with the Thames and Severn Canal and the inland navigations. The navigation of the Severn from Sharpness to Gloucester is circuitous and dangerous, and while the distance is 28 miles, the length of the canal between the same points is 16½ miles. It is on one level throughout, having basins at both ends for shipping, and locks to the Severn. The depth is 18 feet, and vessels which draw more water lighten their cargoes at Sharpness. Sailing ships were formerly towed up the canal by horses, but since 1869 steam tugs have been used. The cargoes are generally timber or grain.

Exeter Canal.—This canal is an interesting work, being the first canal carried out in the United Kingdom for the purpose of enabling seagoing vessels to pass to an inland port. The river Exe was very early utilized by small craft trading to Exeter, Parliament having granted powers for the improvement of the navigation by the construction of a canal 3 miles long from Exeter to the river; at a later date this canal was extended lower down to the tidal estuary of the Exe. Previous to the year 1820 it was only available for vessels of a draft not exceeding 9 feet, but by deepening it, raising the banks, and constructing new locks, vessels drawing 14 feet of water were enabled to pass up to a basin and wharves at Exeter. These works were carried out by Mr James Green under the advice of Mr Telford. The canal is still useful for the coasting trade in coal and timber, but the great increase in the size of steamers and sailing vessels has diminished its importance, more particularly as it does not terminate in a manufacturing or mineral district.

Newry Canal.—This, the only ship canal in Ireland, was constructed between the years 1761 and 1769. Like the Gloucester and some other canals, it was made to avoid the upper and shallow part of a river navigation, the river Newry being only navigable to that town on high tides for small vessels. At first the canal was only 2 miles long, from Fathom to Newry, but in 1829 it passed from the hands of the Irish Board of Navigation to a private company, who obtained powers to lengthen it 1½ miles seawards to deeper water, and also to improve the navigation of the river thence to Carlingford Lough, according to plans prepared by Sir John Rennie. The river was improved by blasting and dredging, and the old canal enlarged to the same width and depth as the new portion, enabling vessels of 13½ feet draught to pass from the sea to Newry.

Suez Canal (see *Ency. Brit.* vol. iv. pp. 789–792, and vol. xxii. pp. 620–621).—The rapid increase of traffic and the greater size of the vessels using the canal caused so much delay in the passage, that a consultative commission was formed in 1884 to consider the question of either enlarging the existing canal or constructing another one alongside it. After full investigation they unanimously decided in favour of increasing the depth of the canal from 26 feet to 27 feet 10 inches, and the width from 72 feet to 121 feet 4 inches. This work, which was delayed through financial considerations and the traffic on the canal, was not completed till December 1898. The dredging on the canal is being continued, and it is expected that a depth of 31 feet will be obtained by 1902. The ultimate width (at a depth of 26 feet 3 inches) is intended to be 213 feet in straight reaches, and 246 to 260 feet on curves, between Port Said and the Bitter Lakes; thence to Suez 246 feet, increasing to 262 feet on curves. The limit of draught of vessels has been increased from 24 feet 6 inches to 25 feet 7 inches, nine additional sidings or passing-places have been provided, and the general use of the electric light has enabled steamers to continue their voyage day and night, thus considerably shortening the time occupied in passing through the canal.

Corinth Canal.—This ship canal crosses the Isthmus of Corinth, the land along its route being low at each end, but high in the central portion. It is the revival of a scheme dating back so far as 600 B.C., when Periander employed Egyptian engineers to survey the isthmus; in A.D. 66 Nero commenced the works along the site of the present canal, but at his death they were abandoned. After the failure to construct the canal, a slipway was made, over which small vessels were transferred on wooden rollers. The works of the canal were commenced in 1882, but were not completed until 1893 through lack of funds. It is nearly 4 miles long, and it shortens the sea route from the Gulf of Patras to the Gulf of Athens by 180 miles. It passes through the isthmus in a straight line, with the advantage of not crossing any river; only one bridge, serving both for railway and road traffic, was required over the canal to join the island cut off from the mainland. The bottom width of the canal is 72 feet, the depth of water 26 feet. The work was commenced by dredging entrance canals at each end and constructing breakwaters. Trial shafts were sunk along the line of the canal to determine the nature of the strata through which the cutting had to be made, but as has often been the case with other works of a similar character, the material proved to be of a more difficult nature than had been anticipated, and the numerous faults and irregularities in the strata largely increased the cost beyond the estimate. At one point the cutting is 287 feet deep, and for a length of 2 miles it averages 200 feet. The total amount of excavation was nearly 15,000,000 cubic yards. Much of this was rock, but as it was too soft to resist erosion by the wash of steamers, long lengths of the canal had to be protected by masonry or rubble stone, 436,000 cubic yards being quarried for this purpose. Notwithstanding these costly precautions, the sides of the canal have given much trouble since its opening, and slips have occurred causing blocks to traffic. Owing to deficient width and strong currents, the traffic is principally confined to small vessels and passenger steamers. The total cost amounted to nearly £3,000,000.

Cronstadt Canal.—This canal was made with the object of bringing St Petersburg into direct connexion with the Baltic for large vessels; these had previously been prevented from reaching that city by the bar of the Neva, and the transhipment of their cargoes into barges at Cronstadt caused considerable expense and delay. Peter the Great originally designed and began the canal, but the works were not proceeded with after his death. In 1877 operations were again commenced, and they were completed in 1885. Starting from the Neva at St Petersburg, the canal diverges from the estuary channel and proceeds in a south-westerly direction for about 2 miles; then curving round towards the north-west, it runs in a straight line to Cronstadt, the total distance being 17½ miles. For the first 7½ miles it is protected by embankments formed with part of the excavated material, and it

has a bottom width of 207 feet; for the remaining 10 miles it has a bottom width of 275 feet, and is merely a dredged channel through the gulf, without embankments. The depth is 22 feet deep throughout. Three basins, formed by widening out the canal near St Petersburg, give an area of 230 acres for the accommodation of shipping. The total cost of the work, about £1,300,000, was paid by the State, and there are no tolls.

Baltic and Black Sea Canal.—A canal has been projected from the Baltic to the Black Sea utilizing the rivers *en route*. It is proposed to have a bottom width of 115 feet, and a depth throughout of 28 feet, but its great length, nearly 1000 miles, brings up the estimated cost to £100,000,000. The advantage of a deep canal between the Baltic and the Black Sea, entirely through Russian territory, which would enable men-of-war and other steamers to pass inland, is obvious; but it is probable that it would be closed by ice in the winter season, and its heavy cost also makes it very doubtful whether the Russian Government will ever undertake the work.

The North Sea and Baltic Canal.—This canal (officially called the Kaiser-Wilhelm Canal) was constructed by the German Government between the years 1887 and 1895, at a cost of about £8,000,000 (of which £2,550,000 was paid by Russia, and the rest by the Imperial Exchequer). It affords a better and shorter route than the sea passage; but it was mainly designed for strategic reasons, its width and depth allowing large ironclads to pass through the German territory of Holstein from the Baltic to the North Sea, without the dangers and delay of the long voyage round Jutland. The average time for passing through the canal is eight to ten hours. It begins in the river Elbe, near Brunsbüttel, and thence traversing the Kuden Lake, passes south of Rendsburg and the Lower Eider to Holtenau, in the harbour of Kiel Bay. It is 61½ miles long, with a depth of 29½ feet, and a surface breadth of 219 feet; but as its bottom width is only 72 feet, large vessels can only pass each other at six places, about 2½ miles apart, where it is specially widened out for the purpose. Locks (492 feet long between the gates, 82 feet

SKETCH MAP OF THE NORTH SEA AND BALTIC CANAL.

broad, and 32 feet deep) have been constructed at each end to regulate the height of the water, which is level throughout the whole length. The canal is crossed by two fixed bridges 138 feet above water-level, one at Grünthal, with a span of 513 feet, carrying the Neumünster-Heide Railway line. The other at Lewensau, near Kiel, 535 feet in span, carrying the Kiel-Flensburg Railway line. There are also three double swing bridges, worked by hydraulic power, at Brunsbüttel, Rendsburg, and between Rendsburg and Kiel. The total amount of excavation was 106,000,000 cubic yards. The work was very difficult through the low lands of the Kuden Lake, where wide sand dams had to be formed on each side of the canal on soft peaty soil; after the dams had sunk through the peat, the canal was dredged between them, the banks being now formed by the sand dams. The advantage to Germany of a secure inland waterway for the navy is important, but the use by the mercantile marine is only slowly developing, in consequence of the saving in time being to some extent neutralized by the tolls charged on the canal.

The extent to which the canal has been used, together with particulars of revenue and expenditure, is shown in the subjoined table:—

Year.	Number of Vessels passing through.	Tonnage.	Receipts.	Expenditure.	Percentage tonnage, German.
1896	20,068	1,751,065	£48,088	£111,300	67·8
1897	21,904	2,345,849	59,936	103,740	...
1898	25,224	3,009,011	76,780	113,900	69·3
1899	26,524	3,451,273	89,370	...	65
1900	29,571	4,282 258	106,658	...	62·3

Brussels Canal.—Brussels has long been connected with Antwerp and the Scheldt by a canal 17½ miles in length with three locks; this begins in a basin at Brussels, and terminates opposite Boom, near Willebroeck, in the river Rupel, by which vessels pass to the Scheldt. As the depth of the canal is only 10½ feet, its use is confined to vessels not exceeding 400 tons. It is now proposed to increase the depth to 20 feet, and to enlarge the locks in order to allow steamers of 2000 tons to reach Brussels. The necessary funds, estimated at about £1,500,000, are to be provided by the State, the city, and the neighbouring communes.

Ghent Canal.—Like other towns in Belgium and Holland, Ghent at an early date began to develop a waterway to the sea, and a canal was opened in 1561 to a tributary of the Scheldt at Sas-de-Gand. In 1758 the opening of the canal from Ghent to Bruges gave it another but longer route. It was found that the navigation to the Scheldt was silting up, and a canal was made from Sas-de-Gand to Terneuzen on the Scheldt, which gave a continuous and direct route to the sea, passing partly through Holland and partly through Belgium. By a convention between those countries a considerable enlargement of the canal was carried out, and the work was completed in 1883. The canal is 20 feet deep, with a bottom width of about 56 feet. There are locks at Sas-de-Gand and Terneuzen 295 feet long and 39½ feet wide. The docks at Ghent have been enlarged, and the result of improving the canal has been a considerable increase in the traffic, and in the trade of Ghent.

Bruges Canal.—During the Middle Ages Bruges was a port of importance, having communication with the sea by means of a canal to the Zwyn estuary, which, however, ultimately filled up with sand to such an extent as to prevent navigation. A canal was afterwards made to Ostend, but owing to the increasing size of seagoing vessels, a project was sanctioned for a larger and more direct canal to Zeebrugge, on the seacoast. The work was commenced in 1896, and as it is only 6¼ miles long, through flat land, it is free from the difficulties that other ship canals have met with; it is 26¼ feet deep, having a bottom width of 72 feet, with flat slopes pitched with stone near the water-level. The canal is expected to be completed in 1902; it is being excavated by dredgers which deposit the soil direct on to the adjacent land by means of shoots, thus forming embankments on each side of the canal. As the coast is not favourable for a deep harbour, an embankment, continued by an open jetty and terminating in a solid breakwater nearly 5000 feet long, is being made to protect the entrance to the canal. The embankment extends to low water west of the canal; the open jetty is designed to permit the flow of the tide across the entrance to scour away deposits of sand or silt. The breakwater curves eastwards for the greater part of its length, when it becomes almost parallel with the shore, extending past the canal entrance. As the harbour will be used as a port of call, the breakwater is provided with a quay wall, railway

lines, and sheds. The outer part of the breakwater is formed of large concrete blocks weighing 2500 to 3000 tons each, in order better to resist the heavy seas on this exposed coast; the upper courses are blocks of 50 tons each. By an ingenious arrangement the largest blocks, which are 24½ feet thick and 26 feet in height, are made hollow in iron caissons; when set hard, they are floated out and sunk in their position in the breakwater, the central portion of the block being then filled by concrete lowered down by means of cranes and skips. The harbour formed by the breakwater will be about 270 acres in area. From it an entrance channel extends to the sea lock, which is 840 feet long between the caissons that here take the place of ordinary gates; the lock is 79 feet wide at the bottom, and several vessels of moderate size can be locked through at the same time. The caissons, which run on wheels into recesses in the lock walls, weigh 479 tons each, and they have the advantage of being able to maintain the level of the water in the canal either above or below the tide outside; to effect this with ordinary lock gates, double pairs of gates would have been required. The docks which are being constructed at Bruges are provided with railway lines, sheds, and cranes, and have communications with the Ostend and other canals. The commercial success of the canal has yet to be proved. It will have to contend with neighbouring ports, but it is expected that this enterprise, which is being carried out at the joint cost of the State and local bodies, will restore the past prosperity of Bruges.

Proposed Paumben Canal.—This scheme, referred to in the 9th edition of this work, has not been proceeded with.

(E. L. W.)

Ship Canals in America.

Isthmian Canal Schemes.—When he crossed the Atlantic, the object Columbus had in view was to find a western passage from Europe to Cathay. It was with the greatest reluctance, and only after a generation of unremitting toil that the explorers who succeeded him became convinced that the American continent was continuous, and formed a barrier of enormous extent to the passage of vessels. The question of cutting a canal through this barrier at some suitable point was immediately raised. In 1550 the Portuguese navigator Antonio Galvao published a book to demonstrate that a canal could be cut at Tehuantepec, Nicaragua, Panama, or Darien, and in 1551 the Spanish historian Gomara submitted a memorial to Philip II. urging in forcible language that the work be undertaken without delay. But the project was opposed by the Spanish Government, who had now concluded that a monopoly of communication with their possessions in the new world was of more importance than a passage by sea to Cathay. It even discouraged the improvement of the communications by land. To seek or make known any better route than the one from Porto Bello to Panama was forbidden under penalty of death. Geographical research was stifled. For more than two centuries no serious steps were taken towards the construction of the canal, if exception be made of the disastrous attempt at colonization at Caledonia Bay by the Scots under Paterson in 1698. In 1771 the Spanish Government, having changed its policy, ordered a survey for a canal at Tehuantepec, and finding that line impracticable, ordered surveys in 1779 at Nicaragua, but political disturbances in Europe soon prevented further action. In 1808 the isthmus was examined by Alexander von Humboldt, who pointed out the lines which he considered worthy of study. After the Central American Republics acquired their independence in 1823, there was a decided increase of interest in the canal question. In 1825 the Republic of the Centre, in consequence of receiving applications for concessions from citizens of Great Britain, and also from citizens of the United States, made overtures to the United States for aid in constructing a canal, but they resulted in nothing. In 1830 a concession was granted to a Dutch corporation under the special patronage of the King of the Netherlands to construct a canal through Nicaragua, but the revolution and the separation of Belgium from Holland soon followed, and the scheme fell through. Since that date numerous concessions have been granted to citizens of the United States, France, and Belgium, both for the Nicaragua and the Panama lines, but with the exception of the concession of 1878 for Panama and that of 1887 for Nicaragua, no work of construction has been done under any of them.

Knowledge of the topography of the isthmus was extremely vague until the great increase of travel due to the discovery of gold in California in 1849 rendered improved communications a necessity. A railroad at Panama and a canal at Nicaragua were both projected. Instrumental surveys for the former in 1849, and for the latter in 1850, were made by American engineers, and, with some small exceptions, were the first really accurate surveys made up to that time, though numerous exploring expeditions had been undertaken, some under Government auspices and others under private enterprise, some furnishing valuable information and others simply adding to the confusion already existing. But they resulted in geographical knowledge sufficient to eliminate from consideration all but the following routes:—1. Nicaragua; 2. Panama; 3. San Blas; 4. Caledonia Bay; 5. Darien; 6. Atrato River, of which last there were four variants, the Tuyra, the Truando, the Napipi, and the Bojaya. In 1866, in response to an inquiry from Congress, Admiral Charles H. Davis, U.S. Navy, reported that "there does not exist in the libraries of the world the means of determining even approximately the most practicable route for a ship canal across the American isthmus." To clear up the subject the United States Government sent out, between 1870 and 1875, a series of expeditions under officers of the Navy, by whom all of the above routes were examined. The result was to show that the only lines by which a tunnel could be avoided were the Panama and the Nicaragua lines; and in 1876 a United States Commission reported, after careful consideration of all the data collected, that the Nicaragua route possessed greater advantages and offered fewer difficulties than any other. Whether they would have so reported if they had possessed all the information now available may be doubted, but from that day the Nicaragua line has been the favourite in American public opinion. At Panama the isthmus is narrower than at any other point except San Blas, its width in a straight line being only 35 miles, and the height of the continental divide is only 300 feet, which is higher than the Nicaragua summit, but less than half the height on any other route. At Nicaragua the distance is greater, being about 156 miles in a straight line, but more than one-third is covered by Lake Nicaragua, a sheet of fresh water with an area of about 3000 square miles and a maximum depth of over 200 feet, the surface being about 105 feet above sea-level. Lake Nicaragua is connected with the Atlantic by a navigable river, the San Juan, and is separated from the Pacific by the continental divide, which is about 160 feet above sea-level. For a considerable portion of its length the San Juan forms the boundary between Nicaragua and Costa Rica. At Nicaragua only a canal with locks can be considered. At Panama a sea-level canal is a physical if not a financial possibility.

By the Clayton-Bulwer Treaty of 1850 with Great Britain, by the Treaty of 1846 with New Granada (Colombia), Article XXXV., and by the Treaty of 1867 with

Nicaragua, Article XV., the United States has guaranteed that the canal shall be neutral, and, furthermore, that it shall be used and enjoyed upon equal terms by the citizens of both countries in each case. Nicaragua guaranteed by her Treaty of 1859 with France that the citizens of both countries should use the canal upon equal terms, and France guaranteed its neutrality. Nicaragua guaranteed by her Treaty of 1858 with Belgium and of 1850 with Spain, that the citizens of those countries should enjoy the same advantages as are granted to the most favoured nations. Costa Rica granted by her Treaty of 1850 with Spain free transit upon the same terms as for her own citizens. All of these treaties are still in force. Colombia has not made special treaties with nations other than the United States, but in addition to the Treaty of 1846 just mentioned, she is committed in the law of concession to the principle that the canal shall be neutral. A modification of the Clayton-Bulwer Treaty being necessary to enable the United States to build the canal, a Treaty making such modifications, but preserving the principle of neutrality, known as the Hay-Pauncefote Treaty, was negotiated with Great Britain in 1900; it was amended by the United States Senate, and the amendments not proving acceptable to Great Britain, the Treaty lapsed in March 1901; but a new Treaty was negotiated in the autumn, and accepted in December by the U.S. Senate.

Many elaborate investigations of the probable traffic and resulting revenue of a canal have been made. The most recent and most trustworthy are those of the new Panama Canal Company and those of the Isthmian Canal Commission. The Commission's estimates are slightly in excess of those of the Company, but being of later date, rather confirm than controvert the accuracy of both. The Commission found that the amount of shipping which would have used the canal if open in the year 1898–99 was 5,736,456 tons net register, and that the probable amount for 1909 would be about 7,000,000 tons.

The completion of the Suez Canal in 1869, and its subsequent success as a commercial enterprise, drew attention more forcibly than ever to the American isthmus. The citizens of France, who had gained money and fame in that enterprise, were especially eager to embark in a new one of similar character. In the year 1876 an association entitled "Société Civile Internationale du Canal Interoceanique" was organized in Paris to make surveys and explorations for a ship canal. An expedition under the direction of Lieutenant L. N. B. Wyse, an officer of the French Navy, was sent to the isthmus to examine the Panama line. In May 1878 Lieutenant Wyse, in the name of the association, obtained a concession from the Colombian Government, commonly known as the Wyse Concession. This is the concession under which work upon the Panama Canal has been prosecuted. Its first holders did no work of construction.

First Panama Company.

In May 1879 an International Congress composed of 135 delegates from various nations—some from Great Britain, United States, and Germany, but the majority from France—was convened in Paris under the auspices of Ferdinand de Lesseps, to consider the best situation for, and the plan of, a canal. After a session of two weeks the Congress decided that the canal should be at the sea-level, and at Panama. Immediately after the adjournment of the Congress the Panama Canal Company was organized under a general law of France, with Lesseps as president, and it purchased the Wyse concession from the company which held it at the price of ten million francs. An attempt to float this company in August 1879 failed, but a second attempt, made in December 1880, was fully successful, 600,000 shares of 500 francs each being sold. The next two years were devoted to surveys and examinations and preliminary work upon the canal. The plan adopted was for a sea-level canal having a depth of 29½ feet and bottom width of 72 feet, involving excavation estimated at 157,000,000 cubic yards. The cost was estimated by Lesseps in 1880 at 658,000,000 francs, and the time required at eight years. The terminus on the Atlantic side was fixed by the anchorage at Colon, and that on the Pacific side by the anchorage at Panama. Leaving Colon (see Map) the canal passes through low ground by a direct line for a distance of 6 miles to Gatun, where it intersects the valley of the Chagres river; passes up that valley for a distance of 21 miles to Obispo, where it leaves the Chagres and ascends the valley of a tributary, the Cumacho; cuts through the watershed at Culebra, and thence descends by the valley of the Rio Grande to Panama Bay. Its total length from deep water in the Atlantic to deep water in the Pacific is about 47 miles. It is laid out in such a way as to give easy curvature everywhere; the sharpest curve, of which there is but one, has a radius of 6200 feet, four others have a radius of 8200 feet, and all others have a radius of 9800 feet or more. To secure this it was necessary to select a point for crossing the watershed where the height was somewhat greater than that of the lowest pass. The maximum height on Culebra Cut is about 328 feet above sea-level. The harbours at Colon and Panama are not first-class, but are sufficiently good for the terminus of a canal where the stay of vessels is short. The line is essentially the same as that followed by the Panama railroad, the concession for which granted a monopoly of that route; the Wyse Concession, therefore, was applicable only upon condition that the canal company could come to an amicable agreement with the railroad company.

The principal difficulties to be encountered in carrying out this plan consist in the enormous dimensions of the cut to be made at Culebra, and in the control of the Chagres river, the valley of which is occupied by the canal for so large a part of its length. This stream is of torrential character, its discharge varying from a minimum of about 350 cubic feet to a maximum of over 100,000 cubic feet per second. It rose at Gamboa 1st December 1890, 18¾ feet in twelve hours, its volume increasing from 15,600 cubic feet to 57,800 cubic feet per second at the same time; and similar violent changes are not uncommon. To admit a stream of this character to the canal would be an intolerable nuisance to navigation unless space could be provided for its waters to spread out. For a canal with locks the remedy is simple, but for a sea-level canal the problem is much more difficult, and no satisfactory solution of the question was ever reached under the Lesseps plan.

Work under this plan continued until the latter part of 1887, the management being characterized by a degree of extravagance and corruption that have had few if any equals in the history of the world. By that time it had become evident that the canal could not be completed at the sea-level with the resources of time and money then available. The plan was accordingly changed to one including locks, and work was pushed on with vigour until 1889, when the company, becoming bankrupt, was dissolved by a judgment of the Tribunal Civil de la Seine, dated 4th February 1889, a liquidator being appointed by the court to take charge of its affairs. One of the more important duties assigned to this official was to keep the property together and the concession alive, with a view to the formation of a new company for the completion of the canal. He gradually reduced the number of men employed, and finally suspended the works on 15th May 1889. He then proceeded to satisfy himself that the canal project was feasible, a question about which the failure of the

company had caused grave doubts, and to this end caused an inquiry to be held by a commission of French and foreign engineers, having at their head M. Guillemain, the Director of the National School of Ponts et Chaussées. This commission reported on 9th May 1890 that a canal with locks, for which they submitted a plan, could be built in eight years at a cost of 580,000,000 francs for the works, which sum should be increased to 900,000,000 francs to include administration and financing. They reported that the plant in hand was in good condition and would probably suffice for finishing the canal, and they estimated the value of the work done and of the plant in hand at 450,000,000 francs.

The time within which the canal was to be completed under the Wyse Concession having nearly expired, the liquidator sought and obtained from the Colombian Government an extension of ten years. The law which granted this extension is dated 26th December 1890, and it provided that a new company should be formed and work upon the canal resumed on or before 28th February 1893. This condition not having been fulfilled, a second extension was sought and obtained 4th April 1893; it provided that the term of ten years granted by the extension of 1890 should begin to run not later than 31st October 1894. By an agreement dated 26th April 1900, the time was still further extended to 31st October 1910. For each of these extensions the Colombian Government exacted heavy subsidies. After many difficulties and delays the liquidator finally secured the organization of a new company on the 20th October 1894. The old company and the liquidator had raised, by the sale of stock and bonds, the sum of 1,271,682,637 francs. The securities issued to raise this money had a par value of 2,245,151,200 francs, and they are held by about 200,000 persons. In all about 72,000,000 cubic yards had been excavated, and an enormous quantity of machinery and other plant had been purchased and transported to the isthmus at an estimated cost of 150,000,000 francs. Nearly all of the stock of the Panama Railroad—68,534 of the 70,000 shares existing—also had been purchased, at a cost of 93,268,186 francs.

Second Panama Company.

The new company has been regularly organized under French law, and has been recognized by the Colombian Government. It is technically a private corporation, but the great number of persons interested in the securities of the old company, and the special legislation of the French Chambers, give it a semi-national character. By the law of 8th June 1888, all machinery and tools used in the work must be of French manufacture, and raw material must be of French origin. Its capital stock consists of 650,000 shares of 100 francs each, of which 50,000 shares belong to Colombia. It succeeded to all the rights of the old company in the concessions, works, lands, buildings, plant, maps, drawings, &c., and shares of the Panama Railroad upon the following conditions, viz.:—It undertook to finish the canal if, after further careful study, that were found expedient; after completion the revenues were to be applied, first to the payment of all subsidies due to the Colombian Government, all expenses of operation and maintenance, all interest and sinking fund on loans, and all sums required by law for a reserve fund; then five per cent. on the capital stock was to be set aside for the payment of dividends, and to provide a sinking fund for redeeming the stock, all of which must be redeemed within ninty-nine years; and the balance remaining, if any, was to be divided into two parts, one of forty per cent. to go to the stockholders, and the remaining sixty per cent. to the liquidator. For the contingency that the canal should not be completed, special conditions were made as to the Panama Railroad shares. These are to revert to the liquidator, but the company has the privilege of purchasing them for 20,000,000 francs in cash and half the net annual profits of the road. The Panama Railroad retains its separate organization as an American corporation. Its relations to the Colombian Government have remained unchanged throughout the vicissitudes of the canal company, its present principal stockholder. The security-holders of the old canal company thus have a contingent interest in the new company. They have no direct voice in its management, but to protect their interests the liquidator has the right to appoint an Auditing Commission of three persons to inspect the works and accounts, the expense to be borne by the company. The old security-holders have the preference in subscriptions for one-half the present stock of the company and for the whole of all future issues.

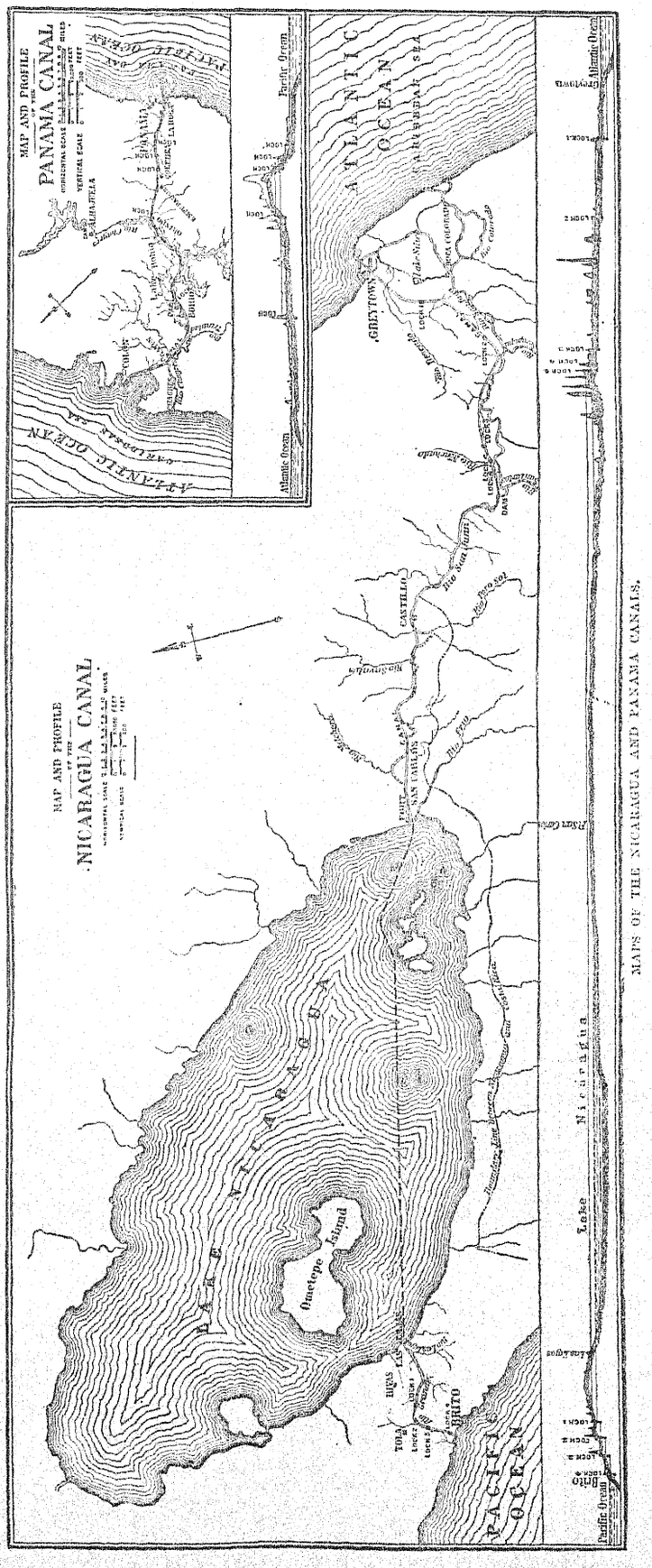
Immediately after its organization in 1894 the new company took possession of the property (except the Panama Railroad shares, which are held in trust for its benefit), and proceeded to make a new study of the entire subject of the canal in its engineering and commercial aspects. It resumed the work of excavation, with a moderate number of men sufficient to comply with the terms of the concession, in a part of the line—the Emperador and Culebra cuts—where such excavation must contribute to the enterprise if completed under any plan. By the middle of 1895 about 2000 men had been collected, and since that time the work has progressed continuously, the number of workmen varying between 1900 and 3600. The amount of material excavated to the end of 1899 was about five million cubic yards. The amount expended to 30th June 1899 was about 35,000,000 francs, besides about 6,500,000 francs advanced to the Panama Railroad Company for building a pier at La Boca.

The charter provided for the appointment by the company and the liquidator of a special engineering commission of five members, to report upon the work done and the conclusions to be drawn therefrom, this report to be rendered when the amounts expended by the new company should have reached about one-half its capital. The report was to be made public, and a special meeting of the stockholders was then to be held to determine whether or not the canal should be completed, and to provide ways and means. The time for this report and special meeting arrived in 1898. In the meanwhile the company had called to its aid a Technical Committee composed of fourteen engineers, European and American, some of them among the most eminent in their profession. After a study of all the data available, and of such additional surveys and examinations as it considered should be made, this committee rendered an elaborate report dated 16th November 1898. This report was referred to the above-mentioned statutory commission of five, who reported in 1899 that the canal could be built according to that project within the limits of time and money estimated. The special meeting of stockholders was called immediately after the regular annual meeting of 30th December 1899. It is understood that the liquidator (who holds about one-fourth the stock) refused to take part in it, and that no conclusions were reached as to the expediency of completing the canal or as to providing ways and means. The engineering questions had been solved to the satisfaction of the company, but the financial questions had been made extremely difficult, if not insoluble, by the appearance of the United States Government in the field as a probable builder of an isthmian canal. The company continued to conduct its operations in a provisional way, without appealing to the public for capital.

The plan adopted by the company involves two levels above the sea-level (see Map)—one of them an artificial lake to be created by a dam at Bohio, to be reached from the Atlantic by a flight of two locks, and the other, the summit-level, to be reached by another flight of two locks from the preceding. The summit-level is to have its surface at high water 102 feet above the sea, and to be supplied with water by a feeder leading from an artificial reservoir to be constructed at Alajuela in the upper Chagres valley; the ascent on the Pacific side to be likewise by four locks. The canal was to have a depth of 29½ feet and a bottom width of about 98 feet, with an increased width in certain specified parts. Its general plan was the same as that adopted by the old company. The locks were to be double, or twin locks, the chambers to have a serviceable length in the clear of 738 feet, with a width of 82 feet and a depth of 32 feet 10 inches, with lifts varying from 20 to 33 feet, according to situation and stage of water. The time required to build the canal was estimated at ten years, and its cost at 525,000,000 francs for the works, not including administration and financing. The old Panama Canal Company began its work without adequate knowledge of the physical conditions of the isthmus. It inaugurated at an early day some of the surveys and examinations required to supply the deficiency, and some of these it maintained as long as it continued to exist. Additional surveys were made by the liquidator, and very extended surveys and observations have been made by the new company. The information concerning all that relates to the topography, hydrography, and geology of the isthmus, as well as the cost of work, is now much more complete than is usual before the inauguration of an engineering enterprise in a new country, and estimates of cost are proportionately more trustworthy.

Nicaragua scheme.

The occupation of the Panama route by Europeans, and the prospect of a canal there under foreign control, was not a pleasing spectacle to the people of the United States. The favour with which the Nicaragua route had been considered since 1876 began to assume a partisan character, and the movement to construct a canal on that line to assume a practical shape. In 1884 a Treaty, known as the Frelinghuysen-Zarala Treaty, was negotiated with Nicaragua, by the terms of which the United States Government was to build the canal without cost to Nicaragua, and after completion it was to be owned and managed jointly by the two Governments. The Treaty was submitted to the United States Senate, and in the vote for ratification, 29th January 1885, received thirty-two votes in its favour against twenty-three. The necessary two-thirds vote not having been obtained, the Treaty was not ratified, and a change of administration occurring soon afterwards, it was withdrawn from further consideration. This failure led to the formation in New York by private citizens in 1886 of the Nicaragua Canal Association, for the purpose of obtaining the necessary concessions, making surveys, laying out the route, and organizing such corporations as should be required to construct the canal. They obtained a concession from Nicaragua in April



MAPS OF THE NICARAGUA AND PANAMA CANALS.

1887, and one from Costa Rica in August 1888, and sent parties to survey the canal. An Act for the incorporation of an association to be known as the Maritime Canal Company of Nicaragua passed Congress and was approved 20th February 1889, and on 4th May 1889 the company was organized. It took over the concessions and, acting through a construction company, began work upon the canal in June 1889. Operations upon a moderate scale and mainly of a preliminary character were continued until 1893, when the financial disturbances of that period drove the construction company into bankruptcy and compelled a suspension of the work. It has not since been resumed. At that time the canal had been excavated to a depth of 17 feet and a width of 280 feet for a distance of about 3000 feet inland from Greytown; the canal line had been cleared of timber for a distance of about twenty miles; a railroad had been constructed for a distance of about 11 miles inland from Greytown; a pier had been built for the improvement of Greytown harbour; a telegraph line had been placed from Greytown to Castillo; buildings for offices, quarters, hospitals, storehouses, &c., had been erected, and wharves and landing-places had been constructed; and a considerable dredging plant had been purchased. In all, about $4,500,000 had been expended.

Congress continued to take an interest in the enterprise, and in 1895 provided for a Board of Engineers to inquire into the possibility, permanence, and cost of the canal as projected by the Maritime Canal Company. The report of this Board, dated April 1895, severely criticized the plans and estimates of the company, and led to the appointment in 1897 of another Board, to make additional surveys and examinations, and to prepare new plans and estimates. The second Board recommended some radical changes in the plans, and especially in the estimates, but its report was not completed when the revival of the Panama scheme attracted the attention of Congress, and led to the creation in 1899 of the present Isthmian Canal Commission to examine and report upon all practicable routes for a canal across the isthmus. In the meanwhile the property of the Maritime Canal Company has become nearly worthless through decay, and its concession has been declared forfeited by the Nicaraguan Government.

Isthmian Canal Commission.

The interest of the United States in an isthmian canal was not essentially different from that of other maritime nations down to about the middle of the 19th century, but it assumed great strength when California was acquired, and it has steadily grown as the importance of the Pacific States has developed. In 1848, and again in 1884, treaties were negotiated with Nicaragua authorizing the United States to build the canal, but in neither case was the treaty ratified. The Spanish War of 1898 gave a tremendous impetus to popular interest in the matter. It seems now to be an article of the national faith that the canal must be built, and, furthermore, that it must be under American control. To the American people the canal appears to be not merely a business enterprise from which a direct revenue is to be obtained, but rather a means of unifying and strengthening their national political interests, and of developing their industries, particularly in the Pacific States and Territories; in short, a means essential to their national growth. The Isthmian Canal Commission created by Congress in 1899 to examine all practicable routes, and to report which was the most practicable and most feasible for a canal under the control, management, and ownership of the United States, reported that there was no route which did not present greater disadvantages than those of Panama and Nicaragua. It recommended that the canal should have a depth of 35 feet and bottom width 150 feet, the locks to be double, the lock chambers to have a length 740 feet, width 83 feet, and depth 35 feet in the clear. The cost of a canal at Panama with these dimensions, built essentially upon the French plans, was estimated at $156,378,258. A plan, however, was recommended in which the height of the Bohio dam is increased about 20 feet, the level of Lake Bohio raised by that amount, the lake made the summit-level, and the Alajuela dam omitted. The cost upon this plan was estimated at $143,971,127.

The plan recommended by the Commission for Nicaragua is shown in the map. Beginning at Greytown on the Caribbean Sea, where an artificial harbour is to be constructed, the line follows the valley of the San Juan for 100 miles to Lake Nicaragua; thence across the lake about 70 miles to the mouth of Las Lajas River; then up the valley of that stream through the watershed, and down the valley of the Rio Grande, 17 miles to Brito on the Pacific, where also an artificial harbour is to be constructed. The distance from ocean to ocean is 187 miles. About midway between the lake and the Caribbean the San Juan receives its most important affluent, the San Carlos, and undergoes a radical change in character. Above the junction it is a clear water stream, capable of improvement by locks and dams. Below, it is choked with sand, and not available for slack-water navigation. A dam across the San Juan above the mouth of the San Carlos is to maintain the water of the river above that point on a level with the lake. The line of the canal occupies essentially the bed of the river from the lake to the dam; from the dam to the Caribbean it follows the left bank of the river, keeping at a safe distance from it, and occasionally cutting through a high projecting ridge. The lake and the river above the dam constitute the summit-level, which will vary in height at different seasons from 104 to 110 feet above mean sea-level. It will be reached from the Caribbean side by five locks, the first having a lift of $36\frac{1}{2}$ feet, and the others a uniform lift of $18\frac{1}{2}$ feet each, making a total lift of $110\frac{1}{2}$ from low tide in the Caribbean to high tide in the lake. From the Pacific side the summit will be reached by four locks having a uniform lift of $28\frac{1}{2}$ feet each, or a total lift of 114 feet from low tide in the Pacific to high tide in the lake. The time required to build the canal is estimated at ten years, and its cost at $200,540,000.

The Commission ended its report thus:—

1. The estimated cost of building the Nicaragua Canal is about $58,000,000 more than that of completing the Panama Canal, leaving out the cost of acquiring the latter property. This measures the difference in the magnitude of the obstacles to be overcome in the actual construction of the two canals, and covers all physical considerations, such as the greater or less height of dams, the greater or less depth of cuts, the presence or absence of natural harbours, the presence or absence of a railroad, the exemption from or liability to disease, and the amount of work remaining to be done. The New Panama Canal Company has shown no disposition to sell its property to the United States. Should that company be able and willing to sell, there is reason to believe that the price would not be such as would make the total cost to the United States less than that of the Nicaragua Canal.

2. The Panama Canal, after completion, would be shorter, have fewer locks and less curvature than the Nicaragua Canal. The measure of these advantages is the time required for a vessel to pass through, which is estimated for an average ship at twelve hours for Panama and thirty-three hours for Nicaragua. On the other hand, the distance from San Francisco to New York is 377 miles, to New Orleans 579 miles, and to Liverpool 386 miles greater *viâ* Panama than *viâ* Nicaragua. The time required to pass over these distances being greater than the difference in the time of transit through the canals, the Nicaragua line, after completion, would be somewhat the more advantageous of the two to the United States, notwithstanding the greater cost of maintaining the longer canal.

3. The Government of Colombia, in which lies the Panama Canal, has granted an exclusive concession, which still has many

years to run. It is not free to grant the necessary rights to the United States, except upon condition that an agreement be reached with the New Panama Canal Company. The Commission believes that such agreement is impracticable. So far as can be ascertained, the company is not willing to sell its franchise, but will allow the United States to become the owner of part of its stock. The Commission considers such an arrangement inadmissible. The Governments of Nicaragua and Costa Rica, on the other hand, are untrammelled by concessions, and are free to grant to the United States such privileges as may be mutually agreed upon.

In view of all the facts, and particularly in view of all the difficulties of obtaining the necessary rights, privileges, and franchises on the Panama route, and assuming that Nicaragua and Costa Rica recognize the value of the canal to themselves, and are prepared to grant concessions on terms which are reasonable and acceptable to the United States, the Commission is of the opinion that "the most practicable and feasible route for" an isthmian canal, to be "under the control, management, and ownership of the United States," is that known as the Nicaragua route.

Other American Canals.—The most important ship canal now in operation in America is the short canal which flanks the rapids in the Sault Ste Marie River, connecting Lake Superior with Lake Huron. The clear dimensions of the principal lock are: length 800 feet, width 100 feet, and depth over mitre sill 21 feet, with a lift of 20 feet. The canal is owned and operated by the United States Government free of tolls. It is closed to navigation by ice four or five months of each year. Its trade during the navigation season of 1899, a period of 231 days, comprised 25,255,810 tons of freight, valued at $281,364,750, or more than double the traffic of the Suez Canal.

A scheme has been projected for providing a deep waterway from Lake Superior to the Atlantic Ocean, for which surveys and estimates have been made by a Board of Engineers under the direction of Congress. Under this project the channel ways now connecting Lake Huron with Lake Superior, Lake Michigan and Lake Erie, are to be enlarged, and ship canals are to be constructed from Lake Erie to Lake Ontario, and from Lake Ontario to the Hudson River. The former canal leaves the Niagara River at La Salle above the Niagara Falls, and joins it again at Lewiston below the Falls, its length being 9 miles. For 6 miles the entire excavation is through solid rock. At Lewiston the canal ends with a descent of nearly 320 feet by means of eight double locks, of which six have a lift of 40 feet each, and two of 39·4 feet each. The canal from Lake Ontario to the Hudson River leaves the lake at Oswego, passes up the Oswego River to Lake Oneida, uses that lake as a summit-level, cuts through the watershed at Rome, descends the valley of the Mohawk River to Schenectady, and then cuts across country to the Hudson River at Normans Kill near Albany. The length of canal to be constructed is 102 miles, and of river to be canalized 96 miles. The lock chambers are to be 694 feet long and 80 feet wide in the clear. The bottom width of the canal is to be 250 feet. Estimates were made for a depth of 21 feet and also for 30 feet. The former was $206,358,103, and the latter $317,284,348. (O. H. E.)

Canadian Waterways.

Canada has the finest system of inland navigations in the world, notwithstanding their liability to being closed by ice in the winter. Previous to confederation the canals were owned by the provincial governments, but after the union of the provinces in 1867 they became the property of the Dominion Government. In 1870 a Commission was appointed to report on a "thorough and comprehensive improvement of the canal system," and after a careful inquiry they reported in favour of large locks and deeper water over the whole of the St Lawrence route, the Welland Canal, and the Sault Ste Marie Canal. These canals, 70½ miles in length, now form links uniting the great lakes, giving an unbroken water communication from Duluth on Lake Superior, 2260 miles in the interior, Chicago on Lake Michigan, and Detroit, Buffalo, and Toronto on Lakes Huron, Erie, and Ontario, bringing the great wheat-growing districts which border upon the lakes into connexion with the seaboard. The distance from Montreal to Liverpool is 315 miles less than that from New York to the same port. The locks on the improved St Lawrence and Welland Canals are 270 feet long and 45 feet wide, whereas the locks on the Erie Canal, the waterway from the lakes to New York, are much smaller, and have only a depth of water of from 7 to 9 feet, in place of 14 feet on the canals leading to Montreal. Steamers of moderate size are now able to bring cargo direct from Chicago to Europe *viâ* Montreal; unless the proposed enlargement of the Erie Canal is carried out, a considerable proportion of the grain trade will be diverted from the route to New York to Montreal. The construction of another waterway from Georgian Bay by way of the Ottawa River to Ottawa City, and thence to Montreal, has been sanctioned by the Legislative Council at Ottawa. The St Clair and Lake Erie Canal, in course of construction across the Canadian peninsula between the two lakes, will be 13 miles in length, with a dredged channel in Lake St Clair 19 miles long. This will give a total length of 32 miles, as against 111 miles through the Detroit River.

The lake traffic is very large. In 1890 the tonnage registered at American ports passing through the Detroit River both ways was 21,684,000 tons, and in 1899 it was 30,000,000 tons. Montreal is well equipped for ocean traffic, the depth of water to Quebec being 27½ feet, while the harbour and the channel are being improved to 30 feet, with new docks at the east end of the harbour; large grain elevators and warehouses are also provided. With the view of enabling large steamers to partake of the lake traffic, the Sault Ste Marie Canal has been provided with locks 900 feet long, 60 feet wide, and 20½ feet depth of water, and the American St Mary's Falls Canal has now locks 800 feet long, 100 feet wide, and 21 feet depth of water, enabling large steamers or a number of smaller craft to pass at one lockage.

The navigation of the river St Lawrence has been made easy by the construction of lateral canals with locks, to avoid rocky rapids. The principal ones are the Lachine Canal, 8½ miles with 5 locks, cut through a wide bend in the river near Montreal; the Beauharnois Canal, 11¼ miles long with nine locks, connecting the Lakes St Louis and St Francis; and four other canals, with a total length of 23½ miles with 12 locks.

The Welland Canal connects the waters of the Lakes Erie and Ontario across the Niagara peninsula. It was commenced in 1824 and completed in 1833. In 1842 the Canadian Government bought the canal and at once began improvements. The canal is 27½ miles long, with a total rise of 326¾ feet and 26 locks. In 1870 important works were put in hand to enlarge the canal throughout; from Port Dalhousie on Lake Ontario a new channel was cut, 11¾ miles long, to Allanburgh, and from thence to Port Colborne the old canal was enlarged.

The improvement of the waterways of Canada has promoted efficiency and reduced the cost of transit. While railways remain at their original gauge they find they can compete better with the American and Canadian canals by increasing the size of their freight cars, which are now being built to carry 30 to 40 tons, against 8 to 10 tons (the ordinary standard size). Shipowners find that the cost of transport is diminished by an increase in the size of their steamers, and the returns of the Board of Trade

show how rapidly the increase has been growing. This applies equally to the cost of transit on inland waterways, and it is only by following the example set by other countries in improving their canals that manufacturers and traders will gain the benefit of low rates of carriage.

(E. L. W.)

Inland Navigation.

Lord Bacon wrote: "There be three things which make a nation great and prosperous, a fertile soil, busy workshops, and easy conveyance for men and commodities from one place to another." Inland navigation certainly provides the most easy and the cheapest mode of conveyance for minerals and goods, and the last quarter of the 19th century saw great improvements in canals and navigable rivers, more particularly in France, Belgium, Germany, and Canada. But, generally speaking, England has been indifferent to this important question, and the railway companies have been allowed to purchase the canals, with the result that they now possess 1139 miles out of a total length of 3907 miles of navigations in that country. Some of these railway-owned canals are links in main lines of communications, and independent canals in the route are therefore blocked from carrying out improvements that would assist through traffic, by deepening their waterways and enlarging the locks so as to admit of increase in the size of boats, a work which on the continent of Europe has been found efficient in reducing the cost of carriage. The maintenance of the railway-owned navigations is often much neglected, and generally they are useless for the purpose of active competition. The Board of Trade returns of canals and navigations for the year 1898 show that while the traffic on the independent canals had increased five million tons in Great Britain since 1888, the traffic on the railway-owned canals had decreased two million tons in the same period. There may be agricultural districts where the traffic would not justify the cost of bringing the early canals up to the standard of the improved navigations of the present day, but main lines of canals from large manufacturing or mineral districts, capable of taking large barges in trains towed by steam-power, would greatly benefit traders, who now undergo severe competition from other countries that have improved their waterways as being the most economical means of giving cheap carriage of minerals and goods. Mr Samuel Lloyd has proposed taking Birmingham, with its large manufacturing and coal and iron industries, as a centre, and joining it with the rivers Severn, Thames, Mersey, and Humber, by improved canals which, passing through other important districts, would convey exports and imports to and from the principal ports on the English coast and serve local trade.

Canalized Rivers.—Before canals were introduced in Great Britain, locks and weirs were constructed in rivers to improve the navigation, and the increased depth thus obtained, together with the water-power gained at the weirs for mills, was of great advantage. Previously, in dry weather, it was difficult to navigate the rivers, even with diminished cargoes, while the long deep pounds between the locks on the improved navigation provide ample water for lockage-power and form natural reservoirs for dry seasons.

Thames.

The first Act for the improvement of a river was for the Thames in the year 1423, and since that date nearly forty Acts relating to it have been passed. The earliest locks and weirs appear to have been made by the owners of adjoining lands, more with a view to obtain mill-power than to improve the navigation, and heavy charges were levied by the landowners for the use of the locks, which were of the rude type termed flash-locks. In 1730 the river was placed in the hands of Commissioners, with power to levy tolls and construct new locks and weirs; it is now a good barge navigation, notwithstanding the abstraction of a large proportion of the summer flow by the London Water Companies. As it does not pass through any mineral or manufacturing district of importance, the trade on the upper river is not large. Below Richmond, sluices and a lock have been erected across the river to maintain deeper water in the reaches above; they are of the same type as those described in use on the Manchester Ship Canal, except that when raised they take a horizontal position instead of a vertical one. In 1783 an Act was passed authorizing the construction of a canal 40 miles long to unite the Thames and Severn, beginning at Lechlade in Oxfordshire and terminating at Frampton-on-Severn, Gloucestershire. The canal was worked successfully for many years, but had been allowed to fall into a state of disrepair. In 1895 a public trust was formed for the purpose of restoration, and the works have been extensive, including powerful steam-pumps for providing a better supply of water to the summit-level, which is 353 feet above the sea, about midway between Stroud and Cirencester.

Severn.

The river Severn is navigable from Shrewsbury to Gloucester. Acts relating to it were passed from 1503 to 1811, mainly to meet the cost of maintenance and other charges on the towing-paths, and it was not until the year 1842 that a body of Commissioners, representing the various interests on the river, were appointed to raise money on the security of the tolls and improve the navigation. Locks and weirs were constructed between Stourport and Worcester, a distance of 12 miles, and thence to Gloucester (28 miles); dredging and embankments only were employed, because a permanent raising of the level of the river so as to give a navigable depth of 6 feet was objected to by the landowners, as floods often occurred in winter, sometimes rising 18 feet above summer level. It was held by the promoters' engineers that by the proposed plans, which showed long weirs placed obliquely to the current in widened portions of the river, with locks in cuts, the floods would be carried off as rapidly as before, owing to the enlarged width at the weirs and the increased velocity of the floods, which would first pass over a deep channel and an almost vertical weir, instead of a shallow bed with shoals. Eminent engineers gave evidence against this view when the Bill was before the Parliamentary Committee, and it was decided that no locks or weirs were to be built below Worcester. From Worcester to Gloucester the shoals were dredged out, a million tons of marl and gravel being removed, with the result that although only a narrow channel had been cut through the shoals, the removal of those natural weirs caused the summer water-level at Diglis locks, near Worcester, to fall 3 feet. After protracted struggles in Parliament, an Act was obtained in 1853 to construct a lock and weir at Tewkesbury, about half-way between Worcester and Gloucester, and in 1869 further powers were got to construct locks and weirs near Gloucester. These powers were obtained largely by the evidence of landowners above Worcester, who proved that instead of the erection of the weirs damaging the land, as was expected, floods, on the contrary, did not occur so frequently, and passed off the land more rapidly. The canalization of the river was then completed, and there is now a minimum depth of 10 feet of water at all seasons from Gloucester to Worcester, enabling vessels of 300 to 400 tons to reach the latter city. The Severn navigation is an important link in the chain of navigation between the ports of the Bristol Channel and the Midland districts. It connects the Gloucester and Berkeley Ship Canal at Gloucester with

the narrow Worcester and Birmingham Canal, which is now the property of the Gloucester and Berkeley Canal, the Midland Railway Company having failed to get powers to purchase it. At present the large Severn barges have to tranship their cargoes into small canal boats at Worcester, and the question of increasing the size of the canal to Birmingham is under consideration.

Aire and Calder.

The Aire and Calder Navigation was authorized by an Act passed in 1698; other Acts of later date gave additional powers for enlarging the navigation, and it is now one of the best English waterways, giving communication between Lancashire and Yorkshire and the ports of Goole and Hull. Its original capital was £150,000, but the amount expended to the year 1898 was £2,761,807. Its total length is 85 miles, part river and part canal, with 31 locks. Commencing at Goole, it terminates at Leeds with a junction with the Leeds and Liverpool Canal, thus forming a continuous navigation from the east to the west coasts. At Castleford it has a branch to Wakefield, where it joins the Barnsley Canal. Originally the navigation was only 3 feet 6 inches deep, but since 1860 great improvements have been carried out, the locks being made 215 feet long, 22 feet wide, with 9 feet of water on the sills. All overhead bridges have been enlarged to the width of the locks; vessels carrying cargoes of 170 tons can now use the navigation, and three 50-ton barges can pass the locks together. Merchandise is generally carried in barges towed in trains by steamers, which also carry goods, but the large coal traffic is conveyed in trains of boat compartments, either towed or pushed by steamers, on a system designed by Mr W. H. Bartholomew. The boats, except the leading one, which has an ordinary bow, are nearly square in shape; they are coupled together by knuckle joints fitted into hollow stern-posts, and they can thus move laterally or vertically; a wire rope in tension on each side of the boat enables the train to be steered. No boat crews are required, the crew of the steamer regulating the train. If the boats do not exceed eleven in number, they can be pushed, but beyond that number they are towed. Each compartment carries 35 tons, and the total weight in a train varies from 700 to 900 tons. On the arrival of a train at Goole the boats are detached, and are each taken over submerged cradles under powerful hydraulic hoists, which lift boat and cradle sufficiently high to enable it to be turned over, and discharge the whole cargo at once into a shoot, and thence into sea-going steamers. Goole has become an important port owing to the improvements of the Aire and Calder Navigation Company, who have constructed docks of 24 acres in extent to give accommodation to foreign and coasting steamers.

Weaver.

The River Weaver Navigation is about 20 miles in length. This river rises in the south-west corner of Cheshire, passing through the salt districts of Winsford and Northwich, and joins the Mersey at Frodsham. It is made navigable between those places under the powers of an Act of 1721, which ordered that any profits were to be employed in repairing public bridges, and meeting other public charges in the county of Chester; considerable sums have been paid accordingly. Subsequent Acts enabled a canal to be made, 4 miles in length, to avoid the lower tidal portion of the river, and to obtain a better entrance on the Mersey at Weston Point, where docks have been constructed. Other cuts were made to shorten the course of the river, and the depth was increased to 7 feet, enabling craft of 100 tons to use the navigation, their cargoes being principally salt for shipment at Liverpool. An Act was obtained in 1866 authorizing further improvements, which have since been completed, with the result that it is the best navigation in England for small coasters and large barges. The locks are in pairs, the largest being 220 feet long by 42 feet wide, with 15 feet depth on the sills; at present the river dredging has not gone beyond 10 feet 6 inches in depth. Canalized rivers have the advantage of a good supply of water, even for large locks, and on the river Weaver there are also large natural reservoirs, formed by the subsidence of the ground owing to salt workings and brine-pumping. The locks have intermediate gates, so as to shorten them when only single vessels have to pass; otherwise the locks can take a steamer, carrying cargo and towing barges, with total cargoes amounting to 600 to 800 tons. The lock gates are worked by turbines, thus utilizing the fall at the locks and the ample supply of water. The effect of the new works has been to secure the whole of the large export salt traffic to Liverpool and other ports, the railways not being able to compete with the low cost of carriage on such an improved waterway.

France.—M. Freycinet, when Minister of Public Works, stated, in a report on the rivers and canals of France: "Navigable waterways play an important part in the production of the wealth of a country. It has been found that navigable waterways and railways are not destined to supplant but to support one another. Each has its particular attributes. Railways take the least cumbrous traffic—that which requires speed and regularity and bears most easily the cost of carriage. Waterways take heavy goods of low value, and their mere existence checks and moderates the rates on goods which are sent by railway." The principle thus laid down has been fully accepted in France, where the waterways, 7459 miles in length, are the property of the State, only 158 miles remaining in other hands. The navigations are divided into two classes, main and secondary, the main ones having a minimum depth of 6½ feet, with locks 126 feet long and 17 feet wide; the second class are of smaller dimensions.

The improvements in the river Seine have made it a most important waterway. Not to mention the embankments and training walls, which with dredging have had such important results in enabling large steamers to reach Rouen, the upper portion of the river from that place to Paris affords a good example of a modern canalized river, although it is so winding that its length of 150 miles between Rouen and Paris is more than double the distance between those cities measured in a straight line. On this portion of the Seine locks and weirs had been constructed between 1838 and 1866, but they only gave a navigable depth of 5 feet. In 1878 new works were authorized to secure a depth of 10½ feet, and so enable vessels of 800 to 1000 tons to reach Paris. These works have been completed, dividing the river into nine reaches by locks and weirs of large size, the level of the highest pound being about 85 feet above high water of the lowest tides which reach the first lock above Rouen. Although the railway competition is severe, the lower cost of water carriage secures a traffic of over four million tons a year. The navigation is toll-free, and the improvements have cost the State £2,500,000. At Rouen the cargoes of shipping for Paris and the interior are discharged into lighters, carrying from 300 to 900 tons each, which are towed by steam tugs; the locks are able to take trains of barges which pass up the first-class navigations beyond Paris. Steamers trade between London and Paris, but their size is restricted by several low bridges which have yet to be altered.

The river Saône has been canalized for a length of 231 miles as a first-class waterway, with a depth of 6½ feet. The most important canals in France have been enlarged to a similar depth, the locks being 126 feet long and 17 feet wide, and barges capable of carrying 300 tons now traverse

the main navigations. The first-class waterways in 1878 were 765 miles in length; in 1897, 2795 miles were first-class, including 401 miles of new canals. The saving in cost of carriage on first-class waterways is due to the fact that a barge of 200 to 300 tons is worked at almost the same expense of crews and haulage as one only able to carry half that cargo. This has led to the great improvements in the waterways of the Continent.

Belgium.—The total length of waterways in Belgium is 1242 miles, 341 being canalized rivers, 301 open rivers, 457 miles of canals for barges of 200 tons and upwards, and 143 miles of smaller canals. The State owns about 85 per cent. of the whole. All improvements are carried out to standard dimensions, the locks being 134 feet long and 17 feet wide, with a canal depth of 8 feet. Since the improvement of the waterways the traffic on them has largely increased, notwithstanding the complete system of railways which are *pro tanto* relieved of the heavy and slow traffic.

Germany.—Inland navigation has been fostered and improved by the State, and between the years 1880 and 1893 £17,875,350 was expended for the creation of new or the improvement of existing waterways. In 1895 their length was 6214 miles. It has been proposed to construct a Midland canal to connect the Dortmund-Ems Canal with the Rhine on one hand and the Weser and the Elbe on the other;[1] this development is supported by the industrial interests, but is opposed by the Agrarians, who fear that new waterways will promote the increased import of foreign grain. The result of improvements has been to make nearly all the waterways available for steamers or steam-towing. On the Rhine the size of vessels has increased from 800 to 1300 tons and upwards, while on the Elbe and the Weser it is possible to carry nearly twice as much cargo as formerly. On the Oder the barges to and through Berlin could only carry 150 to 200 tons, while vessels of 500 to 600 tons now go direct from Breslau to Hamburg. The State levies tolls on the canals and canalized rivers amounting to about one-third of the cost of maintenance, but the tolls have not prevented a large increase in the amount of traffic.

Steam Haulage.—On the Bridgewater Canal, which has a large traffic between Liverpool and Manchester, steam tugs have been introduced, with the result that the traffic is conducted with greater regularity and despatch, and with, as compared with horse traction, a saving of forty per cent. in cost. Experiments were first tried by hauling on a submerged wire rope which passed round a drum worked by steam-power on a tug; this system has succeeded on some wide navigations, but it failed on the Bridgewater Canal, owing to its interference with other traffic and the difficulty of keeping the wire rope in the centre of the canal round sharp curves. Steam tugs were then tried with complete success, although the depth of water in the canal does not allow of larger screws than 3 feet 4 inches in diameter. Twenty tugs are now employed, each 61 feet long, 7 feet 6 inches beam, and 4 feet draft; each can tow four barges at the rate of nearly 3 miles an hour, the barges carrying cargoes of 40 to 50 tons each. The canal has the advantage of being without locks between Runcorn and Manchester, a distance of thirty miles.

Electric Haulage.—Electric haulage has been successfully used in France upon part of the Bourgogne Canal, including a tunnel over 2 miles long. It is also employed on the Charleroi Canal in Belgium, which connects the coal district with Brussels. The canal is a narrow one, and barges towed by horse-power seldom reached a speed of 1½ miles an hour. The use of electric power has given a speed of 6 to 7 miles an hour at the same cost per mile. There are two generating stations, one 15 miles south of Brussels and the other at Roux, 6 miles north of Charleroi. The electric current is taken from overhead wires, and it also serves for lighting purposes and for working machinery at manufactories on the route of the canal, thus reducing the cost of towing by the profit made by adapting the current to secondary uses. The working of the locks is also facilitated by the use of electricity. It is very probable that electric traction will be largely used in the future for haulage on canals; it would also be useful for working wharf cranes or canal lifts.

Lifts.—Where the levels of the ground for a canal are such as to require several locks near each other, lifts or inclines have been adopted instead of locks, to save time in passing traffic, and also to economize water, which in dry seasons has on some canals to be pumped back again by steam-power from the lower to the upper level. The most improved type of lift is that at Anderton on the Weaver Navigation; it was constructed to unite the Trent and Mersey Canal with the river, where the navigations are in close proximity but with a difference in level of 50 feet, the canal having no spare water for locks. The lift is a double one working vertically, barges up to 100 tons being transferred from the canal at the high level to the river in ten to fifteen minutes; the change is made while the barge is floating in an iron trough full of water with gates at each end. The descending trough has more weight, owing to 6 inches of water being removed from the lower trough by self-acting siphons; this gives power to the descending trough to raise the lower one, a hydraulic accumulator being used to overcome the loss of weight in the descending trough when it is immersed in the river at the lower level. The troughs are supported and worked by two cast-iron rams, 3 feet in diameter, placed under the centre of the trough, with cast-iron presses connected with a 5-inch pipe, the weight of trough and water being 240 tons. The lift was completed in 1875, and has continued to work well even in hard frosts.

Similar lifts have since been erected on the Continent. The one at Fontinettes on the Neuffosse Canal in France is capable of lifting vessels of 300 tons burden. Another lift at La Louvière on the Canal du Centre in Belgium is able to lift vessels of 400 tons, the total weight lifted being 1037 tons. Three other lifts of the same character are being constructed on this canal.

The two largest lifts yet constructed are those on the Trent Canal at Peterborough in Canada; the vertical traverse is 65 feet, and the tanks are 139 feet long by 33 feet wide, with 8 feet depth over the sills. They are double, like those at Anderton already described, being worked in

[1] The canal is intended to run *viâ* Minden, Hanover, Gifhorn, and Wolmirstedt, to Heinrichsberg on the Elbe, opposite one of the extremities of the Plane Canal, which goes on to give connexion with the Havel and the Spree, and through these rivers and their connecting canals with the Oder and the Vistula, so that by this means a connected inland waterway, stretching east and west, will be made between the Rhine and the Vistula. The length of the Midland Canal section is estimated at 202 miles, its width at bottom at 59 feet and at the surface at 108¼ feet, the depth at 8⅙ feet, the width of the sluice gates at 28½ feet, and the length of the locks at 220 feet. The highest point (185½ feet) which the canal (as projected) would traverse lies only 22½ feet above the terminus at Bevergern and 57¾ feet above the Elbe terminus near Wolmirstedt. From the main canal it is proposed to construct branch canals to the towns of Osnabrück, Hildesheim, Peine, Brunswick, and Magdeburg, making an additional (total) length of 69 miles. The estimated cost of the main canal amounts to £6,250,000, of the branch canals at £2,150,000, or altogether a total of £8,400,000. A canal 13 miles long, starting from the Weser near Rinteln, will be chiefly relied upon to furnish the water supply of the new canal. Closely connected with this Midland Canal, and really a continuation of it, is the Rhine-Weser-Elbe Canal, the Dortmund-Ems Canal forming the intermediate link between the two.

a similar manner on hollow cast-iron rams 7½ feet in diameter, working in hydraulic cylinders built up of rings of steel castings 3½ inches thick, bolted together by external flanges. Pumps driven by turbines, operated by water taken from the upper reaches of the canal, work an accumulator which supplies the hydraulic plant used to move the gates closing the tanks and branches of the canal leading to them, and also capstans for handling the barges in or out of the tanks.

Canal inclines were early adopted on canals where loss of water in lockage was of importance. The Monkland Canal incline near Glasgow has a rise of 96 feet on a gradient of 1 in 10, and takes the place of eight locks which were insufficiently supplied with water in dry seasons. A carriage with twenty wheels runs on each line of a double way of 7 feet gauge, carrying a water-tight wrought-iron caisson 70 feet long, 13 feet wide, and 2¾ feet deep in a horizontal position on the incline by elevating the lower end of the carriage. The caissons are filled with water and balance each other; they act like movable locks with gates, one ascending as the other descends, moved by engine-power working two vertical drums, round which is coiled the wire rope that hauls the ascending load, which is nearly counterbalanced by the descending boat. In order to prevent the boat from moving in the caisson, it does not float freely when on the incline, but rests on the bottom of the caisson, partially supported by water. The time taken for the whole operation is ten minutes, the saving in time being about half an hour for each barge.

The Grand Junction Canal Company have constructed an incline at Foxton on the Union Canal to take barges of 70 tons, or two canal boats of 33 tons, in place of ten locks, which were necessary to overcome a rise of 75 feet. It is in some respects like the Monkland Canal incline, but the movable caissons work on four pairs of rails on an incline of 1 in 14 broadside on, in consequence of the steeper grade, the boats being water-borne during the whole time. Steam-power is employed with an accumulator, which enables hydraulic power to be used in keeping the caisson in position at the top of the incline while boats are being moved in or out, a water-tight joint being kept against the fixed portion of the canal during the operation. The gates in the caissons and canal are also worked by hydraulic power. The incline is capable of passing 200 canal boats in twelve hours, and the whole plant is worked by three men.

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Canandaigua, a village of New York, U.S.A., and capital of Ontario county, situated in the western part of the state, at an altitude of 735 feet. It has two railways, the New York Central and Hudson River and the Northern Central, and owing to its situation at the outlet of the beautiful Canandaigua lake, has become a summer resort. Population (1880), 5726; (1890) 5868; (1900), 6151 (834 foreign-born, and 110 negroes).

Canary Islands or Canarias, a Spanish archipelago in the Atlantic, about 60 miles W. of the African coast, consisting of 7 large islands and 6 smaller, the latter uninhabited. The total area of the archipelago is 2944 square miles. The population in 1877 was 283,532, in 1897, 334,521. The archipelago forms one Spanish province, of which the capital is Santa Cruz de Tenerife, the residence of the civil governor, who has under his command one of the two districts into which the archipelago is divided, this first district comprising Tenerife, La Palma, Gomera, and Hierro. The other district includes Gran Canaria, Lanzarote, Fuerteventura, and has at its head a sub-governor, residing in Las Palmas, on Gran Canaria, who is independent of the governor except in regard to elections and municipal administration. The province is divided into 7 administrative districts and 90 parishes. The chief Finance Office is at Santa Cruz de Tenerife. The Court of Appeal, created in 1526, is in Las Palmas, which is also the residence of the Bishop of Canarias. The captain-general and second commandant of the archipelago reside in Santa Cruz de Tenerife, and there is a brigadier-governor of Gran Canaria residing in Las Palmas, with 8 inferior military commandants in other isles and forts. The province furnishes no men for the Spanish peninsular army, but its annual conscription provides men for the local territorial militia of Canarias, composed of regiments of infantry, cazadores or rifles, squadrons of mounted rifles, and companies of garrison artillery—about 5000 men all told. The archipelago is divided into 2 naval districts, commanded by royal navy captains. The principal means of communication is by sea. Some shipbuilding is carried on, mostly in Las Palmas. The sugar manufactures are yearly increasing, above all in Gran Canaria. Fishing is the principal industry, employing nearly 10,000 hands, on 2200 boats averaging below 100 tons. This fishing fleet operates over 600 miles near the north-western African coast. In 1898 wheat was grown on 138,295 acres, oats, barley, maize, rye on 130,277 acres, pod fruit on 3435 acres, and vines on 7837 acres. Though the soil is fertile, agriculture is not on the whole in a prosperous condition. The islands are not very rich in live stock, as the official statistics for 1898 only showed 2492 horses, 2380 mules, 4111 asses, 10,900 cattle, 1455 pigs, and 29,467 sheep. There were also 44,895 goats, most of which live in an almost wild state in the hilly parts of the islands. Game is abundant in some districts, especially rabbits, hares, some wild duck, and small deer. Reptiles are quite unknown, though lizards are very numerous. England is at the head of the import trade in coal, cotton textiles, and woollen goods, blankets, hardware, iron, timber, soaps, candles, and colonial products. France introduces sulphur, shoe leather, and *articles de Paris;* Germany, earthenware, hardware, spirits, paper, and cotton goods; Belgium, cement, starch, and glass. The principal exports are tomatoes, of which £67,350 were shipped in 1898; and bananas, £10,500. In all, imports were valued at £280,942 in 1897, and £46,551 in 1898; exports at £150,577 in 1897, and £204,796 in 1898.

Cancer.—Cancer has been the subject of much exact investigation, and of a still larger amount of theory and assumption. It is important to distinguish between them. The following points deserve notice: (1) prevalence, (2) causation, (3) distribution, (4) treatment.

Prevalence.

The question of most general interest is the alleged increase of the disease. The belief that cancer has increased, and is increasing rapidly, rests upon two pieces of evidence—the impression formed by surgeons from their own experience, and the Registrar-General's mortality returns. The first is obviously mere opinion, the value of which depends on the number of individuals holding it and the extent of their experience. If it were the universal or the general experience of the medical profession that cancer is more frequently met with than formerly, the testimony would carry great weight, but there is no evidence of any such experience. The fact that a limited number of practitioners have of late years met with an increased number of cases, or that more cancer patients have found their way into certain hospitals, is of little value. It may be

due to accident or to extended practice. Impressions derived from such *data* have often proved to be fallacious, and no weight should be attached to them in themselves. The Registrar-General's returns stand on a different footing, and merit very careful attention. On the face of them, the statistics show an enormous increase, and similar records in other countries tell the same tale. "In England and Wales," says Dr Roswell Park, Professor of Surgery in the University of Buffalo, "the cancer death-rate has risen from 1 out of 5646 of population in 1840, to 1 out of every 1306 of population in 1896; that is, in fifty years the proportion has increased nearly five times. All over this country the increase is quite as alarming." In England and Wales the mean annual death-rates per million living for the ten years 1861-70 were—males, 242; females, 519; in 1891-97 they were—males, 571; females, 882, showing an increase of 136 per cent. and 70 per cent. respectively; and in 1899 they had further risen to—males, 672; females, 977. Again, the registered mortality for both sexes in the five years 1891-95 was 712 per million; in 1896 it had risen to 764 per million, and in 1899 to 829. At first sight this great and progressive increase looks conclusive, but there are sound reasons for doubting if it represents a real increase in the prevalence of cancer. In any case the Registrar-General's figures must be largely discounted. In the first place, it has been pointed out that since cancer is a "disease of degeneracy, the frequency of which increases as age advances" (Paget), a rise of mortality from this cause would naturally follow on the greater longevity which has been attained in recent years, and the survival of more persons to cancer age. In particular, Dr J. F. Payne has pointed to "the greatly diminished mortality from phthisis and from infectious disease. Since both these causes of death act much earlier in life than cancer, in proportion as they carry off a small number of persons at earlier ages, a larger number will survive so as to be the victims of cancer at a later period of life." That, no doubt, is so, but Dr Newsholme has shown, by a careful comparison of the figures, that survival can only account for a small proportion of the cancer increase. The same statistician points out a far more important source of error, which applies also to other causes of death that show an apparent increase. The Registrar-General's returns are based on the death certificates signed by medical men, and only represent the certified, not the actual, causes of death. They are imperfect, inexact, and liable to a considerable amount of error. In the past the imperfection and margin of error was much larger than in later years. With improved knowledge and greater care the returns tend to become more accurate, and the large number of deaths certified from indefinite causes constantly diminishes. For instance, the number of deaths so certified in 1866-68 was 143,472, and in 1894-96 only 68,650. This diminution represents an addition of 74,822 deaths ascribed to various causes, and it is quite certain that a large proportion of such additional certifications go to the credit of cancer. In 1889, as the result of special inquiries made by the Registrar-General, 421 deaths were transferred to cancer, and in 1896 the transfers rose to 597, and in 1899 to 760. This factor makes the comparison between earlier and later periods quite untrustworthy. The influence of improved diagnosis in swelling the cancer returns is clearly shown by the fact that the apparent increase is far greater among males than among females, for which no reason can be assigned except that cancer in men is more often internal and difficult of diagnosis, and was therefore less frequently diagnosed in former years. This view is further confirmed by the carefully classified records kept for twenty-seven years at Frankfort-on-Main. During that period cancer of "accessible" parts remained stationary, that of "inaccessible" parts showed a large increase. The difference can only be explained by improved diagnosis. Whether this is sufficient to account for the whole of the apparent increase, it is impossible to say at present. As the returns improve in accuracy the factor will drop out, and if it is responsible for the whole of the increase, that will tend to cease *pari passu*. This does in fact seem to be happening, at least in Great Britain, for the rate of increase is less year by year. In other countries the mortality returns are certainly neither more complete nor more accurate, and it is highly probable that the same calculation applies equally to them. On the whole, it must be held that though there has probably been some increase, it has not been satisfactorily proved and is certainly less than is supposed.

Causation.

The rise of the parasitic theory of infectious disease has given a great impetus to the study of cancer from the point of view of causation. It has been shown that there are in cancers certain microscopic bodies peculiar to cancer, and possibly of a parasitic nature. In some cancers they are present in enormous numbers. They have been isolated and cultivated outside the body. The cultures, when introduced into certain animals, have caused death with the production of tumours resembling cancer, from which again cultures have been made producing similar growths on inoculation. The existence of these bodies may be taken to be proved, but their nature and significance remain still undetermined. It may be that their presence is the exciting cause of that abnormal growth of the natural cells which constitutes cancer, or, on the other hand, it may be merely a stage in the process. In any case their origin is quite unknown, and if cancer be infectious at all, both experience in nature and experiment go to show that its infectivity is of a very low degree. It should not be forgotten that cancer is essentially a disease of old age, and that the incidence of all known diseases of a micro-parasitic nature affects rather childhood and early adult life. With regard to the influence of heredity, the trend of modern research is to minimize or deny its importance in cancer, as in phthisis, and to explain family histories by locality or other conditions. In view of the wide hold obtained nowadays by popular fallacies through the agency of elementary education and a cheap press, it may be not superfluous to add that there are no reasons for supposing that tomatoes have anything whatever to do with cancer.

Distribution.

Several years ago Mr Haviland investigated the distribution of cancer in England and Wales, and disclosed the existence of what he called "cancer fields," that is, districts in which the disease prevailed in a marked degree. Such districts were invariably associated with "seasonally flooded areas traversed by, or in close propinquity to, fully formed rivers," and were geologically characterized by alluvial and clayey soils. On the other hand, districts having the lowest mortality were found to be situated on elevated lands, well drained, not subject to floods and geologically characterized by the Carboniferous limestone formation. He has more recently returned to the question, and by comparing a later period with the former one, has shown that this distribution remains constant, though the mortality has everywhere increased. Incidentally it may be remarked that the fact of the increase being generally distributed, and not confined to cancer districts, is an additional reason for regarding the increase as only apparent. Mr Haviland concludes that flooded clays are always associated with the highest mortality, and limestones with the lowest. The Thames valley, which is the greatest cancer field in England,

forms the most striking illustration of this generalization. The river flows through a great variety of geological formations, but all the localities having the highest cancer mortality lie on clays, and are liable to floods; those having the lowest lie on limestone and chalk, and are, for the most part, not subject to flooding. Further light has been thrown upon the subject by the investigation of localities and houses to which the term "cancer-haunted" has been applied. Certain spots, groups of buildings and single houses, seem to harbour some special liability, and that independent of their size and age. An investigation caried out by Mr d'Arcy Power in a cancer district produced some remarkable examples. In one case, three men occupying the same house in succession all died of cancer since 1877, when the earliest case occurred. It was a new house then, built on land which had been pasture, and its first occupant was the first victim. The third was only thirty-six years of age. In another instance three cottages were under one roof, and in each of them a case of cancer occurred within six years. Many other similar instances have been recorded, and it is difficult to deny the existence of some local influence. But whether it lies in a predisposition engendered by the situation, or in the harbouring of a parasite in the soil, or in some intermediate host, is at present mere subject of conjecture. Animals do not appear to play any part in the matter. Cancer has been observed in horses, dogs, cattle, cats, and sheep, in the relative frequency named, but it is not very common in any of them. With regard to occupation, the following comparative mortality figures are given by the Registrar-General:—All occupied males, 44; all unoccupied males, 96; grocers, 34; clergy, 35; potters, 35; coal-miners, 36; farmers, 36; fishmongers, 42; medical practitioners, 43; blacksmiths, 45; fishermen, 46; porters, 48; general labourers, 48; drapers, 49; shoemakers, 50; dock and wharf labourers, 51; tobacconists, 51; plumbers, 53; innkeepers, 53; coal-heavers, 56; butchers, 57; coachmen and grooms, 58; tool and scissors makers, 58; gas-workers, 59; lawyers, 60; merchant seamen, 60; maltsters, 61; commercial travellers, 63; inn and hotel servants, 65; brewers, 70; innkeepers in London, 70; chimney-sweeps, 156. An examination of these figures is very suggestive. They appear more or less incompatible with any existing theory. Mental worry and overwork seem to be negatived by the low position of doctors, who come below labourers, fishermen, and seamen. The great differences in occupational incidence are not in accordance with either a parasitic or a local theory, while the moderate place—considerably below lawyers—taken by innkeepers is quite at variance with the suggestion that alcohol is responsible. Why should lawyers be more susceptible than clergymen and doctors? They are not so long-lived as the former, so that old age cannot account for the greater incidence, and both less intemperate and less worried than the latter. It looks very much as if chance had more to do with the matter than anything else; but there is the one striking fact of the enormous susceptibility of chimney-sweeps, which is too great to be explained by chance. The well-known and long-recognized frequency of cancer in this particular class used to be advanced as proof of the hypothesis of local irritation, which is still the orthodox explanation of cancer. The soot is supposed to act as an irritant; but, if so, why are potters and coal-miners, who also work in irritating materials, so very low in the cancer scale? No doubt the case of the chimney-sweep contains one of the keys to the problem of cancer causation, but it has not been found yet.

The only "cure" for cancer remains removal by operation. There is some ground for claiming that improvements in surgery offer a better chance of complete cure in favourable cases, and of a longer respite in others. A number of drugs, including inoculations with thyroid extract and toxins, have been tried, but such methods of treatment are only in the nature of experiments. Change of residence from a clay to a chalk soil is worth trying after removal by operation. (A. Sl.)

Treatment.

Candon, a town in south Ilocos province, near the west coast of Luzon, Philippine Islands, in 17° 4′ N. Its climate is hot, though healthful. It is surrounded by an extensive and fertile plain, and is defended by a small fort. Its inhabitants are noted for their honesty and industry, as well as for their regard for law and order. They carry on an extensive traffic with the wild tribes of the neighbouring mountains. Indigo is grown in considerable quantity, as are rice and tobacco. The weaving of blankets, handkerchiefs, and cotton and silk cloths constitutes quite an important industry. The language is Ilocano. Population, 15,700.

Cangas de Onis, a township of the province and diocese of Oviedo, with a population in 1897 of 9507, situate in a fertile, well-watered, partly wooded, undulating region. Its trade is chiefly in live stock and products of neighbouring copper and coal mines. It has good buildings, a foundling hospital, schools, a town hall with a Latin inscription recording the fact that this place was the residence of the first kings of Spain after the spread of the Moors over the peninsula. Here early in the 8th century lived King Pelayo, who started the Christian reconquest of Spain. His historic cave of Covadonga is only 8 miles distant. The church of the Assumption, rebuilt in the 19th century, is on the model and site of an older church of the Middle Ages. Near Cangas are ruins and bridges of the Roman period

Cannanore (Kananore), a town of British India, in the Malabar district of Madras, on the coast, 58 miles N. from Calicut. The population in 1881 was 26,386, in 1891 it was 27,418; the municipal income in 1897-98 was Rs.28,450. Here is the residence of the Mopla chief, known as the Ali Raja, who owns most of the Laccadive Islands. Cannanore is the headquarters of a military division. It has a municipal high school and reading-room. A railway is under construction from Calicut.

Cannes, a town of France, in the arrondissement of Grasse, department of Alpes-Maritimes, on the coast, 23 miles in direct line S.W. of Nice, and on the railway from that town to Toulon. The town, which has steadily grown in favour as a winter health resort, was several times visited by Queen Victoria. In 1899, 382 vessels of 47,421 tons (including those engaged in coasting trade) entered the port, and 368 of 48,046 tons cleared. The trade is mainly in French hands. Population (1881), 14,086; (1896), 28,591; (1901), 34,151.

Canning.—By canning is meant the preparation of food in packages of tin or glass so as to preserve it indefinitely with its natural flavour and nutritive properties uninjured. To this end it is necessary that the food should be hermetically sealed and the bacteria or germs that cause fermentation be destroyed. The process was developed and given a commercial value by Nicolas Appert in France in 1807-10. Until recently it was thought that the spoiling of hermetically sealed food was due to the presence of air in the tins or jars, and the process of sterilization was carried on by cooking in an open water bath, at a temperature of 212° F. It is now known that fermentation is caused only by the presence of bacteria or micro-organisms; if these are destroyed and the food

sealed against them, the presence of air would not of itself cause fermentation, provided it were sterilized. To destroy bacteria the food is heated to a sufficiently high temperature under pressure in retorts and kettles. Heat is the only agency that need be employed. The use of antiseptics is inexcusable.

While the process of canning is simple, extreme care is required in handling the material. Bacteria lodge upon food from utensils; they are in the water-supply, in the air, perhaps in the fluids used in the process of canning; and on the person or garments of workmen. Cleanliness is imperative. Moreover, certain forms of bacteria are not killed as easily as others, and unless the packer knows how long the food should be cooked and how high a temperature is necessary for sterilization, he is liable to lose an entire season's product. Fortunes have been lost through lack of cleanliness or of a knowledge of bacteriology. The simple process devised by Appert has been developed by applying steam and machinery to all parts of the work from the cultivation, gathering, preparation, and packing of raw material to the manufacture of tin cans, labels, and cases. Among the devices in common use are automatic can-making machinery, cappers, fillers, floaters, brining or syruping machines, wipers, corn cutters, corn silkers, pea briners, hullers, corn cookers, conveyers, labelling machines, and box fillers; a portable process kettle has made canning possible on the farm. In treating peas, for example, the work was formerly done by hand and the peas twice cooked; after being subjected to heat for ten minutes at 212° F. the tins were vented, resealed, and again processed. By the aid of modern machinery the pods are gathered by a viner, the peas are podded by a "huller," and are assorted in four or five sizes by a revolving cylinder, the sides of which have meshes of varying sizes. After being blanched the peas are covered with brine, placed in tins, and sealed by machine. They are then processed once in a retort for twenty minutes at a temperature of 240° F. One firm in Wisconsin, U.S.A., puts up over 2,500,000 tins of peas annually. As a general rule fruits and vegetables are only processed once, meats and fish twice. Method and results vary greatly. Until recently there has not been any considerable scientific study of the art, and canners are generally deficient in a knowledge of scientific cooking and of the time and heat required to destroy the various kinds of bacteria.

The cans are made from steel plates, with little or no solder anywhere exposed to chemical action. In a perfectly closed tin chemical action is virtually suspended. Upon the access of air the acids in fruits and vegetables may decompose the tin very rapidly, forming mineral salts, and therefore the contents of a tin should be immediately removed. When properly prepared canned food will keep without deterioration for practically an unlimited period of years in all extremes of any climate. At the London Exhibitions of 1851, 1862, and 1873 tins of meat which had been put up from twenty-five to forty years were found perfectly sound. Stores of meat, &c., in tins have been left in the Arctic regions for years, annually exposed to temperatures of 92° below and 80° above zero, and when examined found as sound as the day they were put up. Condensed milk thirty-two years old was found in perfect condition except for a slight discoloration. It is attested on high medical authority that the qualities and properties of foods are not altered to any material extent by the process of preservation. Severe tests of this statement have been made both in the Arctic regions and in the torrid zone. Brigadier-General A. W. Greeley, U.S.A., records that canned fruits and vegetables which were subjected to the extremes of Arctic temperatures for almost three years presented the same appearance as though freshly canned, and their flavour was as good when the last can was eaten as in the first month. No illness of any kind occurred prior to the famous retreat, and those most inclined to canned fruit and vegetables were the healthiest and strongest of the party. Surgeon-Major W. Simson Pratt, M.D., whose experience and judgment on this point were attested by Sir Garnet (afterwards Lord) Wolseley, reported as follows:—"Taking my experience in India and the late Nile expedition in which the test of tinned provisions was exceptionally severe from continued exposure to the powerful direct rays of the sun, I have found that tinned provisions, meat, and vegetables, put up separately or combined in the form of soups, are practically undamageable by any climatic heat."

Canning was early introduced in various parts of the Atlantic States of North America (1820-45). In 1848 the demand for canned meat for California became urgent, and additional impetus was given by the Civil War in America, 1861-65. From that time the industry spread over the globe. There are now canning factories in China, the East Indies, Africa, France, Great Britain, and other countries of Europe; but the industry has received its chief development in the United States and Canada. Factories line the Atlantic coast from Nova Scotia to Florida, the Gulf of Mexico, the Pacific coast as far north as points between 60° and 65° north latitude in Alaska, and are found in nearly all the forty-six States of the Union. In the whole of North America there are about 2000 canning factories besides a number of firms in the cattle trade that have canning houses in connexion with their stock-yards. One of these has placed upon the market eighty food specialities into which meat or poultry enter, and is adding one new sort every week. Besides the packing of all varieties of fruits, vegetables, meats, fish, fowl, soups, the packers put up combinations of food, and the favourite special dishes of different nations, as for instance, succotash, okra and tomatoes, stewed kidneys, clam chowder, plum pudding, Irish stew, beefsteak and onions, Hamburger steak with onions, veal loaf, ham loaf. Many of these articles are sold as low as eighty to ninety cents per dozen (3s. 2½d. to 3s. 7½d.), so as to permit of their being sold to consumers at ten cents (5d.) per tin. Full statistics are not available because packers are unwilling to make public the extent of their business, but the following figures may be relied on. In 1889 there were put up in the United States and Canada 177,718,152 No. 3 or quart tins of tomatoes, and during ten years 1891-1900, a total of 1,174,369,200 tins. Of sweet corn there were put up in 1900 a total of 155,654,976 tins, and during ten years 937,452,408 tins. In California the estimated output of table fruits reaches sixty million tins every season. The output of canned salmon on the Pacific coast for ten years 1890-1899, was 1,027,510,896 one-pound tins. During the three seasons ending 1899, the average annual output was nearly 3,000,000 cases of forty-eight one-pound tins each, or 144,000,000 tins. Of this the United Kingdom takes an average of over 48,000,000 tins annually. The magnitude of the American industry is further shown by the fact that during the year ending 30th June 1900 the exports of canned beef were 55,553,745 pounds, of which 32,273,374 pounds went to the United Kingdom, and 12,172,889 pounds to South Africa. It is estimated that 375,000,000 pounds of milk are annually used in the United States for making condensed milk, which is equivalent to an output of 156,500,000 tins. One company engaged in the business has a capital of $20,000,000. Large corporations are engaged in the same line in Switzerland and other countries. It is safe to estimate the output of canned goods in the United States and Canada at over one billion

tins annually, exclusive of jams and preserves put up in tin cans.

The price of canned goods has fallen enormously, the difference being almost wholly due to machinery. The machinery for canning peas promises to stimulate the industry for years to come, and the portable process kettle has multiplied the producers of tomatoes many times over. So great has been the increase of production that the normal relation of supply to demand has been disturbed for years, and in the case of some articles is not yet adjusted to a profitable basis. The following are the comparative prices of vegetables per dozen one-pound cans:—

	1870.		1900.	
Corn	11/ to 12/	$2.75 to 3.00	2/5 to 3/	$.60 to .75
Peas	11/ to 15/	2.75 to 3.75	3/5 to 4/10	.85 to 1.20
Tomatoes	10/ ...	2.50	2/10 to 3/5	.70 to .85
Lima beans	13/ ...	3.25	3/ to 3/5	.75 to .85
String beans	9/ ...	2.25	2/ to 2/10	.50 to .70
Asparagus	£1, 4/ ...	6.00	13/ ...	3.25

In meat products the price per dozen cans has fallen off as follows:—

	1840.		1900.	
2-lb meats	£1, 1/	$5.25	10/10	$2.70
2-lb poultry	1, 10/	7.50	12/7½	3.15
2-lb oysters	1, 10/	7.50	3/5	.85
2-lb clams	1, 8/	7.00	9/7½	2.40
1-lb lobster	12/	3.00	12/	3.00
1-lb salmon	14/6	3.62	7/5	1.85

(F. N. B.)

Cannock, a market town and railway station in the Western parliamentary division of Staffordshire, England, in the district known as Cannock Chase, 9 miles S.S.E. of Stafford. There are ancient and modern Anglican churches; a Roman Catholic school-chapel, and various Nonconformist chapels; two endowed schools; public rooms, market-hall, urban council offices, and a public hall. The Cannock Chase district abounds in coal mines and also contains iron. Area of township (an urban district), 8010 acres; population (1881), 17,125; (1901), 23,500. There is a parish of Cannock.

Canons of Hippolytus, The.—This book stands at the head of a series of Church Orders, which contain instructions in regard to the choice and ordination of Christian ministers, regulations as to widows and virgins, conditions of reception of converts from heathenism, preparation for and administration of baptism, rules for the celebration of the eucharist, for fasting, daily prayers, charity suppers, memorial meals, first-fruits, &c. We shall give (1) a description of the book as we have it at present; (2) a brief statement of its relation to allied documents; (3) some remarks on the evidence for its date and authorship.

1. We possess the *Canons of Hippolytus* only in an Arabic version, itself made from a Coptic version of the original Greek. Attention was called to the book by Wansleben and Ludolf towards the end of the 17th century, but it was only in 1870 that it was edited by Haneberg, who added a Latin translation, and so made it generally accessible. In 1891 Achelis reproduced this translation in a revised form, embodying it in a synopsis of allied documents. He suspected much interpolation and derangement of order, and consequently rearranged its contents with a free hand. In 1900 a German translation was made by Riedel, based on fresh MSS. These showed that the book, as hitherto edited, had been thrown into disorder by the displacement of two pages near the end; they also removed other difficulties upon which the theory of interpolation had been based. Further discoveries, to be spoken of presently, have added to our materials for the study of the book, and a fresh investigation of it is urgently needed.

The book is attributed to "Hippolytus, the chief of the bishops of Rome," and is divided into thirty-eight canons, to which short headings are prefixed. This division is certainly not original, but it is convenient for purposes of reference. Canon 1 is prefatory; it contains a brief confession of faith in the Trinity, and especially in the Word, the Son of God; and it speaks of the expulsion of heretics from the Church. Canons 2-5 give regulations for the selection and ordination of bishops, presbyters, and deacons. The bishop is chosen by the whole congregation: "one of the bishops and presbyters" is to lay hands upon him and say a prayer which follows (3): he is at once to proceed with "the offering," taking up the eucharistic service at the point where the *sursum corda* comes in. A presbyter (4) is to be ordained with the same prayer as a bishop, "with the exception of the word bishop"; but he is given no power of ordination (this appears to be inconsistent with c. 2). The duties of a deacon are described, and the prayer of his ordination follows (5). Canons 6-9 deal with various classes in the Church. One who has suffered punishment for the faith (6) is to be counted a presbyter without ordination: "his confession is his ordination." Readers and sub-deacons (7) are given the Gospel, but are not ordained by laying-on of hands. A claim to ordination on the ground of gifts of healing (8) is to be admitted, if the facts are clear and the healing is from God. Widows are not ordained (9): "ordination is for men only." Canons 10-15 describe conditions for the admission of converts. Certain occupations are incompatible with Christian life: only under compulsion may a Christian be a soldier. Canons 16-18 deal chiefly with regulations concerning women. Canon 19 is a long one dealing with catechumens, preparation for baptism, administration of that sacrament, and of the eucharist for the newly-baptized. The candidate is twice anointed: first, with the oil of exorcism, after he has said, with his face westward, "I renounce thee, O devil, and all thy following"; and, again, immediately after the baptism. As he stands in the water, he declares his faith in response to an interrogatory creed; and after each of the three clauses he is immersed. After the second anointing the bishop gives thanks "for that Thou hast made them worthy that they should be born again, and hast poured out Thy Holy Ghost upon them, so that they may belong, each one of them, to the body of the Church": he signs them with the cross on their foreheads, and kisses them. The eucharist then proceeds: "the bishop gives them of the body of Christ and says, This is the body of Christ, and they answer 'Amen'"; and similarly for the cup. Milk and honey are then given to them as being "born a second time as little children." A warning is added against eating anything before communicating. Canons 20-22 deal with fast-days, daily services in church, and the fast of the passover-week. Canon 23 seems as if it closed the series, speaking, as it does, of "our brethren the bishops" who in their cities have made regulations "according to the commands of our fathers the apostles": "let none of our successors alter them; because it saith that the teaching is greater than the sea, and hath no end." We pass on, however, to regulations about the sick (24) who are to be visited by the bishop, "because it is a great thing for the sick that the high-priest should visit them (for the shadow of Peter healed the sick)." Canons 25-27 deal again with prayers and church-services. The "seven hours" are specified, with reasons for their observance (25): attendance at sermons is urged (26), "for the Lord is in the place where his lordship is proclaimed" (comp. *Didaché* 4, part of the *Two Ways*). When there are no prayers in church, reading at home is enjoined (27): "let the sun each morning see the book upon thy knees" (comp. Ath. *ad virg.*, § 12, "Let the sun when he ariseth see the book in thy hands"). Prayer must be preceded by the washing of the hands. "No believer must take food before communicating, especially on fast-days": only believers may communicate (28). The sacred elements must be guarded, "lest anything fall into the cup, and it be a sin unto death for the presbyters." No crumb must be dropped, "lest an evil spirit get possession of it." Canons 30-35 contain various rules, and specially deal with suppers for the poor (*i.e.*, *agapae*) and memorial feasts. Then we have a prayer for the offering of first-fruits (36); a direction that ministers shall wear fair garments at "the mysteries" (37); and a command to watch during the night of the resurrection (38). The last canon hereupon passes into a general exhortation to right living, which forms a sixth part of the whole book. In Riedel's translation we read this for the first time as a connected whole. It falls into two parts, and describes, first, the true life of ordinary Christians, warning them against an empty profession, and laying down many precepts of morality; and then it addresses itself to the "ascete" who "wishes to belong to the rank of the angels," and who lives a life of solitude and poverty. He is

encouraged by an exposition, on somewhat strange lines, of the temptations of our Lord, and is specially warned against spiritual pride and contempt of other men. The book closes with an appeal for love and mutual service, based on the parables in St Matthew xxv.

2. It is impossible to estimate the position of the Canons of Hippolytus without some reference to allied documents. (*a*) The most important of these is what is now commonly called the *Egyptian Church Order*. This is preserved to us in Coptic and Æthiopic versions, of which Achelis, in his synopsis, gives German translations. The subject-matter and arrangement of these canons correspond generally to those of Hippolytus; but many of the details are modified to bring them into accord with a later practice. A new light has been thrown on the criticism of this work by Hauler's discovery (1900) of a Latin version (of which, unfortunately, about half is missing) in the Verona palimpsest, from which he has also given us large Latin fragments of the *Didascalia* (which underlies books i.-vi. of the Apostolic Constitutions, and which hitherto we have only known from the Syriac). The Latin of the Egyptian Church Order is somewhat more primitive than the Coptic, and approaches more nearly, at some points, to the *Canons of Hippolytus*. It has a preface which refers to a treatise *Concerning Spiritual Gifts*, as having immediately preceded it; but neither this nor the Coptic-Æthiopic form has either the introduction or concluding exhortation which is found in the Canons of Hippolytus. (*b*) The *Testament of the Lord* is a document in Syriac, of which the opening part had been published by Lagarde, and of which Rahmani (1899) has given us the whole. It professes to contain instructions given by our Lord to the apostles after the resurrection. After an introduction containing apocalyptical matter, it passes on to give elaborate directions for the ordering of the Church, embodying, in a much-expanded form, the Egyptian Church Order, and showing a knowledge of the preface to that document which appears in the Latin version. It cannot be placed with probability earlier than the latter part of the 4th century. (*c*) The *Apostolic Constitutions* is a composite document, which probably belongs to the end of the 4th century. Its first six books are an expanded edition of a *Didascalia* which we have already mentioned: its seventh book similarly expands and modifies the *Didaché*: its eighth book begins by treating of "spiritual gifts," and then in c. 3 passes on to expand in like manner the Egyptian Church Order. The hand which has wrought up all these documents has been shown to be that of the interpolator of the Ignatian Epistles in the longer Greek recension. (*d*) The *Canons of Basil* is the title of an Arabic work, of which a German translation has been given us by Riedel, who thinks that they have come through Coptic from an original Greek book. They embody, in a modified form, considerable portions of the Canons of Hippolytus.

3. We now approach the difficult questions of date and authorship. Much of the material has been quite recently brought to light, and criticism has not had time to investigate and pronounce upon it. Some provisional remarks, therefore, are all that can prudently be made. It is plain that we have two lines of tradition: (1) The Canons of Hippolytus, followed by the Canons of Basil; (2) the Egyptian Church Order, itself represented (*a*) by the Latin version, the Testament of the Lord, and the Apostolic Constitutions, which are linked together by the same preface (or portions of it), (*b*) by the Coptic and Æthiopic versions. Now, the Latin preface points to a time when the canons were embodied in a *corpus* of similar materials, or, at the least, were preceded by a work on "Spiritual Gifts." The Canons of Hippolytus have a wholly different preface, and also a long exhortation at the close. The question which criticism must endeavour to answer is, whether the Canons of Hippolytus are the original from which the Egyptian Church Order is derived, or whether an earlier body of canons lies behind them both. At present it is probably wise to assume that the latter is the true explanation. For the Canons of Hippolytus appear to contain contradictory regulations (*e.g.*, cc. 2 and 4 of the presbyters), and also suggest that they have received a considerable supplement (after c. 23). There is, however, no doubt that they present us with a more primitive stage of Church life than we find in the Egyptian Church Order. The mention of sub-deacons (which, after Riedel's fresh manuscript evidence, cannot now be dismissed as due to interpolation) makes it difficult to assign a date much earlier than the middle of the 3rd century.

The Puritan severity of the canons well accords with the temper of the writer to whom the Arabic title attributes them; and it is to be noted that the exhortation at the close contains a quotation from 2 Peter actually attributed to the apostle, and Hippolytus is perhaps the earliest author who can with certainty be said to have used this epistle. But the general style of Hippolytus, which is simple, straightforward, and strong, is in marked contrast with that of the closing passage of the canons; moreover, his mind, as presented to us in his extant writings, appears to be a much larger one than that of the writer of these canons; it is as difficult to think of Hippolytus as it would be to think of Origen in such a connexion. How, then, are we to account for the attribution? There is evidence to show that Hippolytus was highly reverenced throughout the East: his writings which were in Greek were known, but his history was entirely unknown. He was supposed to be "a pupil (γνώριμος) of apostles" (Palladius, 4th century), and the Arabic title calls him "chief of the bishops of Rome," *i.e.*, archbishop of Rome. It is hard to trust this attribution more than the attribution of a Coptic discourse on the *Dormitio Mariæ* to "Evodius, archbishop of the great city Rome, who was the second after Peter the apostle" (*Texts and Studies*, iv. 2-44)—Evodius being by tradition first bishop of Antioch. A whole group of books on Church Order bears the name of Clement of Rome; and the attribution of our canons to Hippolytus may be only an example of the same tendency. The fact that Hippolytus wrote a treatise *Concerning Spiritual Gifts*, and that some such treatise is not only referred to in the Latin preface to the Egyptian Church Order, but is actually found at the beginning of book viii. of the Apostolic Constitutions, introduces an interesting complication; but we cannot here pursue the matter further. Dom Morin's ingenious attribution of the canons to Dionysius of Alexandria (on the ground of Eusebius, *H.E.* vi. 46-5) cannot be accepted in view of the broader church policy which that writer represents. If the Hippolytean authorship be given up, it is probable that Egypt will make the strongest claim to be the locality in which the canons were compiled in their present form.

The authorities of chief practical importance are Achelis, *Texte u. Unters*, vi. 4 (1891); Rahmani, *Testamentum Domini* (1899); Hauler, *Didascaliæ Apostolorum* (1900); Riedel, *Kirchenrechtsquellen des Patriarchats Alexandrien* (1900). (J. A. R.)

Canovas del Castillo, Antonio (1828-1897), Spanish statesman, was born in Malaga 8th February 1828. Educated in his native town, he went to Madrid in 1845, bent upon finding means to complete his literary and philosophical studies. His uncle Don Serafin Estebañez Calderon, found him a situation as clerk in the Madrid-Aranjuez railway, but Canovas soon took to journalism and literature, earning enough to support him-

self and pay for his law studies at the Madrid University. During this period he published his two best works—a historical novel, *Las Campanas de Huesca*, and the history of the decay of Spain from Philip III. to Charles II. under the house of Austria. He became a politician through his Junius-like letters to the "Murcielago"—*The Bat*, a satirical political journal—and by drawing up the manifesto of Manzanares in 1854 for Marshal O'Donnell, of whom he always remained a loyal adherent. Canovas entered the Cortes in 1854; he was made governor of Cadiz in 1857, sub-director of the state department in 1858, under-secretary at the Home Office in 1860, minister of the interior in 1864, minister of the colonies in 1865, minister of finance in 1866, and was exiled by Marshal Narvaez in the same year, afterwards becoming a bitter opponent of all the reactionary cabinets until the revolution of 1868. He took no part in preparing that event. He sat in the Cortes Constituyentes of 1869 as a doctrinaire Conservative, combating all Radical and democratic reforms, and defending the exiled Bourbons; but he abstained from voting when the Cortes elected Amadeus king on 16th November 1870. He did not object to some of his political friends, like Silvela and Elduayen, entering the cabinets of King Amadeus, and in 1872 declared that his attitude would depend on the concessions which Government would make to Conservative principles. After the abdication of Amadeus and the proclamation of the federal republic, Canovas took the lead of the propaganda in favour of the restoration of the Bourbons, and was their principal agent and adviser. He drew up the manifesto issued in 1874 by the young King Alphonso XII., at that time a cadet at Sandhurst; but he dissented from the military men who were actively conspiring to organize an Alphonsist *pronunciamiento*. Like Marshal Concha, marquis del Duero, he would have preferred to let events develop enough to allow of the dynasty being restored without force of arms, and he severely blamed the conduct of the generals when he first heard of the *pronunciamiento* of Marshal Campos at Sagunto. Sagasta thereupon caused Canovas to be arrested (30th December 1874); but the next day the Madrid garrison also proclaimed Alphonso XII. king, and Canovas showed the full powers he had received from the king to assume the direction of affairs. He formed a regency ministry pending the arrival of his majesty, who confirmed his appointment, and for six years Canovas was premier except during the short-lived cabinets of Marshal Jovellar in 1875 and Marshal Campos for a few months in 1879. Canovas was, in fact, the soul of the Restoration. He had to reconstruct a Conservative party out of the least reactionary parties of the days of Queen Isabella and out of the more moderate elements of the revolution. With such followers he made the constitution of 1876 and all the laws of the monarchy, putting a limited franchise in the place of universal suffrage, curtailing liberty of conscience, rights of association and of meeting, liberty of the press, checking democracy, obliging the military to abstain from politics, conciliating the Carlists and Catholics by his advances to the Vatican, the Church, and the religious orders, pandering to the protectionists by his tariff policy, and courting abroad the friendship of Germany and Austria after contributing to the marriage of his king to an Austrian princess. Canovas crowned his policy by countenancing the formation of a Liberal party under Sagasta, flanked by Marshal Serrano and other Liberal generals, which took office in 1881. He again became premier in 1883, and remained in office until November 1885; but he grew very unpopular, and nearly endangered the monarchy in 1885 by his violent repression of popular and Press demonstrations, and of student riots in Madrid and the provinces. At the death of Alphonso XII. he at once advised the queen regent to send for Sagasta and the Liberals, and during five years he looked on quietly whilst Sagasta re-established universal suffrage and most of the liberties curtailed in 1876, and carried out a policy of free trade on moderate lines. In 1890 Canovas took office under the queen regent, and one of his first acts was to reverse the tariff policy of the Liberals, denouncing all the treaties of commerce, and passing in 1892 a highly protectionist tariff. This was the starting-point of the decline in foreign trade, the advance of foreign exchanges, the decay of railway traffic, and the monetary and financial crisis which continued from 1892 to 1898. Splits in the Conservative ranks forced Canovas to resign at the end of 1893, and Sagasta came in for eighteen months. Canovas resumed office in March 1895 immediately after the outbreak of the Cuban insurrection, and devoted most of his time and efforts, with characteristic determination, to the preparation of ways and means for sending 200,000 men to the West Indies to carry out his stern and unflinching policy of no surrender, no concessions, and no reforms. He was making up his mind for another effort to enable General Weyler to enforce the reforms that had been wrung from the Madrid Government, more by American diplomacy than from a sense of the inevitable, when the bullet of an anarchist, in August 1897, at the baths of Santa Agueda, cut short his career. On the whole, Canovas must be regarded as the greatest Spanish statesman of the close of the 19th century. He was not only a politician but also a man of the world, a writer of considerable merit, a scholar well versed in social, economical, and philosophical questions, a great debater, a clever lecturer, a member of all the Madrid academies, and a patron of art and letters. (A. E. H.)

Canrobert, François Certain (1809-1895), Marshal and Senator of France, was born at St Céré, Lot, on 27th June 1809, and educated at St Cyr; he received a commission as sub-lieutenant in the 47th Regiment in 1828. He went to Africa in 1835, served in the expedition to Mascara, at the capture of Tlemcen, and in 1837 was wounded in the storm of Constantine (captain and Legion of Honour). Promoted lieutenant-colonel in 1846 and colonel of the 3rd Regiment in 1847, he commanded the expedition against Ahmed Sghir in 1848, and defeated the Arabs at the Djerma Pass. Transferred to the Zouaves, he defeated the Kabyles, and, in 1849, displayed both courage and energy in reinforcing the blockaded garrison of Bou Sada, and in command of one of the attacking columns at Zaatcha (general of brigade and Commander Legion of Honour). He led the expedition against Narah in 1850 and destroyed the Arab stronghold. Summoned to Paris, he was made aide-de-camp to the President, Louis Napoleon, and took part in the *coup d'état* of 2nd December 1851. In the Crimean war he commanded the 1st Division at the battle of the Alma, where he was twice wounded. He succeeded St Arnaud a few days later in the supreme command of the French army. He was slightly wounded and had a horse killed under him at Inkerman when leading a charge of Zouaves. In May 1855 he resigned the command-in-chief, and, soon after his return to France, was sent on diplomatic missions to Denmark and Sweden (Marshal and Senator of France, Grand Cross Legion of Honour, and honorary G.C.B.). He commanded the 3rd army corps in Lombardy in 1859, distinguishing himself at Magenta and Solferino. He successively commanded the camp at Châlons, the 4th army corps at Lyons, and the army of Paris. In the Franco-German war he commanded the 6th army corps, and, after the disaster at Forbach, served under Bazaine

in the battles around Metz, and became a prisoner of war on the surrender of that fortress. In 1872 he was appointed a member of the Supreme Council of War. He was elected Senator for Lot in 1876, and for Charente in 1879, and again in 1885. He died at Paris on 28th January 1895, and his remains received a public funeral. (R. H. V.)

Canstatt, or CANNSTATT, a town and watering-place of Würtemberg, on the Neckar, 2½ miles by rail N.E. from Stuttgart. It was connected in 1891-93 with Berg, a suburb of Stuttgart, by a bridge 990 feet long. It has railway workshops, iron-foundries, and machine shops, and manufactures of fire-engines, zinc goods, electro-technical apparatus, motor-cars, cottons, &c.; fruit and wine are cultivated. The poet Freiligrath was buried here. Population (1885), 18,031; (1895), 22,590; (1900), 26,449.

Cantal, a department in the middle of the central plateau of France, watered by the tributaries of the Lot, the Dordogne, and the Allier.

Area, 2230 square miles, distributed among 23 cantons and 267 communes. From 241,742 in 1886 the population declined to 218,941 in 1901. In 1899 there were 4978 births, of which 277 were illegitimate, against 4644 deaths; marriages numbered 1672. The chief towns are Aurillac (the capital), Mauriac, Murat, St Flour, and Salers. In 1896 there were 782 schools, with 41,000 pupils, and 3 per cent. of the population was illiterate. The area under cultivation in 1896 comprised 1,161,437 acres, of which 452,218 acres were laid out in grass, employed for the rearing of a great many cattle. Rye takes the first rank among the cereals, yielding in 1899 a value of £400,000. The green crop lands yield only a minimal return, but the natural grass lands, in which Cantal ranks first among the French departments, produced in 1899 a value of £1,025,000. There is abundance of chestnuts. The live stock in 1899 included 222,790 cattle, 42,220 pigs, 369,000 sheep, and 15,500 goats. The mining comprises but a few coal-pits, turning out 99,000 metric tons in 1898, and except for the coppersmith work of St Flour there is no metallurgic industry to speak of.

Canterbury, a city, county borough, and parliamentary borough—since 1885 returning one member only—of England, on the Stour, 62 miles E.S.E. of London by rail. The Elham Valley railway now connects Canterbury with Folkestone. Parish churches, other than the cathedral, number fourteen. Recent erections are the Simon Langton schools, endowed with funds of an old Blue Coat school, the Sidney Cooper Art Gallery, an institute containing library and museum, a Masonic temple, and a memorial (1891) of Christopher Marlowe, who was born here; there are also a Wesleyan college, the Clergy Orphan School, and a school of art under the town council. Linen-weaving, rope-making, and tanning are among the industries. Area of county borough, 3971 acres; population (1881), 21,848; (1901), 24,868.

Many improvements have been made in the cathedral. The crypt, probably the finest in England, has been cleared of the lumber formerly deposited in it; the earth placed there in the 16th century, on account of the inflow of water, has all been removed, and the bases of the Norman columns exposed to view; a good floor has been laid down, and the whole crypt provided with gas brackets, so that it can be used for various purposes. The chapel of the Holy Innocents has been fitted up and is occasionally used as a place of worship. The French church, which for many years occupied a large portion of the south side of the crypt, has been removed to the Black Prince's chantry, and is now far more convenient for the use of the alien congregation. A judicious use of gold ornament and an elaborate reredos have added materially to the beauty of the cathedral. The chapel of St Anselm has also been restored, and is now used for early morning service as well as for other services. The chapter-house, formerly in a ruinous condition, has been thoroughly restored. The roof has been entirely renovated, and the ceiling again appears in all its original beauty. The windows have all been reglazed, and the east window filled with stained glass at a cost of £1000, contributed by the Freemasons of England. The interior of the walls has been re-decorated, and the arcade, which extends round the whole building, has been tastefully ornamented. The old pavement has been replaced by a new one of a uniform pattern, and arrangements for warming this splendid room and making it suitable for public meetings have been completed.

The old palace, at the north-western part of the cathedral, last occupied by Archbishop Parker, who there entertained Queen Elizabeth, of which only a part remained, has after many changes been rebuilt, and is now the country residence of the archbishop of Canterbury.

The field lying to the east of St Augustine's College, and known as the Abbey Field, has recently been acquired by trustees. In this field are the ruins of the Chapel of St Pancras, which was probably built by St Augustine. It also contains the eastern portion of the Abbey Church of St Peter and St Paul, in which St Augustine and many of his successors were buried. There are also remains of the chapter-house, dormitory, and infirmary, and the site of the chapel of the Blessed Virgin Mary built by Eadbald, Ethelbert's son and successor. The excavations which have been commenced have laid bare many matters of interest. The ruins of the chapel of St Pancras have been uncovered, and the abbey chapter-house has been traced in part. Of the abbey church the eastern apse is now exposed to view with its central and side apsidal chapels. The central chapel contains some interesting frescoes on the walls, and in the middle are the remains of an altar highly decorated. In the north apsidal chapel there is an altar almost perfect, in front of which were found the remains of an abbot, which had been enclosed in a wooden coffin. The ambulatory at the eastern end of the crypt has also been uncovered. To the east of the main church is an oblong chapel, in which was found the body of John Dygon, abbot, who died in 1509. On the head was a large leaden painted mitre, and in the grave were found a coffin plate, a leaden chalice and paten, and two finger rings. Exploration is in progress which will, it is hoped, yield much valuable information. (F. W. F.)

Canton, city and treaty port in southern China, capital of the province of Kwangtung, on the left bank of the river Canton, some 70 miles from its mouth. The city has continued to make good progress as one of the principal markets of China. The trade, which in 1874 was H.taels 26,139,000 (£7,841,000), amounted in 1899 to H.taels 58,641,000 (£8,769,000). The silver valuation represents more accurately the volume of trade. Besides the above, which comprises the trade carried in foreign bottoms, there is a large traffic in native craft of which no statistics are kept. There is daily communication by steamer with Hongkong, and with the Portuguese colony of Macao which lies near the mouth of the river. Inland communication by steam is now open by the West river route to the cities of Wuchow and Nanning. The opening of these inland towns to foreign trade, which has been effected, cannot but add considerably to the volume of Canton traffic. The native population is variously estimated at from 1,500,000 to 2,000,000, the former being probably nearer the truth. The foreign residents number about 400. Canton is the headquarters of the provincial government of Kwangtung and Kwangsi, generally termed the two Kwang, at the head of which is a governor-general or viceroy, an office which next to that of Nanking is the

most important in the empire. It possesses a mint built in 1889 by the then viceroy Chang Chih-tung, and equipped with a very complete plant supplied from England. It turns out silver subsidiary coinage and copper cash. Contracts have been entered into to connect Canton by railway with Hong-Kong (Kowloon), and by a grand trunk line with Hankow on the Yangtse. It is connected by telegraph with all parts.

Canton, a city of Fulton county, Illinois, U.S.A., on the Chicago, Burlington, and Quincy, and the Toledo, Peoria, and Western railways, at an altitude of 651 feet. It has extensive manufactures of agricultural implements. Population (1880), 3762; (1890), 5604; (1900), 6564 (424 foreign-born, and 38 negroes).

Canton, capital of Stark county, Ohio, U.S.A., situated in 40° 48′ N. lat. and 81° 23′ W. long., in the eastern part of the state, at an altitude of 1031 feet. It is at the intersection of three railways, the Pennsylvania, the Cleveland Terminal and Valley, and the Wheeling and Lake Erie. The surrounding country is a rich agricultural region. In 1890 the manufacturing capital was $5,621,960, and the output was valued at $7,986,627. Of this, about one-fifth consisted of agricultural implements. In 1900 the assessed valuation of real and personal property was $11,033,380; the net debt was $924,719, and the total tax rate $30 per $1000. Population (1880), 12,258; (1890), 26,189; (1900), 30,667 (4018 foreign-born and 135 negroes). Canton was the home of President McKinley.

Cantù, a town of the province of Como, Lombardy, Italy, 8 miles by rail S. by E. from Como. It is a seat of considerable industry, chiefly carried on in the inhabitants' own houses. Silks, laces, veils, and nails are the principal articles made. There are also furniture factories and a technical school. Population, about 5500.

Capannori, a town of the province of Lucca, Tuscany, Italy, 3 miles E. from Lucca. It carries on silk, thread, and paper industries. Population, about 44,000.

CAPE COLONY.

Geography and Statistics.

CAPE COLONY, or officially, The Colony of the Cape of Good Hope, is a British colony in the extreme south of Africa. During the last twenty-five years of the 19th century, the boundaries of the colony underwent many modifications. In 1876, though various parts of independent Kaffraria[1] had already been brought under the control of the Cape Government, no part of the territories now known as Transkei, Tembuland, Griqualand East, and Pondoland had been actually incorporated in the colony. It was not, indeed, till 1879 that two large areas of Transkei, Fingoland and the Idutywa reserve, together with the district commonly known as Noman's-land, which was taken to comprise most of the territory belonging to modern Griqualand East, were formally proclaimed an integral part of the Cape. About this time most of the rest of Kaffraria came under British control, but it was 1885 before Galekaland, the coast region of Transkei, and the various districts composing Tembuland—Bomvanaland on the coast, Tembuland Proper, and Emigrant Tembuland, were annexed to the colony. By this annexation, the frontier of the colony was carried right up to the Umtata river, beyond which it has been already stated that Griqualand East, stretching to Natal, was within the frontier line, so that by 1885 only Pondoland, fronting on the Indian Ocean, separated the Cape from Natal. In Pondoland, Port St John's, after being for some years connected with the colony, had been incorporated along with the lower reaches of the St John's river in 1884; in 1886 the Xesibe Country (Mount Ayliff) was annexed to the Cape, and added to Griqualand East; and in the following year the Rhode Valley was included within the boundary line. The rest of Pondoland, chiefly in virtue of a British protectorate established over all the coast region in 1885, was already more or less under British control, and in 1894 it was annexed to the Cape in its entirety. Thus by 1894 the whole of Kaffraria had been incorporated, and in 1901 the extreme north-eastern frontier of the Cape was conterminous all along the line with that of Natal. Looking to the west of Kaffraria, Basutoland, which became part of Cape Colony in 1871, has since 1884 been constituted a Crown colony. Farther west still, the intimate connexion between Cape Colony and Griqualand West resulted in the incorporation of the latter in 1880, and fifteen years later the adjacent Crown colony of British Bechuanaland, lying between the Orange and Molopo rivers, and extending west as far as the 20th meridian, was brought within the Cape boundaries. On the other hand, Great Namaqualand, stretching west to the Atlantic, has been taken over by Germany, with the exception of a small district around Walfisch Bay, which, proclaimed British territory in 1878, was incorporated in 1884.

[1] Though not officially recognized, we shall retain the term Kaffraria, which is convenient for designation.

Area and Population.—The following table shows concisely the growth of the colony, giving the extent and population of the actual colony in 1875; in 1891, when Transkei, Tembuland, Griqualand East, Griqualand West, and Walfisch Bay had been incorporated, and Basutoland had been disannexed; and in 1900, when Pondoland and British Bechuanaland had been added.

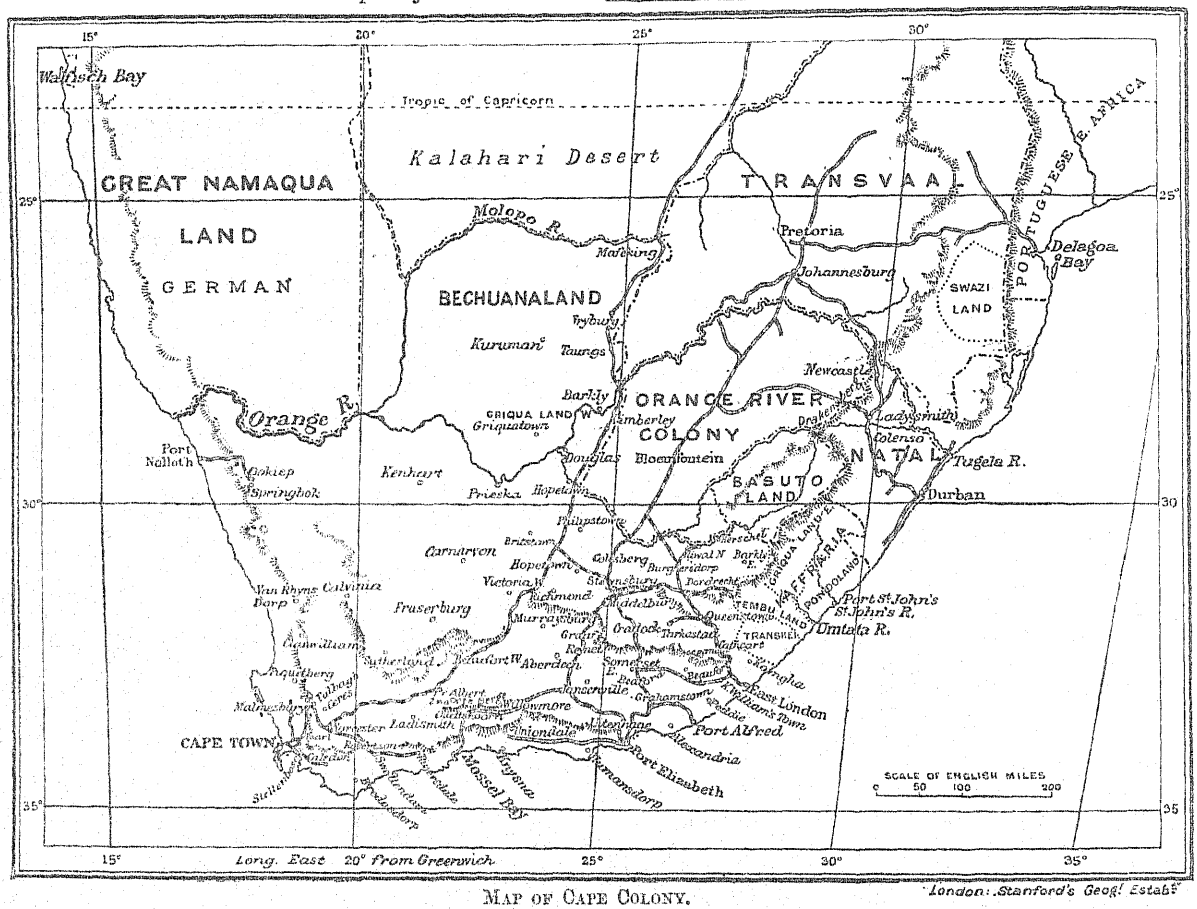
1875.		1891.		1900.	
Area.	Population.	Area.	Population.	Area.	Pop. (estimated).
201,126	849,160	260,918	1,598,773	277,077	2,349,908

The census of 1891 was the only one taken between 1875 and 1901. Since 1875 the limits of most of the divisions of the colony have been altered so entirely that it is impossible to make any comparison between the population returns of 1901 and those of 1891 and 1875. With regard to the 1875 census, however, it should be noted that the revised returns differed slightly from those given in the ninth edition of this work, placing the population of the colony proper at 720,984, and that of Basutoland at 128,176, thus making the total for the whole colony 849,160, as given above.

The incorporation of the various native territories in the east has considerably increased the average density of population in the colony. Thus, in 1891 the average density of population within the old limits of the colony (but excluding Basutoland) was 5·00 per square mile; that of Griqualand West was only 5·49 per square mile, while that of Walfisch Bay was merely 1·79; but the density of Griqualand East being 20·10, that of Tembuland 43·77, and that of Transkei 60·16, the density of the whole colony in 1891 was brought up to 6·90. If Pondoland (46·53 per square mile) and British Bechuanaland (1·41 per square mile) be taken into account, it is found that the density of the colony, as at present constituted, was 6·45 in 1891. Of the 1,527,224 inhabitants within the limits of the colony in 1891, 376,987, or about a quarter, were European or white (some 230,000 of Dutch and

French descent; 130,000 of British descent); 13,907 were Malay, 50,388 Hottentot, 229,680 Fingo, 608,456 Kaffir or Bechuana, and 247,806 mixed and other. In 1900 it was roughly estimated that the colony, as then constituted, contained about half a million white and a million and a half coloured inhabitants. The professional, commercial, and industrial occupations employ a comparatively small proportion of the people. In 1891 those of the white population engaged in such pursuits numbered respectively only 14,253, 17,922, and 31,177, whereas 77,118 were engaged in domestic employment, and 74,095 in agricultural employment, while 155,333 were dependants, and the employment of 7089 was indefinite or unspecified. The natives follow the domestic and agricultural pursuits almost exclusively. The registration of births and deaths did not become compulsory till 1895. The following table shows the numbers of the births, deaths, and marriages in that year, and in 1898 and 1899:—

Year.	Marriages.	Births.		Deaths.	
		Europeans.	Others.	Europeans.	Others.
1895	7360	14,763	31,432	6,660	24,919
1898	8718	15,340	37,864	6,936	34,031
1899	8535	15,214	39,258	6,758	30,477



MAP OF CAPE COLONY.

In 1900, 8736 marriages were solemnized, the number of births was 52,571, and the number of deaths 47,369. Among the European population the birth-rate is about 34·44 per thousand, and the death-rate 15·73 per thousand. In the same section of the population there were, in 1891, 181,031 females to 195,956 males, *i.e.*, 92·38 females to 100 males; in the total population the proportion was 99·03 to 100. About one-fifth of the population was urban, the chief towns being Cape Town, 51,251 (including suburbs, 83,718); Kimberley, 23,718; Port Elizabeth, 23,266; Grahamstown, 10,498; Beaconsfield, 10,478; Paarl, 7668; King William's Town, 7226; East London, 6924; Graaff Reinet, 5946; Worcester, 5404; and Uitenhage, 5331. From 1873-84 only 23,337 persons availed themselves of the Government aid to immigrants from England to the Cape, and in 1886 this aid was stopped. The total number of adult immigrants by sea, however, rapidly and steadily increased from 11,559 in 1891 to 38,669 in 1896, while during the same period the number of departures by sea only increased from 8415 to 17,695, and most of this increase took place in the last year. But from 1896 onwards the uncertainty of the political position caused a falling off in the number of immigrants, while the emigration figures still continued to grow; thus in 1900 there were 29,848 adult arrivals by sea, as compared with 21,163 departures.

Administration—Central Government.—Since 1893 the ministry under the Crown Governor consists of a Colonial Secretary, a Treasurer, an Attorney-General, a Commissioner of Public Works, and a Secretary of Agriculture. Each of these, if an elected member of either House of Parliament, may sit and speak in both, but vote only in that of which he is a member. The office of Secretary for Native Affairs has been abolished, and its former duties have to be discharged by the Prime Minister or such other minister as they may be assigned to by the Governor. The Prime Minister may take whichever of the five offices named above he prefers. But if (like Mr Rhodes) he assumes none of them he may draw no salary, because no holder of any office of profit other than the five already named can be lawfully elected a member of Parliament. An unpaid prime minister may, however, sit and speak in both Houses, but vote only in that of which he is a member. Some of the Cabinets formed since 1881 have comprised a "minister without portfolio"; but the constitutional laws do not provide for, though they do not forbid, this. The Chief Justice is *ex-officio* President of the Legislative Council (which has 24 members), with a casting vote. Election is now for only seven years. The 46 electoral divisions, constituted in 1898, return 95 members to the Legislative Assembly or Lower House. Since 1882 the debates in each House may be conducted in either Dutch or English. The members of this House, who are still elected for five years, choose a Speaker from their own number. By Act No. 9 of 1892 vote by ballot for both Houses was introduced, and by the same Act the number of electors was restricted by various modifications in the requisite qualifications, with a view to preventing the white vote from being "swamped" by the black. The value of property, the occupation of which qualified for electorship, was raised from £25 to £75; an alternative to the being in receipt of wages to the amount of £50 per annum, namely, the being in receipt of £25 per annum with board and lodging,

was abolished; and, further, it was enacted that no one should in future be registered as an elector who could not sign his name and write his address and occupation. The total number of registered electors in 1898-99 was 109,888. The qualifications for a member of the Lower House, being the same as those for an elector, underwent the same modification as those for an elector; those which must be possessed by a member of the Upper House remain as they were. Cumulative voting is still allowed in the election of members for the Upper House, but not in the election of members for the Lower House. The members of both Houses are paid for their services during session. By Act No. 6 of 1899 the provisions of the general electoral law were temporarily set aside in the case of persons accused of treason during the Boer war. Such cases were dealt with by the Special Tribunals created for the purpose.

Local Government.—The colony is now divided into 79 fiscal divisions. The local affairs of each division are dealt with by a council elected every three years by the registered parliamentary voters, and presided over by a civil commissioner, who is usually also resident magistrate. The laws relating to municipalities, which now number 97, were consolidated and amended in 1882; each municipality is governed by a council (with a mayor at its head), a certain number of the members of which are elected by the ratepayers every year. In 1881 there were also constituted Village Management Boards of three members for the smaller villages and hamlets. These Boards are elected annually by the registered parliamentary voters, and are now 82 in number.

Justice and Crime: Pauperism.—The administration of justice is presided over by nine judges of the Supreme Court, who are divided into three Courts of three judges each. The first, called the Supreme Court, sits in Cape Town, and is presided over by the Chief Justice and two puisne judges; the second, known as the Eastern District Court, sits at Grahamstown, and is presided over by a Judge President and two puisne judges; and the third, known as the High Court of Griqualand, sits at Kimberley, and is also presided over by a Judge President and two puisne judges. From 1879 to 1886 there was a five-judges Court of Appeal for the colony, but in the latter year this Court was abolished, and its powers were vested in the Supreme Court. From this, whether sitting as a Court of Primary Instance or as a Court of Appeal (in which latter case there must not be less than three of the nine judges sitting), there is appeal only to the Privy Council. The judges of each of the three divisional Courts go on circuit twice a year, and since 1888 a special Court has been held at Kimberley for trying cases relating to illicit diamond buying ("I.D.B."). This Court consists of two judges of the Supreme Court and one other member, hitherto the civil commissioner or the resident magistrate of Kimberley. The Transkeian territories, which fall under the jurisdiction of the Eastern District Court, are subject to a Native Territories Penal Code, which came into force in 1887. Besides the usual magistrates in these territories, there are two chief magistrates, one for Griqualand East, and the other for Tembuland (officially including Pondoland) and Transkei. At the end of 1898 the Cape Police Force comprised 68 officers, 1922 men, and 1572 horses; the municipal and ordinary Police Force, 1401 men; and the Gaol Establishment, 689 men. There were 1233 persons convicted before the special Justices of the Peace Courts in 1899; 52,904 before Magistrates' Courts, and 804 before the Superior Courts; at the end of the year there were 3348 males and 352 females in gaol. In the colony proper, in 1898, 1410 persons received indoor relief, and an average of 638 monthly received outdoor relief.

Religion.—The following table classifies the inhabitants in 1891, according to religion:—

Denomination.	Whites.	All Races.	Per-centage.
Protestants—			
Dutch Reformed Church	228,627	306,320	20·06
Others	128,333	425,727	27·87
Total	356,960	732,047	47·93
Roman Catholics	14,853	17,275	1·13
Mahommedans	31	15,099	·99
Jews	3,007	3,009	·20
Various, including Unknown and Unspecified	1,606	5,970	·39
"No Religion"	530	753,824	49·36
Grand Total	376,987	1,527,224	100·00

The general description in the ninth edition of the relative strengths of the various Protestant bodies still holds good. The Methodists have a larger number of coloured people in their denomination than any other sect, but not a larger proportion.

Education.—The University of the Cape of Good Hope, modelled on that of London, was granted a royal charter in 1877, and is governed by a chancellor, a vice-chancellor (who is chairman of the University Council), and a council of 33 members, of whom 15 are elected by the University Convention, 15 nominated by the Cape Government, and 3 nominated by the Governor to represent Natal—these last under a recent Act granting representation on the council to any other South African colony or state that agreed to give a grant to the University funds. The examinations are open to candidates irrespective of where they have studied, but under the Higher Education Act grants are paid to seven colleges that specially devote themselves to preparing students for the graduation courses. These, at which there were 658 students in 1898-99, are the South African College at Cape Town, the Victoria College at Stellenbosch, the Diocesan College at Rondebosch, St Andrew's College at Grahamstown, Gill College at Somerset East, the School of Mines at Kimberley, and the Huguenot Ladies' College at Wellington. Several denominational colleges, receiving no Government aid, do the same work in a greater or less degree, the best known being St Aidan's (Roman Catholic) College and Kingswood (Wesleyan) College, both at Grahamstown. Graaff Reinet College, Dale College, King William's Town, and the Grey Institute, Port Elizabeth, occupy the place of high schools under the Education Department. The Theological Seminary at Stellenbosch prepares theological students for the ministry of the Dutch Church, and is not connected with University work—so long as the University does not grant degrees in Divinity. Primary education is under the Education Department, controlled by a Superintendent-General of Education. The schools under the Education Department are classified into undenominational public schools of three classes—mission schools, poor schools, district boarding-schools, private farm schools, evening schools, and aborigines' schools. In addition to these there are 3 art schools, 8 industrial schools for whites, 9 for aborigines, 5 training schools for whites, 11 for aborigines. Classes for adult teachers in drawing, needlework, and woodwork are held chiefly in Cape Town. In September 1899, just before the war broke out, there were in operation 2674 schools connected with the Education Department, taught by 4505 adult teachers, and having on their rolls 147,424 children, with an average attendance of 114,842. The total Government expenditure on education in 1899-1900 was £272,214. The standard of education is rapidly improving, but education is not compulsory, and it must be remembered that among the European population 28·82 per cent. of the males and 28·02 per cent. of the females could neither read nor write in 1891.

Finance.—The following table shows the revenue (including loans) and expenditure (including that under Loan Acts) of the colony in various financial years, from 1880 to 1900:—

Year ending 30th June.	Revenue.		Expenditure.
	Total.	Loans.	
1880	£3,556,601		£3,742,665
1885	£3,814,947	£496,795	4,211,832
1890	5,571,907	1,141,857	5,327,496
1897	7,389,966	...	6,360,404
1898	7,327,975	675,750	8,613,659
1899	8,781,212	2,317,434	8,190,124
1900	6,565,752	128,376	7,778,230

The principal items in the revenue and expenditure for 1900 were as follows:—

Revenue.		*Expenditure.*	
Customs	£1,879,408	Public debt	£1,415,685
Stamps and licenses	328,789	Railways	2,017,424
Postage	302,091	Defence	223,429
Railways	2,864,880	Police and gaols	564,395
Telegraphs	164,001	Civil establishment	191,347
		Science and education	278,071
		Crown lands, forests, irrigation, harbours, &c.	244,554
		Post office and telegraphs	495,498
		Native affairs	285,330

The estimated expenditure (under votes) for 1900-1 was put down at £6,888,352. The colony had a public debt of £31,097,825 on 31st December 1900, including £3,483,878 raised for corporate bodies, harbour boards, but guaranteed in the general revenue. Nearly the whole of the loans have been spent in public works—eighteen millions and a half sterling on railways alone. The total value of assessed property in the colony, excluding the Transkeian Territories, in 1900 was returned at £54,591,746, excluding Government property. The total revenue of the Divisional Councils in 1900 was £187,493, and expenditure £168,901. The total Municipal

revenue in 1900 was £942,317, and expenditure £922,992. The total debt of the Divisional Councils, 31st December 1900, was £36,440, and of the Municipalities £2,396,105.

Defence.—The whole of the Cape peninsula is fortified against foreign attack by a series of forts and batteries; here is situated the important naval station of Simon's Bay, which is to be greatly improved, new docks to cost three millions sterling having been already authorized. A contingent of the Imperial army is specially reserved for the defence of the peninsula, and the Imperial military expenditure in 1898 was £306,308; the naval expenditure amounted to about £200,000. Further, on the Cape and West African station generally, a squadron of 13 ships is maintained. In 1878 a law was passed whereby every able-bodied man between the age of 18 and 50 years is liable to be called upon for military service, but the only purely colonial force regularly maintained (other than some bodies of volunteers, numbering 6953 in 1898) is that known as the C.M.R.—Cape Mounted Rifles. This corps numbers about 1000 officers and men, whose ordinary duties are to preserve order in Transkei. The Cape Police may be called upon for defence purposes in case of emergency. The colonial expenditure on defence in 1899-1900 was £223,429.

Minerals and Mining.—A geological survey of the colony was commenced in 1896. Meanwhile great strides have been already made in developing the mineral resources of the colony. Diamonds have become by far the most valuable of all the products of the industry. The importance of the mines around Kimberley rose by leaps and bounds after their discovery about 1870, and how the output has increased and continues to be maintained will be seen from the figures given below under exports. Coal-mining is another industry that has greatly developed, chiefly owing to the encouragement that has been given to it by the extensive use of Cape coal on the Government railways. The total yield of the mines, which are mostly situated in the Stormbergen, was 198,451 tons in 1900. The demand for copper has given a big impetus to the mines in Namaqualand, the output from which was returned at 42,678 tons in 1900.

Agriculture.—There are no recent statistics as to the area under cultivation, but of the 177,376,660 acres comprising the total area of the colony as at present constituted, 129,065,925 acres had been allotted by the end of 1900, while 48,695,897 acres were still undisposed of. The area under forests throughout the colony is over 537 square miles (343,680 acres); they yield large quantities of valuable timber, and are under the control of the Department of Agriculture, which was instituted in 1887, and for which a special ministry has been created. This department has done much good work since its institution, especially by introducing French-American resistant stocks into the vineyards, which had suffered very severely from the ravages of the phylloxera, by improving the breed of horses, by establishing an animal bacteriological laboratory, and by practically stamping out the rinderpest. In the old colony and native territories there were produced in the year ending 31st May 1899—of wheat, 2,220,747 bushels; oats, 1,810,611 bushels; barley, 830,730 bushels; mealies, 2,857,809 bushels; Kaffir corn, 2,000,000 bushels; rye, 304,491 bushels; and oat-hay, 14,547,044 bundles of about 5½ lb. There were 83,000,000 vine-stocks, yielding 4,824,432 gallons of wine, and 1,107,344 gallons of brandy. There were also fruit trees (peach, apricot, apple, pear, plum, fig, orange, lemon, and naartje) to the number, in 1898, of 4,195,624. The chief pastoral products were—wool, 35,179,900 lb; mohair, 6,707,379 lb; ostrich feathers, 278,167 lb; and butter, 2,879,000 lb. There were 1,077,044 head of cattle, 387,824 horses, 90,379 mules and asses, 12,639,992 sheep, 5,572,793 Angora and other goats, 245,947 pigs, and 260,672 ostriches. Except in the case of ostriches, these figures are all much lower than those returned in 1891 for the colony as then constituted, and in particular the number of cattle, owing to the ravages of rinderpest in 1896, is less than one-half that returned in the former year. Farms in tillage are comparatively small, but those devoted to the rearing of sheep are very large, ranging from 3000 acres to 15,000 acres and more. For the most part the graziers own the farms they occupy. Perhaps here may be best introduced a reference to the gradual extermination of the big game. The larger "wild animals," with the exception of the elephant and the Cape tiger (leopard), are practically extinct in the old colony. Bucks (antelopes), however, of all sorts, and smaller game, including many varieties of birds, are now protected by laws establishing close seasons.

Fisheries.—These are under the Department of Agriculture, which has done much to develop them. For several years a Government expert has been employed in exploring the fishing-grounds, and examining the habits of the fish, their probable quantity, &c., all round the coast. The result seems to show that the fishing-grounds could furnish an abundant supply to trawlers. Salmon and trout have been introduced into the rivers with very satisfactory results.

Manufactures.—Excluding mines, industrial establishments producing goods to the value of £100 and upwards employed altogether, in 1891, 17,062 persons, producing manufactures, &c., valued at £3,560,004. Food, drinks, and stimulants provided the largest item, with 3931 persons, and goods to the value of over two millions sterling; after this came, in value, animal matter, vehicles and harness, dress, buildings, printing books and stationery, and vegetable matter, on each of which, except the last, over 1000 persons were employed. No other industry produced goods to the value of over £100,000, or employed over 1000 persons.

Commerce.—After making every allowance for the natural growth of the colony, it will be seen from the following table, giving the total values (including specie) of the imports and exports in various years since 1885, that, up to the breaking out of the Boer war, the trade of Cape Colony underwent a great development during the later years of the 19th century.

	1885.	1890.	1895.	1898.	1899.	1900.
	£	£	£	£	£	£
Imports .	4,991,688	10,106,466	12,094,880	16,682,438	19,207,549	17,161,811
Exports .	6,224,261	9,910,370	16,904,756	25,318,701	23,662,538	7,646,682

In 1900 the specie imported was valued at £2,516,525, and the gross duty received on all imports amounted to £2,309,769. Apart from specie, the principal items in the list of imports in 1900 were textile fabrics, dress, &c., £4,301,331, and food, drinks, &c., £5,584,600. The principal items in the exports were raw gold, £336,795 (this, though not included in the imports, is first imported from the Transvaal, hence, largely, the big fall in the value of the exports in 1900); diamonds, £3,433,832; wool, £837,809; ostrich feathers, £876,801; hair (Angora), £489,905; copper ore, £498,552; and hides and skins, £346,800. During the preceding years of the decade, the lowest export of diamonds was £3,013,578 (1894), and the highest £4,775,016 (1895). The total value (partly estimated) of the diamond export from 1867 to 1900 was £95,447,399. The following table (specie excluded) shows the distribution of trade in 1885 and 1900. It will be seen that, in the imports, but not in the exports, the foreign trade has grown more proportionately than the British:—

Country.	Imports from		Exports to	
	1885.	1900.	1885.	1900.
	£	£	£	£
United Kingdom .	3,759,387	11,052,428	5,451,255	6,854,175
British Possessions	578,810	2,477,692	81,664	238,047
Foreign Countries .	434,707	3,631,691	278,525	554,460
Total {excluding Specie}	4,772,904	17,161,811	5,811,444	7,646,682

Of the imports in 1900, £1,772,580 were from the United States, and £551,101 from Germany.

Shipping and Navigation—Harbours.—Since 1860 work has been constantly going on at the Cape Town breakwater and docks. When the works, at present being proceeded with, are completed, there will be an area of about 94 acres so entirely enclosed as to be safe from every wind. Up to 1901 about £3,000,000 had been spent. At Port Elizabeth, on the west shore of Algoa Bay, only jetties have as yet been provided, at which cargoes are landed by lighters from vessels lying at anchor in the roadstead, though by far the largest amount of landing of goods is done here. At East London, at the mouth of the Buffalo river, works have been in

FOREIGN TRADE.

	1885.		1895.		1900.	
	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.
Entrances . .	715	818,666	851	1,974,576	1555	4,803,456
Clearances . .	696	792,999	810	1,905,500	1506	4,701,536

COASTING TRADE.

	1885.		1895.		1900.	
	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.
Entrances . .	1293	1,896,392	1167	3,141,982	1266	4,608,893
Clearances . .	1303	1,904,799	1170	3,153,895	1266	4,558,851

progress for many years, with a view to doing away with the bar at the river mouth, and at present vessels drawing about 20 feet of water can discharge cargo at the wharves in the river. At Mossel Bay the arrangements for landing passengers and goods are the same as at Port Elizabeth, only on a much smaller scale; but railway communication, which this part is now for the first time to enjoy, will probably lead to a considerable development of the harbour works. At Port Alfred, at the Kowie mouth, a sum of over three-quarters of a million sterling has been expended, but the average depth of water on the bar is now only about half what it was before the works were commenced, and they have in consequence been practically abandoned. Between Cape Town and East London inclusive, there are sixteen lighthouses. The registered shipping is still comparatively small, amounting in 1900 to only 37 vessels of 5936 tons, of which 31 of 5483 tons were steamers. The tonnage of the shipping engaged in the foreign and coasting trades has, however, grown considerably, as will be seen from the tables at the foot of the previous page. Of the foreign entrances in 1900, 484 of 1,544,084 tons were British; of the clearances, 856 of 2,538,463 tons.

Internal Communications—Railways, &c.—In 1875 the only railway ran from Cape Town to Wellington, a distance of 45 miles, while parliamentary sanction had just been given, and money voted, for starting what have since developed into three systems: the Western, the Midland, and the Eastern, the main lines of which proceed from the three principal seaports—Cape Town, Port Elizabeth, and East London, towards Kimberley and the north. The *Western System* starts from Cape Town, and runs by Kimberley to Vryburg and Mafeking, from which it is continued by the Rhodesian railway to Bulawayo. The total length of the main line is over 1360 miles. Branches run from Cape Town or its immediate neighbourhood to Simon's Town (22 miles), to Caledon (67 miles), and to Pickenier's Kloof by Malmesbury (126 miles). From Worcester a line constructed by a private company, with Government subsidy, runs by Swellendam to Riversdale (147 miles). The *Midland System* starts from Port Elizabeth, and the main line runs by Cradock and Naauwpoort to Norval's Pont on the Orange river, from which it is continued through the Orange River Colony and the Transvaal by Bloemfontein to Johannesburg and Pretoria. The total length of the main line is over 740 miles. From Port Elizabeth a second line (186 miles) runs by Uitenhage and Graaff Reinet, rejoining the main line at Rosmead, from which a junction line (83 miles) runs eastwards, connecting with the eastern system at Stormberg. From Naauwpoort another junction line (about 70 miles) runs north-west, connecting the Midland with the Western system at De Aar. A short branch runs from Alicedale to Grahamstown, from which a line (43 miles), owned by a private company, runs south-east to Port Alfred at the mouth of the Kowie. The *Eastern System* starts from East London, and the main line ran at first to Aliwal North on the Orange river, a distance of 280 miles. After the Midland system was completed to Johannesburg, however, a connecting line was built from Albert Junction, near Burghersdorp, by Bethulie on the Orange river to Springfontein, in what was then the Orange Free State. The distance from East London to Springfontein is 313 miles. A short branch from Blaney runs to King William's Town, and a light railway of the standard gauge has been opened from Queenstown to Tarkastad (31 miles). A private railway runs eastwards from Sterkstroom to the Indwe coal-mines (66 miles). From Cookhouse, on the eastern branch of the Midland system, a line is in process of construction by a private company subsidized by Government, westwards to Somerset East and eastwards to King William's Town; while from Klipplaat, on the western branch of the same system, a line is being constructed under similar conditions to Oudtshoorn and Mossel Bay. It is generally believed that when the gaps in this chain of railways are filled up, they will form the main railway route from Cape Town to Natal. The standard gauge of the railways in South Africa is 3 feet 6 inches, the exceptions being the Beira railway, the private railway running from Port Nolloth on the west coast to the O'Okiep copper mines (92 miles), and the light two-foot-gauge railway under construction, as an experiment, from Port Elizabeth to Avontuur. At the end of 1900, the length of Government railways in actual use was 2089, while 670 miles of line were under construction. There were also 400 miles of private railways. The capital expended on Government railways to the end of 1900 was £21,842,216, showing a cost per mile of £10,456. The gross earnings in 1900 were £3,520,537, and the expenses, £2,198,205; the number of passengers conveyed was 13,640,414, and the tonnage of goods, 1,370,248 (of 2000 lb). Electric tramways run in Cape Town and suburbs, Port Elizabeth, East London, and Kimberley, but in the case of the last-mentioned town horse and mule trams are still more general. In the old colony there are over 8000 miles of roads.

Posts and Telegraphs.—The number of post-offices at the end of 1898 was 942; the revenue in 1900 amounted to £342,431, and the expenditure to £346,979. The total number of letters despatched to England from the general post-office, Cape Town, in 1900 was 49,358,840 (nearly double the normal number), and of newspapers and book packets, 1,797,540. Almost every village in South Africa is connected with the outer world by telegraph, and at the end of 1900 there were 7467 miles of line (22,597 miles of wire), with 494 offices, besides 1723 miles of telephone wire. The number of telegraphic messages sent in 1900 was 3,562,039. The telegraphs were constructed at the expense of the Government, 781 miles of line having been taken over from a company in 1873. The revenue in 1900 was £202,454 (exclusive of £244,766, the value of Government messages), and the expenditure, £205,986.

Banks.—The following table gives statistics of the banks under trust laws:—

31st December.	Including Head Offices.			Circulation, Colony only.	Assets and Liabilities, Colony only.
	Capital.	Paid Up.	Reserve.		
1890 . .	£5,780,610	£1,558,612	£850,489	£740,210	£9,221,661
1895 . .	7,189,090	2,382,003	1,008,827	612,266	11,864,152
1900 . .	12,166,800	6,508,308	1,810,021	2,042,059	48,068,445

Money, Weights, and Measures.—Though all the standards are British, the following old Dutch measures are still used:—*Liquid Measure:* Leaguer = about 128 imperial gallons; half aum = 15½ imperial gallons; anker = 7½ imperial gallons. *Capacity:* Muid = 3 bushels. The general surface measure is the old Amsterdam *Morgen*, reckoned equal to 2·11654 acres; 1000 Cape lineal feet are equal to 1033 British imperial feet.

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RECENT HISTORY.

The year 1870 marks the dawn of a new era in South Africa. From that date the development of modern South Africa may be said to have fairly started, and in spite of political complications, arising from time to time, the progress of Cape Colony down to the outbreak of the Transvaal war of 1899 was steadily forward. The discovery of diamonds on the Orange river in 1867, followed immediately afterwards by the discovery of diamonds on the Vaal river, led to the rapid occupation and development of a tract of country which had hitherto been but sparsely inhabited. In 1870 Dutoitspan and Bultfontein diamond mines were discovered, and in 1871 the still richer mines of Kimberley and De Beers. These four great deposits of mineral wealth are still richly productive, and although not technically within the confines of Cape Colony till 1880, to-day they constitute the

greatest industrial asset which the colony possesses. At the time of the beginning of the diamond industry, both Cape Colony and the Boer Republics, as well as all the rest of the colonies of South Africa, were in a very depressed condition. Ostrich-farming was in its infancy, and agriculture but little developed. The Boers, except in the immediate vicinity of Cape Town, were a primitive people. Their wants were few, they lacked enterprise, and the trade of the colony was restricted. Even the British colonists at that time were far from rich. The diamond industry therefore offered considerable attractions, especially to colonists of British origin. It was also the means at length of demonstrating the fact that South Africa, barren and poor on the surface, was rich below the surface. It takes ten acres of Karroo to feed a sheep, but it was now seen that a few square yards of diamondiferous blue ground would feed a dozen families. By the end of 1871 a large population had already gathered at the diamond fields, and immigration continued steadily, bringing new-comers to the rich fields. Among those who emigrated to South Africa at that time was Mr Cecil Rhodes.

So far back in the history of the colony as 1858, the then Governor, Sir George Grey, had prepared for the home authorities a scheme for the federation of the various colonies and states of South Africa, but this proposition was not entertained at the time. In 1875, Lord Carnarvon, who was Secretary of State for the Colonies, and who had been successful in aiding to bring about the federation of Canada, turned his attention to a similar scheme for the confederation of South Africa. The new Parliament at Cape Town, which had received its privileges of self-government in 1872, appears to have resented the despatch in which he propounded his suggestions, and passed a resolution stating that any scheme in favour of confederation must in their opinion originate within South Africa itself. James Anthony Froude, the distinguished historian, was sent out by Lord Carnarvon to further his policy in South Africa. As a diplomatist and a representative of the British Government, the general opinion in South Africa was that Froude was not a success, and he entirely failed to induce the colonists to adopt Lord Carnarvon's views. In 1876, Fingoland, the Idutywa reserve, and Noman's-land, tracts of country on the Kaffir frontier, were annexed to Cape Colony, on the understanding that the Cape Government should provide for their government. Lord Carnarvon, still bent on confederation, now appointed Sir Bartle Frere Governor of Cape Colony and High Commissioner of South Africa.

Frere had no sooner taken office as High Commissioner, than he found himself confronted with serious native troubles in Zululand and on the Kaffir frontier of Cape Colony. In 1877 there occurred an outbreak on the part of the Galekas and the Gaikas. A considerable force of Imperial and Colonial troops was employed to put down this rising, and the war was subsequently known as the Ninth Kaffir war. This war was the last of a long series which the colonists waged on the eastern frontier ever since the colony came into existence. At its conclusion the Transkei, the territory of the Galeka tribe, under Kreli, was annexed by the British. In the meantime Lord Carnarvon had resigned his position in the British Cabinet, and the scheme for confederation which he had been pushing forward was abandoned. As a matter of fact, at that time Cape Colony was too fully occupied with native troubles to take into consideration very seriously so great a question as confederation. A wave of feeling spread amongst the different Kaffir tribes on the colonial frontier, and after the Gaika-Galeka war there followed in 1879 a rising in Basutoland under Moirosi, whose cattle-raiding had for some time past caused considerable trouble. His stronghold was taken after very severe fighting by a colonial force, but, their defeat notwithstanding, the Basutos remained in a restless and aggressive condition for several years. In 1880 the colonial authorities endeavoured to extend to Basutoland the Peace Preservation Act of 1878, under which a general disarmament of the Basutos was attempted. Further fighting followed on this proclamation, which was by no means successful, and although peace was declared in the country in 1883, the colonial authorities were very glad in 1884 to be relieved of the administration of a country which had already cost them £3,000,000. The Imperial Government then took over Basutoland as a Crown colony, on the understanding that Cape Colony should contribute for administrative purposes £18,000 annually. In 1880, Sir Bartle Frere, who by his energetic and statesmanlike attitude on the relations with the native states, as well as on all other questions, had won the esteem and regard of loyal South African colonists, was recalled by Lord Kimberley, the Liberal Secretary of State for the Colonies, and was succeeded by Sir Hercules Robinson. Griqualand West, which included the diamond fields, was now incorporated as a portion of Cape Colony.

The Boer war of 1881, with its disastrous termination, naturally reacted throughout South Africa; and as one of the most important results, in the year 1882 the first Afrikander Bond Congress was held at Graaff Reinet. The organization of the Bond developed into one embracing the Transvaal, the Orange Free State, and Cape Colony. Each country had a provincial committee with district committees, and branches were distributed throughout the whole of South Africa. At a later date the Bond in the Cape Colony dissociated itself from its Republican branches. The general lines of policy which this organization endeavoured to promote may best be gathered from *De Patriot*, a paper published in the colony, and an avowed supporter of the organization. The following extracts from articles published in 1882 will illustrate, better than anything else, the ambition entertained by some of the promoters of this remarkable organization.

"The Afrikander Bond has for its object the establishment of a South African Nationality by spreading a true love for what is really our fatherland. No better time could be found for establishing the Bond than the present, when the consciousness of nationality has been thoroughly aroused by the Transvaal war." . . . "The British Government keep on talking about a confederation under the British flag, but that will never be brought about. They can be quite certain of that. There is just one obstacle in the way of confederation, and that is the British flag. Let them remove that, and in less than a year the confederation would be established under the Free Afrikander flag." "After a time the English will realize that the advice given them by Froude was the best—they must just have Simon's Bay as a naval and military station on the way to India, and give over all the rest of South Africa to the Afrikanders." . . . "Our principal weapon in the social war must be the destruction of English trade by our establishing trading companies for ourselves." . . . "It is the duty of each true Afrikander not to spend anything with the English that he can avoid."

De Patriot afterwards became imperialist, but *Ons Land*, another Bond organ, continued in much the same strain.

In addition to having its press organs, the Bond from time to time published official utterances less frank in their tone than the statements of its press. Some of the Articles of the Bond's original manifesto are entirely praiseworthy, *e.g.*, those referring to the administration of justice, the honour of the people, &c.; such clauses as these, however, were meaningless in view of the enlightened government which obtained in Cape Colony, and for the true "inwardness" of this document it is necessary to note Article 3, which distinctly speaks of

the promotion of South Africa's independence (*Zelfstandigheid*). If the Bond aroused disloyalty and mistaken aspirations in one section of the Cape inhabitants, it is equally certain that it caused a great wave of loyal and patriotic enthusiasm to pass through another and more enlightened section. A pamphlet written in 1885 for an association called the Empire League by Mr Charles Leonard, who afterwards consistently championed the cause of civil equality and impartial justice in South Africa, maintained as follows:—

"(1) That the establishment of the English Government here was beneficial to all classes; and (2) that the withdrawal of that Government would be disastrous to every one having vested interests in the colony. . . . England never can, never will, give up this colony, and we colonists will never give up England. . . . Let us, the inhabitants of the Cape Colony, be swift to recognize that we are one people, cast together under a glorious flag of liberty, with heads clear enough to appreciate the freedom we enjoy, and hearts resolute to maintain our true privileges; let us desist from reproaching and insulting one another, and, rejoicing that we have this goodly land as a common heritage, remember that by united action only can we realize its grand possibilities. We belong both of us to a home-loving stock, and the peace and prosperity of every home in the land is at stake. On our action now depends the question whether our children shall curse or bless us; whether we shall live in their memory as promoters of civil strife, with all its miserable consequences, or as joint architects of a happy, prosperous, and united state. Each of us looks back to a noble past. United, we may ensure to our descendants a not unworthy future. Disunited, we can hope for nothing but stagnation, misery, and ruin. Is this a light thing?"

It is probable that many Englishmen reading Mr Leonard's manifesto at the time regarded it as unduly alarming, but subsequent events proved the soundness of the views it expressed. The fact is that, from 1881 onwards, two great rival ideas came into being, each strongly opposed to the other. One was that of Imperialism—full civil rights for every civilized man, whatever his race might be, under the supremacy and protection of Great Britain. The other was nominally republican, but in fact exclusively oligarchical and Dutch. The policy of the extremists of this last party was summed up in the appeal which President Kruger made to the Free State in February 1881, when he bade them "Come and help us. God is with us. It is His will to unite us as a people"—"to make a united South Africa free from British authority." The two actual founders of the Bond party were Mr Borckenhagen, a German who was residing in Bloemfontein, and Mr Reitz, afterwards State Secretary of the Transvaal. Two interviews have been recorded which show the true aims of these two promoters of the Bond at the outset. One occurred between Mr Borckenhagen and Mr Rhodes, the other between Mr Reitz and Mr T. Schreiner, whose brother became, at a later date, Prime Minister of Cape Colony. In the first interview Mr Borckenhagen remarked to Mr Rhodes: "We want a united Africa," and Mr Rhodes replied: "So do I." Mr Borckenhagen then continued: "There is nothing in the way; we will take you as our leader. There is only one small thing; we must, of course, be independent of the rest of the world." Mr Rhodes replied: "You take me either for a rogue or a fool. I should be a rogue to forfeit all my history and my traditions; and I should be a fool, because I should be hated by my own countrymen and mistrusted by yours." But as Mr Rhodes truly said at Cape Town in 1898, "The only chance of a true union is the overshadowing protection of a supreme power, and any German, Frenchman, or Russian would tell you that the best and most liberal power is that over which Her Majesty reigns." The other interview took place at the beginning of the Bond's existence. Being approached by Mr Reitz, Mr T. Schreiner objected that the Bond aimed ultimately at the overthrow of British rule and the expulsion of the British flag from South Africa. To this Mr Reitz replied: "Well, what if it is so?" Mr Schreiner expostulated in the following terms: "You do not suppose that that flag is going to disappear without a tremendous struggle and hard fighting?" "Well, I suppose not, but even so, what of that?" rejoined Mr Reitz. In the face of this testimony with reference to two of the most prominent of the Bond's promoters, it is impossible to deny that from its beginning the great underlying idea of the Bond was an independent South Africa.

In 1882 an Act was passed in the Cape Legislative Assembly, empowering members to speak in the Dutch language on the floor of the House, if they so desired. The intention of this Act was a liberal one, but the moment of its introduction was inopportune, and its effect was to give an additional stimulus to the policy of the Bond. It was probably also the means of bringing into the House a number of Dutchmen, by no means well educated, who would not have been returned had they been obliged to speak English. By this Act an increase of influence was given to the Dutch leaders. The head of the Afrikander Bond at this time in Cape Colony, and the leader of Dutch opinion, was Mr J. H. Hofmeyr, a man of undoubted ability and astuteness. Although he was recognized leader of the Dutch party in Cape Colony, he consistently refused to take office, preferring to direct the policy and the action of others from an independent position. Mr Hofmeyr sat in the House of Assembly as member for Stellenbosch, a strong Dutch constituency. His influence over the Dutch members was supreme, and in addition to directing the policy of the Bond within the Cape Colony, he supported and defended the aggressive expansion policy of President Kruger and the Transvaal Boers. In 1883, during a debate on the Basutoland Annexation Bill, Mr Rhodes openly charged Mr Hofmeyr in the House with a desire to see a "United States of South Africa under its own flag." In 1884 Mr Hofmeyr led the Bond in strongly supporting the Transvaal Boer raiders in Bechuanaland, proclaiming that if the Bechuanaland freebooters were not permitted to retain the territories they had seized, in total disregard of the terms of the Conventions, there would be rebellion among the Dutch of Cape Colony. Fortunately, however, for the peace of Cape Colony at that time, Sir Charles Warren removed the invading Boers from Stellaland and no rebellion occurred. Nevertheless the Bond party was so strong in the House that they compelled the ministry under Sir Thomas Scanlen to resign in 1884. The logical and constitutional course for Mr Hofmeyr to have followed in these circumstances would have been to accept office and himself form a government. This he refused to do. He preferred to put in a nominee of his own who should be entirely dependent on him. Mr Upington, a clever Irish barrister, was the man he selected, and under him was formed in 1884 what will always be known in Cape history as the "Warming-pan" ministry. This action was denounced by many British colonists, who were sufficiently loyal, not only to Great Britain, but also to that constitution which had been conferred by Great Britain upon the Cape Colony, to desire to see the man who really wielded political power also acting as the responsible head of the party. It was Mr Hofmeyr's refusal to accept this responsibility, as well as the nature of his Bond policy, which won for him the political sobriquet of "The Mole." Open and responsible exercise of a power conferred under the constitution of the country, Englishmen and English colonists would have accepted and even welcomed. But that subterranean method of Dutch policy which found its strongest

expression in Pretoria, and which operated from Pretoria to Cape Town, could not but be resented by loyal colonists. From 1881 down to 1898, Mr Hofmeyr practically determined how Dutch members should vote, and also what policy the Bond should adopt at every juncture in its history. The influence of this action on Cape politics was a demoralizing one. Other well-known politicians at the Cape subsequently found it convenient to adapt their views a good deal too readily to those held by the Bond. In justice to Mr Hofmeyr, however, it is only fair to say that after the Warren expedition in 1884, which was at least evidence that Great Britain did not intend to renounce her supremacy in South Africa altogether, he adopted a less hostile or anti-British attitude. The views and attitude of Mr Hofmeyr between 1881 and 1884—when even loyal British colonists, looking to the events which followed Majuba, had almost come to believe that Great Britain had little desire to maintain her supremacy—can scarcely be wondered at.

Recognizing the difficulties of the position, Mr Rhodes from the outset of his political career showed his desire to conciliate Dutch sentiment by considerate treatment and regard for Dutch prejudices. Mr Rhodes was first returned as member of the House of Assembly for Barkly West in 1880, and in spite of all vicissitudes this constituency remained loyal to him. He supported the Bill permitting Dutch to be used in the House of Assembly in 1882, and early in 1884 he first took office, as Treasurer-General, under Sir Thomas Scanlen. Mr Rhodes had only held this position for six weeks when Sir Thomas Scanlen resigned, and later in the same year he was persuaded by Sir Hercules Robinson to proceed to British Bechuanaland as Special Commissioner in succession to Mr Mackenzie. In 1885 the territories of Cape Colony were further extended, and Tembuland, Bomvanaland, and Galekaland were formally added to the colony. In 1886 Sir Gordon Sprigg succeeded Sir Thomas Upington as Prime Minister.

The period from 1878 to 1885 in Cape Colony had been one of considerable unrest. In this short time there occurred a series of native disturbances which were followed by the Boer war of 1881, and the Bechuanaland disturbances of 1884. In spite, however, of these drawbacks, the development of the country proceeded. The diamond industry was flourishing. In 1887 a conference was held in London for "promoting a closer union between the various parts of the British Empire by means of an Imperial tariff of customs." At this conference it is worthy of note that Mr Hofmeyr propounded a sort of "Zollverein" scheme, in which Imperial customs were to be levied independently of the duties payable on all goods entering the empire from abroad. In making the proposition he stated that his objects were "to promote the union of the empire, and at the same time to obtain revenue for the purposes of general defence." The scheme was not at the time found practicable. But its authorship, as well as the sentiments accompanying it, created a favourable view of Mr Hofmeyr's attitude. In the year 1888, in spite of the failure of statesmen and High Commissioners to bring about political confederation, the members of the Cape Parliament set about the establishment of a South African Customs Union. A Customs Union Bill was passed, and this in itself constituted a considerable development of the idea of federation. Shortly after the passing of the Bill the Orange Free State entered the Union. An endeavour was also made then, and for many years afterwards, to get the Transvaal to join. But President Kruger, consistently pursuing his own policy, hoped through the Delagoa Bay Railway to make the South African Republic entirely independent of Cape Colony. The endeavour to bring about a Customs Union which would embrace the Transvaal was also little to the taste of President Kruger's Hollander advisers, interested as they were in the Netherlands Railway schemes.

Another event of considerable commercial importance to the Cape Colony, and indeed to South Africa, was the amalgamation of the diamond-mining companies, chiefly brought about by Mr Cecil Rhodes, Mr Alfred Beit, and Mr Barnato in 1889. One of the principal and most beneficent results of the discovery and development of the diamond mines was the great impetus which it gave to railway extension. Lines were opened up to Worcester and Beaufort West, to Grahamstown, Graaff Reinet, and Queenstown. Kimberley was reached in 1885. In 1890 the line was extended northwards on the western frontier of the Transvaal as far as Vryburg in Bechuanaland. In 1889 the Free State entered into an arrangement with the Cape Colony whereby the main trunk railway was extended to Bloemfontein, the Free State receiving half the profits. Subsequently the Free State bought at cost price the portion of the railway in its own territory. In 1891 the Free State Railway was still further extended to Viljoen's Drift on the Vaal river, and in 1892 it reached Pretoria and Johannesburg.

In 1889 Sir Henry Loch was appointed High Commissioner and Governor of Cape Colony in succession to Sir Hercules Robinson. In 1890 Sir Gordon Sprigg, the Premier of the colony, resigned, and a Government was formed under Mr Rhodes. Prior to the formation of this ministry (see Table at end of article), and while Sir Gordon Sprigg was still in office, Mr Hofmeyr approached Mr Rhodes and offered to put him in office as a Bond nominee. This offer Mr Rhodes declined. When, however, he was invited to take office after the downfall of the Sprigg ministry, he asked the Bond leaders to meet him and discuss the situation. His policy of Customs union and railway union between the various states, added to the personal esteem in which he was at this time held by many of the Dutchmen, enabled him to undertake and to carry on successfully the business of government.

The colonies of British Bechuanaland and Basutoland were now taken into the Customs Union existing between the Orange Free State and Cape Colony. Pondoland, another native territory, was added to the colony in 1894, and the year was marked by a departure in native policy for which Mr Rhodes was chiefly responsible. It dealt with the natives residing in certain native reserves, and in addition to providing for their interests and holdings, and in other ways protecting the privileges accorded to them, the principle of the duty of some degree of labour devolving upon every able-bodied native enjoying these privileges was asserted, and a small labour tax was levied. This Act, entitled the Glen Grey Act, enjoined that "every male native residing in the district, exclusive of natives in possession of lands under ordinary quit-rent titles, or in freehold, who, in the judgment of the resident magistrate, is fit for and capable of labour, shall pay to the public revenue a tax of ten shillings per annum unless he can show to the satisfaction of the magistrate that he has been in service beyond the borders of the district for at least three months out of the previous twelve, when he will be exempt from the tax for that year, or unless he can show that he has been employed for a total period of three years, when he will be exempt altogether." This is in many respects the most statesmanlike Act dealing with natives on the statute-book; and in the session of 1895 Mr Rhodes was able to report to the Cape Parliament that the Act then applied to 160,000 natives.

During 1895 Sir Hercules Robinson was reappointed Governor and High Commissioner of South Africa in succession to Sir Henry Loch, and in the same year Mr Chamberlain became Her Majesty's Secretary of State for the Colonies.

With the development of railways, and the extension of trade between Cape Colony and the Transvaal, there had grown up a closer relationship of political questions. Whilst Premier of Cape Colony, by means of the Customs Union and in every other way, Mr Rhodes endeavoured to bring about a friendly measure of at least commercial federation among the states and colonies of South Africa. He hoped to establish both a commercial and a railway union, and a speech which he made in 1894 at Cape Town admirably describes this policy :—

"With full affection for the flag which I have been born under, and the flag I represent, I can understand the sentiment and feeling of a republican who has created his independence, and values that before all; but I can say fairly that I believe in the future that I can assimilate the system, which I have been connected with, with the Cape Colony, and it is not an impossible idea that the neighbouring Republics, retaining their independence, should share with us as to certain general principles. If I might put it to you, I would say the principles of tariffs, the principle of railway connexion, the principle of appeal in law, the principle of coinage, and in fact all those principles which exist at the present moment in the United States, irrespective of the local assemblies which exist in each separate state in that country."

To this policy President Kruger and his Government offered every possible opposition. Their action in what is known as the Vaal River Drift question will best illustrate the line of action which the Transvaal Government believed it expedient to adopt. A difficulty arose at the termination of the agreement in 1894 between the Cape Government Railway and the Netherlands Railway. The Cape Government, for the purposes of carrying the railway from the Vaal river to Johannesburg, had advanced the sum of £600,000 to the Netherlands Railway and the Transvaal Government conjointly; at the same time it was stipulated that the Cape Government should have the right to fix the traffic rate until the end of 1894, or until such time as the Delagoa Bay-Pretoria line was completed. These rates were fixed by the Cape Government at 2d. per ton per mile, but at the beginning of 1895 the rate for the 52 miles of railway from the Vaal river to Johannesburg was raised by the Netherlands Railway Company to no less a sum than 8d. per ton per mile. It is quite evident from the action which President Kruger subsequently took in the matter that this charge was put on with his approval, and with the object of compelling traffic to be brought to the Transvaal by the Delagoa route, instead of as heretofore by the Colonial Railway. In order to compete against this very high rate, the merchants of Johannesburg began removing their goods from the Vaal river by waggon. Thereupon President Kruger arbitrarily closed the drifts (fords) on the Vaal river, and thus prevented through waggon traffic, causing an enormous block of waggons on the banks of the Vaal. A protest was then made by the Cape Government against the action of the Transvaal, on the ground that it was a breach of the London Convention. President Kruger took no notice of this remonstrance, and an appeal was made to the Imperial Government; whereupon the latter entered into an agreement with the Cape Government, to the effect that if the Cape would bear half the cost of any expedition which should be necessary, assist with troops, and give full use of the Cape Railway for military purposes if required, a protest should be sent to President Kruger on the subject. These terms were accepted by Mr Rhodes and his colleagues, of whom Mr. W. P. Schreiner was one, and a protest was then sent by Mr Chamberlain stating that Her Majesty's Government would regard the closing of the drifts as a breach of the London Convention, and as an unfriendly action calling for the gravest remonstrance. President Kruger at once reopened the drifts, and undertook that he would issue no further proclamation on the subject except after consultation with the Imperial Government.

In the year 1895 the Jameson Raid occurred, and Mr Rhodes's complicity in this movement compelled him to resign the Premiership of Cape Colony in January 1896. As Mr Rhodes's complicity in the Raid became known, there naturally arose a strong feeling of resentment and astonishment among his colleagues in the Cape ministry, who had been kept in complete ignorance of his connexion with any such scheme. M. Hofmeyr and the Bond were loud in their denunciation of him. After his resignation, Mr Rhodes was proceeding to the north, when he received a summons from the Chartered Company to go to London; but after interviews with the directors in London, he went back to Rhodesia, and was present in the country during the Matabele rebellion. While hostilities were still proceeding in Matabeleland, Mr Rhodes went unarmed to a meeting of Matabele Indunas (chiefs) in the heart of the Matoppo hills. The result was not a massacre of the great white chief, as was foretold at the time, and as has occurred on similar occasions in attempted negotiations with Bantu tribes, but a peace which terminated the rebellion. It was a master-stroke of diplomacy and courage. The Matabele rising ended, Mr Rhodes travelled down through the colony on his way to attend the inquiry of the British South Africa Select Committee at Westminster, which had been appointed to investigate the causes of the Raid. The memory of the Raid, and Mr Rhodes's complicity in it, was still fresh in men's minds, the Cape Parliament having itself brought out the main facts by means of a committee of their own. But, nevertheless, so high was the esteem in which he was held that at both Port Elizabeth and Cape Town he met with an enthusiastic reception, and even at the Paarl, a Dutch centre in the Western Province, he was presented with an address signed by farmers, of whom the majority were Dutchmen. In 1897 a native rising occurred under Galeshwe, a Bantu chief, in Griqualand West. Galeshwe was arrested and the rebellion repressed. On cross-examination Galeshwe stated that Bosman, a magistrate of the Transvaal, had supplied ammunition to him, and urged him to rebel against the Government of Cape Colony. There is every reason to suppose that this charge was true, and it is consistent with the intrigues which the Boers have from time to time practised among the natives.

In 1897 Sir Alfred Milner was appointed High Commissioner of South Africa and Governor of Cape Colony in succession to Sir Hercules Robinson, who was created a peer under the title of Baron Rosmead.

In 1898 commercial federation in South Africa advanced another stage, Natal entering the Customs Union. A fresh convention was drafted at this time, and under it "a uniform tariff on all imported goods consumed within such Union, and an equitable distribution of the duties collected on such goods amongst the parties to such Union, and free trade between the colonies and state in respect of all South African products," was arranged. In the following year the Cape Parliamentary election occurred, and the result was the return to power of a Bond ministry under Mr W. P. Schreiner. From this time, until June 1900, Mr Schreiner remained in office as head of the Cape Government. During the negotiations which preceded the war in 1899, feeling at the Cape ran very high, and Mr Schreiner's attitude has been freely discussed. As head of a party, dependent for its position

in power on the Bond's support, his position was undoubtedly a trying one. At the same time, as Prime Minister of a British colony, it was strongly felt by loyal colonists that he should at least have refrained from openly interfering between the Transvaal and the Imperial Government during the course of most difficult negotiations. His public expressions of opinion were hostile in tone to the policy pursued by Mr Chamberlain and Sir Alfred Milner. The effect of them, it was believed, might conceivably be to encourage President Kruger in persisting in his rejection of the British terms. Mr Schreiner, it is true, used directly what influence he possessed to induce President Kruger to adopt a reasonable course. But however excellent his intentions, his publicly expressed disapproval of the Chamberlain-Milner policy probably did more harm than his private influence with Mr Kruger could possibly do good. On 11th June 1899, shortly after the Bloemfontein Conference, from which Sir Alfred Milner had just returned, Mr Schreiner asked the High Commissioner to inform Mr Chamberlain that he and his colleagues agreed in regarding President Kruger's Bloemfontein proposals as "practical, reasonable, and a considerable step in the right direction." Early in June, however, the Cape Dutch politicians began to realize that President Kruger's attitude was not so reasonable as they had endeavoured to persuade themselves, and Mr Hofmeyr, accompanied by Mr Herholdt, the Cape Minister of Agriculture, visited Pretoria. On arrival, they found that the Transvaal Volksraad, in a spirit of defiance and even levity, had just passed a resolution offering four new seats in the Volksraad to the mining districts, and fifteen to exclusively burgher districts. Mr Hofmeyr, on meeting the executive, freely expressed indignation at these proceedings. Unfortunately, Mr Hofmeyr's influence was more than counterbalanced by an emissary from the Free State, Mr Abraham Fischer, who, while affecting to be a peacemaker, practically encouraged the Boer executive to take extreme measures. Mr Hofmeyr's established reputation as an astute diplomatist, and as the trusted leader for years of the Cape Dutch party, made him as powerful a delegate as it was possible to find. His political insight enabled him at once to see that a concession to those moderate franchise demands which constituted the substance of Sir Alfred Milner's proposals at Bloemfontein, and which came to be known as the "Milner Minimum," might safely be accepted by the Transvaal without jeopardizing its independence. He recognized that a free admission of the Uitlanders to the franchise, with some additional ten Uitlander seats in the Volksraad, would not only leave the independence of the Transvaal unimpaired, but would leave the Boers largely masters of the situation; while he trusted to time to reconcile other differences, such as the questions of voting for President and Commandant-General. If any emissary could accomplish anything in the way of persuading Mr Kruger, it was assuredly Mr Hofmeyr. Much was looked for from his mission by moderate men of all parties, and by none more so, it is fair to believe, than by Mr Schreiner. But Mr Hofmeyr's mission, like every other mission to Mr Kruger to induce him to take a reasonable and equitable course, proved entirely fruitless. He returned to Cape Town disappointed, but probably not altogether surprised at the failure of his mission. Meanwhile a new proposal was drafted by the Boer executive, which, before it was received in its entirety, or at least before it was clearly understood, elicited from Mr Schreiner a letter on 7th July to the *South African News*, in which, referring to his Government, he said:—

"While anxious and continually active with good hope in the cause of securing reasonable modifications of the existing representative system of the South African Republic, this Government is convinced that no ground whatever exists for active interference in the internal affairs of that Republic."

This letter was precipitate and unfortunate. On 11th July, after seeing Mr Hofmeyr on his return, Mr Schreiner made a personal appeal to President Kruger to approach the Imperial Government in a friendly spirit. At this time an incident occurred which raised the feeling against Mr Schreiner to a very high pitch. On 7th July 500 rifles and 1,000,000 rounds of ammunition were landed at Port Elizabeth, consigned to the Free State Government, and forwarded to Bloemfontein. Mr Schreiner's attention was called to this consignment at the time, but he refused to stop it, alleging as his reason that, inasmuch as Great Britain was at peace with the Free State, he had no right to interdict the passage of arms through the Cape Colony. The British colonist is as capable of a grim jest as the Transvaal Boer, and this action of Mr Schreiner's won for him the nickname "Ammunition Bill." At a later date he was accused of delay in forwarding artillery and rifles for the defence of Kimberley, Mafeking, and other towns of the colony. The reason he gave for delay was that he did not anticipate war; and that he did not wish to excite unwarrantable suspicions in the minds of the Free State. His conduct in both instances may have been technically correct, but it was much resented by loyal colonists.

On 28th July Mr Chamberlain sent a conciliatory despatch to President Kruger, suggesting a meeting of delegates to consider and report on his last franchise proposals, which were complex to a degree. Mr Schreiner, on 3rd August, telegraphed to Mr Fischer begging the Transvaal to welcome Mr Chamberlain's proposal. At a later date, on receiving an inquiry from the Free State as to the movements of British troops, Mr Schreiner curtly refused any information, and referred the Free State to the High Commissioner. On 28th August Sir Gordon Sprigg in the House of Assembly moved the adjournment of the debate, to discuss the removal of arms to the Free State. Mr Schreiner, in reply, used expressions which called down upon him the severest censure and indignation, both in the colony and in Great Britain. He stated that, should the storm burst, he would keep the colony aloof with regard both to its forces and its people. In the course of the speech he also read a telegram from President Steyn, in which the president repudiated all contemplated aggressive action on the part of the Free State as absurd. The speech created a great sensation in the British press. It was probably forgotten at the time (though Lord Kimberley afterwards publicly stated it) that one of the chief reasons why the Gladstone Government had granted the retrocession of the Transvaal after Majuba, was the fear that the Cape Colonial Dutch would join their kinsmen if the war continued. What was a danger in 1881, Mr Schreiner knew to be a still greater danger in 1899. At the same time it is quite obvious, from a review of Mr Schreiner's conduct through the latter half of 1899, that he took an entirely mistaken view of the Transvaal situation. He evinced, as Premier of the Cape Colony, the same inability to understand the Uitlanders' grievances, the same futile belief in the eventual fairness of President Kruger, as he had shown when giving evidence before the British South Africa Select Committee into the causes of the Jameson Raid. Actual experience taught him that President Kruger was beyond an appeal to reason, and that the protestations of President Steyn were insincere. War had no sooner commenced with the ultimatum of the Transvaal Republic on 9th October 1899, than Mr Schreiner found himself called upon to deal with the conduct of

Cape rebels. The rebels joined the invading forces of President Steyn, whose false assurances Mr Schreiner had offered to an indignant House of Assembly only a few months before. The war on the part of the Republics was evidently not to be merely one of self-defence. It was one of aggression and conquest. Mr Schreiner ultimately addressed, as Prime Minister, a sharp remonstrance to President Steyn for allowing his burghers to invade the colony. He also co-operated with Sir Alfred Milner, and used his influence to restrain the Bond.

The first shot actually fired in the war was at Kraipan, a small railway station within the colony, forty miles south of Mafeking, a train being derailed, and ammunition intended for Colonel Baden-Powell seized. The effect of this was entirely to cut off Mafeking, the northernmost town in Cape Colony, and it remained in a state of siege for over seven months. On 16th October Kimberley was also isolated. Proclamations by the Transvaal and Free State annexing portions of Cape Colony were actually issued on 18th October, and included British Bechuanaland and Griqualand West, with the diamond fields. On 28th October Mr Schreiner signed a proclamation issued by Sir Alfred Milner as High Commissioner, declaring the Boer annexations of territory within Cape Colony to be null and void. The battles of Belmont, Graspan, and Modder River were all fought by Lord Methuen in November, on colonial soil, in his endeavour to force a passage through to the relief of Kimberley. The heavy British losses at Modderfontein on 29th November were followed by a reverse in Cape Colony at Stormberg, where an expedition under General Gatacre from Queenstown marched into a Boer ambush and was defeated. On the following day Lord Methuen suffered a severe check and heavy losses at Magersfontein. The effect of these engagements at the very outset of the war, occurring as they did within Cape Colony, was to offer every inducement to a number of the frontier colonial Boers to join their kinsmen of the Republics. The Boers are prolific, and their families large. Many younger sons from the colony, with nothing to lose, left their homes with horse and rifle to join the republican forces.

Meanwhile the loyal Cape colonists were chafing at the tardy manner in which they were enrolled by the Imperial authorities. It was not until after the arrival of Lord Roberts and Lord Kitchener at Cape Town on 10th January 1900 that these invaluable, and many of them experienced, men were freely invited to come forward. So strongly did Lord Roberts feel on the subject, that he at once made Colonel Brabant, a well-known and respected colonial veteran and member of the House of Assembly, a Brigadier-General, and started recruiting loyal colonists in earnest. On 15th February Kimberley was relieved by General French, and the Boer General, Cronje, evacuated Magersfontein, and retreated towards Bloemfontein. Mr Cecil Rhodes was shut up in Kimberley during the whole of the siege, and his presence there undoubtedly offered an additional incentive to the Boers to endeavour to capture the town, but his unique position and influence with the De Beers workmen enabled him to render yeoman service, and infused enthusiasm and courage into the inhabitants. The manufacture of a big gun, which was able to compete with the Boer "Long Tom," at the De Beers workshops, under Mr Rhodes's orders, and by the ingenuity of an American, Mr Labram, who was killed a few days after its completion, forms one of the most striking incidents of the war.

On 11th March Barkly East, a small town on the north-east frontier of the colony, which had been seized by the rebels, was reoccupied by British forces, and by the 18th of March, Burghersdorp, Aliwal North, Herschel, Lady Grey, Prieska, and other frontier towns reported that the rebel movement had collapsed. Mafeking, where the beleaguered garrison maintained their gallant defence under Colonel Baden-Powell till 17th May, was relieved by a force, chiefly colonial, sent up from Kimberley. With this incident the Cape rebellion ended, and the colony was at least for a time delivered of the presence of hostile forces.

On 20th March Mr Rose-Innes, a prominent member of the House of Assembly, who for several years had held aloof from either party, and who also had defended Mr Schreiner's action with regard to the passage of arms to the Free State, addressed his constituents at Claremont in support of the annexation of both republics; and in the course of an eloquent speech he stated that in Canada, in spite of rebellions, loyalty had been secured from the French Canadians by free institutions. In South Africa they might hope that a similar policy would attain a similar result with the Boers. In June, Mr Schreiner, whose recent support of Sir Alfred Milner had incensed many of his Bond followers, resigned in consequence of the refusal of some of his colleagues to support the Disfranchisement Bill which he was prepared, in accordance with the views of the Home Government, to introduce for the punishment of Cape rebels. The bill certainly did not err on the side of severity, but disfranchisement for their supporters in large numbers was more distasteful to the Bond extremists than any stringency towards individuals. Sir Gordon Sprigg, who after a political crisis of considerable delicacy succeeded Mr Schreiner, and for the fourth time became Prime Minister, was able to pass the Bill with the co-operation of Mr Schreiner and his section. Towards the end of the year 1900 the war entered on a new phase, and took the form of guerilla skirmishes with scattered forces of marauding Boers. In December some of these bands entered the Cape Colony and endeavoured to induce colonial Boers to join them. In this endeavour they met at first with little or no success; but as the year 1901 progressed and the Boers still managed to keep the various districts in a ferment, it was deemed necessary by the authorities to proclaim martial law over the whole colony, and this was done on the 9th October 1901.

On 4th January 1901 Sir Alfred Milner was gazetted Governor of the Transvaal and Orange River Colony, being shortly afterwards created a peer as Lord Milner, and Sir Walter Hely-Hutchinson, Governor of Natal, was appointed his successor as Governor of the Cape Colony.

Since responsible government was first granted to Cape Colony it must be admitted that, in spite of the sinister Transvaal influence on the Bond, the system has, on the whole, worked smoothly and well. There have at least never occurred in the Cape Chamber such scenes as have disgraced more than one European legislative assembly in recent years, while the statute-book is evidence of the many useful and enlightened measures which have passed into law. Many writers have objected that much more ought to have been done by a body of educated men in matters of excise, remedial measures for a depressed agriculture, and other schemes of a similar character, but as against this there must be set an admirable system of colonial civil service, which administers and controls railways, post, telegraphs, education, and native affairs with excellent results, while the Customs Union is a real step towards a practical scheme of federation.

The public life of Cape Colony has produced many men of singular ability and accomplishments, some having been of European and others of colonial birth.

First and foremost stands the Right Hon. Cecil J. Rhodes. While quite a young man, he was sent by the Cape Government in 1884 as Deputy-Commissioner to Bechuanaland. The policy he there adopted was that of maintaining the "Suez Canal" of South Africa—the Bechuanaland route to the north—for Great

Britain at all costs. He first endeavoured to conciliate the Boers by every reasonable concession, and only when he found this task hopeless did he join the politicians at the Cape in the agitation which led to the Warren expedition. By this action the great northern trade route was kept open. In 1889 Mr Rhodes was chiefly instrumental in bringing about the amalgamation of the diamond mines of Kimberley, a measure which strengthened and conserved the great mineral resources of the diamond fields, and thus preserved for Cape Colony an industry which might have declined with over-production. It has been urged that this step greatly added to his own fortune, but of all the millionaires South Africa has produced none has recognized more liberally the obligations of wealth. It is recorded of the very negotiations which led to amalgamation that Mr Rhodes insisted on the application of what (following Mr Chamberlain in his "Radical days") he called the doctrine of ransom, whereby a certain portion of the immense wealth won by such a huge and lucrative corporation as the De Beers Consolidated Mines should be directly devoted to the development and progress of the country from which that wealth was derived. In this action he also received the support of Mr Alfred Beit. This policy has been accepted and in a considerable measure acted on by the De Beers directors, if not by all shareholders, and £500,000 was advanced to further the opening up of Rhodesia and railway extension. Under Mr Rhodes's chairmanship all local institutions were treated with a liberality foreign to most commercial concerns, and he on at least one occasion urged the desirability of investing De Beers funds for the furtherance of the fruit industry in the Western Province, many of the fruit-growers being without enough capital or the requisite knowledge to conduct this industry with much success. In his dealings with the natives of Cape Colony and elsewhere in South Africa, Mr Rhodes was particularly successful. He won their personal respect, and he was signally successful, both with the Pondos and the Matabele, in arranging their future government. He opposed the native liquor traffic, and at the risk of offending some of his supporters among the brandy farmers of the Western Province, he suppressed it entirely on the diamond mines, and restricted it as far as he was able in the native reserves and territories. Nevertheless the continuance of this traffic on colonial farms, as well as to some extent in the native territories and reserves, is a black spot in the annals of the Cape Colony. The Hottentots have been terribly demoralized, and even partially destroyed by it in the Western Province.

Mr Rhodes has been denounced by his enemies as an autocrat. In view of his successful conduct of the Premiership for several years, and his cordial relationship with many men of all parties, the charge cannot be considered a just one. At the same time he had a direct way of going to the heart of things, and sometimes of acting entirely on his own responsibility in matters of State importance. The leading instance of this was in the Jameson Raid. But another instance, which is not so widely known, and in which the result was beneficial to all concerned, deserves some notice. After the native territories east of the Kei had been added to Cape Colony, and were under colonial administration, a case of claim to inheritance came up for trial, and in accordance with the law of the colony, the Court held that the eldest son of a native was his heir. This decision created the strongest resentment among the people of the territory, as it was in distinct contradiction to native tribal law, which recognized the great son, or son of the chief wife, as heir. The Government were threatened with a native disturbance, when Mr Rhodes telegraphed his assurance that compensation should be granted, and that such a decision should never be given again. This assurance was accepted and tranquillity restored. At the close of the next session (that of 1894), after this incident had occurred, Mr Rhodes laid on the table a Bill drafted by himself, the shortest the House had ever seen. It provided that all civil cases were to be tried by magistrates, an appeal to lie only to the chief magistrate of the territory with an assessor. Criminal cases were to be tried before the judges of Supreme Court on circuit. The Bill was passed, and the effect of it was, inasmuch as the magistrates administered according to native law, that native marriage customs and laws (including polygamy) were legalized in these territories. Mr Rhodes had retrieved his promise, and no one who has studied and lived amongst the Bantu will question that the action taken was both beneficent and wise. When not engaged with Cape politics, Mr Rhodes turned his energies to the north, and Rhodesia has become a monument to his energy, ambition, and financial genius.

Sir Gordon Sprigg, four times Premier, has been associated with the Cape Parliament since 1873. In and out of office his zeal has been unflagging, and if he lacks those qualities which inspire enthusiasm, and are requisite in a great leader, he has at least been a model of industry. Among other prominent politicians have been Mr Rose-Innes, Mr J. X. Merriman, and Mr Schreiner. Mr Rose-Innes is a lawyer whose intellectual gifts and patriotism have never been impugned; he is not a "party man," and this has made him, on more than one occasion, a somewhat difficult political ally. On the native question he has taken up a consistently strong attitude, defending their rights, and uncompromisingly opposing the native liquor traffic. Mr Thomas Fuller, the Cape Town representative, though he has remained outside office, has given staunch support to every enlightened liberal and progressive measure which has been brought forward. A man of exceptional culture and eloquence, he has made his influence felt, not only in politics, but in journalism, and every other branch of social and public life in the colony.

In literature, the colony has produced at least two authors whose works have taken their place among those of the best English writers of their day. The *History of South Africa*, by Mr G. M'Call Theal, will remain a classic work of reference. The careful industry and the lucidity which characterize Mr Theal's work, stamp him as a historian of whom South Africa may well be proud. In fiction, Olive Schreiner (Mrs Cronwright-Schreiner) produced, while still in her teens, the *Story of an African Farm*, a work which gave great promise of original literary genius. Her later works have scarcely fulfilled that promise. Unfortunately, she, in common with the rest of South Africa, was swept into the seething vortex of contemporary politics, and her political pamphlets will add nothing to her reputation as a writer, whatever value they may have as expressions of opinion. In music and painting there have been artists of talent in the Cape Colony, but the country is still too young, and the conditions of life too disturbed to allow such a development as has already occurred in Australia.

GOVERNORS AT THE CAPE SINCE INTRODUCTION OF RESPONSIBLE GOVERNMENT.

1870. Sir Henry Barkly.
1877. Sir Bartle Frere.
1880. Sir Hercules Robinson.
1889. Sir Henry Loch.
1895. Sir Hercules Robinson (Lord Rosmead).
1897. Sir Alfred Milner.
1901. Sir W. Hely-Hutchinson.

PRIME MINISTERS.

1872. Mr J. C. Molteno.	1890. Mr C. J. Rhodes.
1878. Mr J. Gordon Sprigg.	1896. Sir J. Gordon Sprigg.
1881. Mr T. C. Scanlen.	1898. Mr W. P. Schreiner.
1884. Mr Upington.	1900. Sir J. Gordon Sprigg.
1886. Sir J. Gordon Sprigg.	

AUTHORITIES.—*History of South Africa*, THEAL; *South African History and Geography*, THEAL; *Annual Register, Cape of Good Hope*, 1899; *Leading Points in South African History*, PRATT; *South African Studies*, HILLIER; *Cecil Rhodes: Political Life and Speeches*, VINDEX; *Cecil Rhodes*. IMPERIALIST, AND DR JAMESON; *South Africa: Its History, Heroes, and War*, MACKENZIE AND STEAD; *Austral Africa: Losing it or Ruling it*, MACKENZIE; "*The Times*" *History of the Boer War*; Parliamentary Papers—see Colonial Office list; *Argus* Annual and South African Directory.

(A. P. H.)

Cape Elizabeth, a town of Cumberland county, Maine, U.S.A., situated in the south-western part of the state, adjoining Portland, and on the Boston and Maine railway. In 1895 it was subdivided, and a part of it chartered as the city of South Portland. Population (1880), 5302; (1890), 5459.

Cape Town, the capital of Cape Colony, on the south shore of Table Bay, between the sea and Table Mountain. It stands on a site at first almost flat, then of moderate ascent, and finally with steep slope as the mountain and its spurs are approached. It is almost completely hemmed in on the west by the Lion's Head and Rump, and less completely so on the east by the Devil's Peak. Since 1875 the town has been modernized. The "stoeps" have been cleared away, and continuous foot pavements put in their place; the streets have been levelled up and paved or well macadamized, and an underground drainage and sewage system is now approaching completion. As the supply of water from the Molteno Reservoir at the foot of Table Mountain was found insufficient for the increasing needs of the town, another reservoir, with a capacity of several hundred million gallons, has been constructed on the top of the mountain. The town is lighted with gas and electric light, water falling from the mountain to the Molteno Reservoir supplying the motive power for the

production of the latter. The old flat-roofed style of architecture is being gradually eliminated, and fine structures of modern design are rising in every part. The most noteworthy streets from the architectural point of view are Adderley Street, the fashionable business quarter, in which stand the Railway Station, the new General Post-Office, and the Standard Bank; and Queen Victoria Street, looking into the Gardens, in which are the City Club, the New Supreme Courts, the Art School, the Huguenot Memorial Hall, and, at a later date, the University Buildings. At present there are no University buildings, but a site and a large sum of money for building have been bequeathed to the University. The Parliament Houses have been completed, but a new and worthier Anglican cathedral is still a *desideratum*. Of the other public buildings, apart from those noticed in *Ency. Brit.*, ninth edition, there are the South African College, with antiquated buildings except for the modern chemical and physical laboratories; the South African Museum, a well-equipped modern building in the centre of the Botanical Gardens, quite apart from the Public Library; and the Good Hope Seminary for Girls. The suburbs of Cape Town, for natural beauty of position, are among the finest in the world. On the west they extend for about three miles, by Green Point to Sea Point, between the sea and the foot of the Lion's Rump; on the east they run round the foot of the Devil's Peak, by Woodstock, Mowbray, Rondebosch, Claremont, &c., to Wynberg, a distance of 7 miles. Though these are managed by various municipalities, there is practically no break in the buildings for the whole ten miles. All the parts are connected by the suburban railway service, and by an electric tramway system. A branch of the tramway is in process of construction over the "nek" between Table Mountain and the Lion's Head, to Camp's Bay, on the west coast, and a branch of the railway is being constructed from Cape Town round the head of Table Bay towards Blaauwberg, with a view to the laying out of a new marine suburb. Trade has considerably increased in Cape Town, though it is still smaller than that of Port Elizabeth. In 1899 the goods landed amounted in value to about $5\frac{1}{4}$ millions sterling. The exports cannot well be compared with those from other ports, as they include the diamonds and bar gold from the whole of South Africa. In 1899 the total was over £11,000,000. In 1891 the population of Cape Town proper was 51,251, almost equally divided between white and coloured. The population of the whole Cape peninsula at the same date was about 100,000, the balance, also equally divided, being found mostly in the Cape Town suburbs. (R. M'W.)

Cape Verde Islands, The, on the West African coast, between 17° 13′ and 14° 47′ N. lat., and 22° 45′ and 26° 22′ W. long., consisting of fourteen islands and islets, all belonging to Portugal. Area, 1475 square miles; population (1896), 139,796. The principal product of the soil is coffee, cultivated chiefly on the islands of Santo Antão, Fogo, and São Thiago. The physic nut (*Jatropha curcas*) grows abundantly and well, also the sugar-cane, millet, and vegetables. Excellent oranges are grown. Every variety of live stock is kept, especially cattle, on São Thiago, Fogo, and Boa Vista. The principal industries, apart from agriculture, are the manufacture of sugar, spirits, salt, cottons, straw hats, and fish-curing. The total exports amounted in 1896 to a value of £85,800, and the imports (including £198,200 for coal for passing steamboats) to £354,670. The most important of the exports were coffee (£39,100), physic-tree seed (£20,450), millet (£17,100), sugar, spirits, salt, live animals, skins, and fish. This trade is principally carried on with Lisbon and the Portuguese possessions on the west coast of Africa, and with passing vessels. The imports consist principally of textiles (£43,350), food-stuffs (£23,100), wine, metals, tobacco, machinery, pottery, vegetables, &c. In 1899 the ports of the archipelago were entered by a total of 3225 vessels of 3,548,065 tons. The coal, for passing steamboats, was imported in 106 steamers with 326,577 tons cargo. The total imports in the same year were £345,111, and the exports £47,777.

Capernaum, on the shore of the Sea of Galilee. The site has been placed at Tell Hûm, where are the ruins of a synagogue, now the property of the Franciscans, and extensive remains; at Khan Minyeh; and at et-Tabgha. At Kerázeh, 3 miles north of Tell Hûm, are the ruins of Chorazin.

Capital Punishment.—By this term is meant the infliction of the penalty of death for crime under the sentence of some properly constituted authority, as distinguished from killing the offender as a matter of self-defence or private vengeance, or his execution under the order of some self-constituted or irregular tribunal unknown to the law, such as that of the Vigilantes of California, or of lynch law as practised in the Southern and Western of the United States. In the early stages of society man-slayers were killed by the avengers of blood on behalf of the family of the man killed, and not as representing the authority of the State. This mode of dealing with homicide survives in the vendetta of Corsica and of the Mainotes in Greece, and in certain of the Southern States of North America. The obligation or inclination to take vengeance depends on the fact of homicide, and not on the circumstances in which it was committed, *i.e.*, it is a part of the *lex talionis*. The mischief of this system was alleviated under the Levitical law by the creation of cities of refuge, and in Greece and Italy, both in Pagan and Christian times, by the recognition of the right of sanctuary in temples and churches. A second mode of dealing with homicide was that known to early Teutonic and early Celtic law, where the relatives of the deceased, instead of the life of the slayer, received the wer of the deceased, *i.e.*, a payment in proportion to the rank of the slain, and the king received the blood-wite for the loss of his man. But even under this system certain crimes were in Anglo-Saxon law bot-less, *i.e.*, no compensation could be paid, and the offender must suffer the penalty of death.

History.

United Kingdom.—The modes of capital punishment in England under the Saxon and Danish kings were various: hanging, beheading, burning, drowning, stoning, and precipitation from rocks. The principle on which this variety depends is that where an offence was such as to entitle the king to outlaw the offender, he forfeited all, life and limb, lands and goods, and that the king might take his life and choose the mode of death. William the Conqueror would not permit judgment of death to be executed, and substituted mutilation; but his successors varied somewhat in their policy as to capital punishment, and by the 13th century the penalty of death became by usage (without legislation) the usual punishment for high and petty treason and for all felonies (except mayhem and petty larceny, *i.e.*, theft of property worth less than 1s.). It therefore included all the more serious form of offences against person or property, such as murder, manslaughter, arson, highway robbery, burglary (or hamesucken), and larceny; and when statutory felonies were created they were also punishable by death unless the statute otherwise provided. The death penalty was also extended to heretics under the writ *de heretico comburendo*, which was lawfully issuable under statute

British and foreign laws and methods.

from 1382 (5 Ric. II. stat. 5) until 1677 (29 Chas. II. c. 9). For this purpose the legislature had adopted the civil law of the Roman empire, which was not a part of the English common law (Stephen, *Hist. Cr. Law*, 438-469).

The severity of barbarian and feudal laws was mitigated, so far as common-law offences were concerned, by the influence of the Church as the inheritor of Christian traditions and Roman jurisprudence. The Roman law under the empire did not allow the execution of citizens except *Lex Porcia*. But the right of the emperors to legislate *per rescriptum principis* enabled them to disregard the ordinary law when so disposed. The 83rd novel of Justinian provided that criminal causes against clerics should be tried by the judges, and that the convicted cleric should be degraded by his bishop before his condemnation by the secular power, and others of the novel gave the bishops considerable influence, if not authority, over the lay judiciary. In Western Europe the right given by Imperial legislation in the Eastern empire was utilized by the Papacy to claim privilege of clergy, *i.e.*, that clerks must be remitted to the bishop for canonical punishment, and not subjected to civil condemnation at all. The history of benefit of clergy is given in Pollock and Maitland, *Hist. English Law*, vol. i. pp. 424-440, and Stephen, *Hist. Cr. Law*, 463. By degrees the privilege was extended not only to persons who could prove ordination or show a genuine tonsure, but all persons who had sufficient learning to be able to read the neck-verse (Ps. li. v. 1). Before the Reformation the ecclesiastical courts had ceased to take any effective action with respect to clerks accused of offences against the king's laws; and by the time of Henry VII. for the old process of compurgation in use in these courts was substituted burning on the hands under the order of the king's judges.

The effect of the claim of benefit of clergy is said to have been to increase the number of convictions, though it mitigated the punishment; and it became, in fact, a means of showing mercy to certain classes of individuals convicted of crime as a kind of privilege to the educated, *i.e.*, to all clerks whether secular or religious (25 Edw. III. stat. 3); and it was allowed only in case of a first conviction, except in the case of clerks who could produce their letters of orders or a certificate of ordination. To prevent a second claim it was the practice to brand murderers with the letter M, and other felons with the Tyburn T, and Ben Jonson was in 1590 so marked for manslaughter.

The times of Henry VIII. were marked by extreme severity in the execution of criminals. After the formation of English settlements in America the severity of the law was mitigated by the practice of reprieving persons sentenced to death on condition of their consenting to transportation to the American colonies, and entering into bond service there. The practice seems to have been borrowed from Spain, and to have been begun at the end of the 16th century (39 Eliz. c. 4). It was in full force immediately after the Restoration, and is recognized in the Habeas Corpus Act of 1677, and was applied by Cromwell after his campaign in Ireland, and to the Cameronians during Claverhouse's campaign in south-west Scotland. In the 18th century the courts were empowered to sentence felons to transportation instead of to execution, and this state of the law continued until 1857 (6 *Law Quarterly Review*, p. 388). The power to sentence to transportation applied only to felonies with benefit of clergy; and in 1705, on the abolition of the necessity of proving capacity to read, all criminals alike became entitled to the benefit previously reserved to clerks. Benefit of clergy was finally abolished in 1827 as to all persons not having privilege of peerage, and in 1841 as to peers and peeresses. By this time its beneficial effect had been exhausted, since no clergyable offences remained capital crimes.

At the end of the 18th century the criminal law of all Europe was ferocious and indiscriminating by its administration of capital punishment for almost all forms of grave crime; and yet owing to poverty, social conditions, and the inefficiency of the police, such forms of crime were far more numerous than they now are. The policy and righteousness of the English law were questioned as early as 1766 by Goldsmith through the mouth of the vicar of Wakefield: "Nor can I avoid even questioning the validity of that right which social combinations have assumed of capitally punishing offences of a slight nature. In cases of murder their right is obvious, as it is the duty of us all from the law of self-defence to cut off that man who has shown a disregard for the life of another. Against such all nature rises in arms; but it is not so against him who steals my property." He adds later: "When by indiscriminate penal laws the nation beholds the same punishment affixed to dissimilar degrees of guilt, the people are led to lose all sense of distinction in the crime, and this distinction is the bulwark of all morality."

The opinion expressed by Goldsmith was strongly supported by Bentham, Romilly, Basil Montagu, and Mackintosh in England, and resulted in considerable mitigation of the severity of the law. In 1819 about 180 crimes were capital. As the result of the labour of these eminent men and their disciples, and of Sir Robert Peel, there are now only four crimes capitally punishable in England,—high treason, murder, piracy with violence, and destruction of public arsenals and dockyards (12 Geo. III. c. 24). An attempt to abolish the death penalty for this last offence was made in 1837, but failed, and has not since been renewed. In the case of the last two offences sentence of death need not be pronounced, but may be recorded (4 Geo. IV. c. 48). High treason is rarely prosecuted as such, but dealt with as treason felony, and since 1838 sentence of death has in practice been executed only for murder.

The change in the severity of the law is best illustrated by the following statistics:—

Years.	Death Sentences.		Sentences Executed.	
	For all Crimes.	For Murder.	For all Crimes.	For Murder.
1831	1601	14	52	12
1833[1]	931	9	33	6
1838[1]	116	25	6	5
1862[1]	29	28	15	15

During the twenty years from 1879 to 1898, 1278 persons were committed for trial in England for murder, being an average of 64. The highest number was in 1884 (79), and the lowest in 1892 (50).

Of those tried in 1898, 27 were convicted, 11 were executed (all males), 15 had their sentence commuted to penal servitude for life.

The judicial statistics do not show whether any persons charged with murder were convicted of manslaughter.

Twenty persons charged with murder were sent to Broadmoor as criminal lunatics. Of these 5 were found insane on arraignment, 11 were found guilty, but insane, and 4 were certified insane by the Home Office before or after trial. It is difficult to reconcile these figures with those of the convictions, except by supposing that the persons found guilty, but insane, are not included in the convictions.

The common-law method of punishing male traitors was ferocious in the extreme. According to Walcot's case (1696) 1 *Eng. Rep.* p. 89, the proper sentence was "quod . . . ibidem super bigam (herdillum) ponatur et abinde usque ad furcas de [Tyburn] trahatur, et ibidem per collum suspendatur et vivus ad terram prosternatur et quod secreta

[1] Each of these years followed upon legislation mitigating severity of punishment.

membra ejus amputentur, et interiora sua intra ventrem suum capiantur et in ignem ponantur et ibidem *ipso vivente* comburantur, et quod caput ejus amputetur, quodque corpus ejus in quatuor partes dividatur et illo ponantur ubi dominus rex eas assignare voluit." There is a tradition that Harrison the regicide after being disembowelled rose and boxed the ears of the executioner.

In Townley's case (18 Howell, *State Trials*, 350, 351), there is a ghastly account of the mode of executing the sentence; and in that case the executioner cut the traitor's throat. In the case of the Cato Street conspiracy (1820, 33 Howell, *State Trials*, 1566), after the traitors had been hanged their heads were cut off by a man in a mask whose dexterity led to the belief that he was a surgeon.

Female traitors were until 1790 liable to be drawn to execution and burnt alive. In that year hanging was substituted for burning (30 Geo. III. c. 48).

In 1814, so much of the sentence as related to disembowelling and burning the bowels was abolished (54 Geo. III. c. 146), and the king was empowered to substitute decapitation for hanging. But it was not till 1870 that the portions of the sentence as to drawing and quartering were abolished (33 and 34 Vict. c. 23, § 31).

The mode of executing male offenders other than traitors has in England almost always been by hanging. The more primitive modes of carrying out the sentence were gradually disused, and the present system of hanging by use of the drop is said to have been inaugurated by the exertions of Earl Ferrers. The form of scaffold now in use has under the gallows a drop constructed on the principle of the trap-doors on a theatrical stage, upon which the convict is placed under the gallows, a white cap is placed over his head, and when the halter has been properly adjusted the drop is withdrawn by a mechanical contrivance, and the convict falls to a distance calculated to fracture the cervical vertebræ, the noose tightening so as to stop respiration, and the convict hangs until life is extinct.

It was until quite lately considered essential that executions, like trials, should be public, and be carried out in a manner calculated to impress evil-doers. Partly to this idea, partly to notions of revenge and temporal punishment of sin, is probably due the rigour of the administration of the English law. But the methods of execution were unseemly, as delineated in Hogarth's print of the execution of the idle apprentice, and were ineffectual in reducing the bulk of crime, which was augmented by the inefficiency of the police and the uncertainty and severity of the law, which rendered persons tempted to commit crime either reckless or confident of escape. The scandals attending public executions led to an attempt to alter the law in 1841, although many protests had been made long before, among them those of the novelist Fielding. But perhaps the most forcible and effectual was that of Charles Dickens in his letters to the *Times* written after mixing in the crowd gathered to witness the execution of the Mannings at Horsemonger Lane Gaol in 1849. After his experiences he came to the conclusion that public executions attracted the depraved and those affected by morbid curiosity; and that the spectacle had neither the solemnity nor the salutary effect which should attend the execution of public justice. His views were strongly resisted in some quarters; and it was not until 1868 (31 and 32 Vict. c. 24) that they were accepted, and executions for murder conducted in private in England. Under that Act (which was adopted from similar legislation already in force in the Australian colonies) convicted murderers are hanged within the walls of a prison. As a general rule the sentence is carried out at 8 A.M. on a week-day (not being Monday), in the week following the third Sunday after sentence was passed. The persons required to be present are the sheriff, the gaoler, chaplain, and surgeon of the prison, and such other officers of the prison as the sheriff requires; justices of the peace for the jurisdiction to which the prison belongs, and such of the relatives, or such other persons as the sheriff or visiting justices allow, may also attend. It is usual to allow the attendance of some representatives of the Press. The death of the prisoner is certified by the prison surgeon, and a declaration that judgment of death has been executed is signed by the sheriff. An inquest is then held on the body by the coroner for the jurisdiction and a jury from which prison officers are excluded. The certificate and declaration, and a duplicate of the coroner's inquiry also, are sent to the Home Office, or in Ireland to the Lord-Lieutenant, and the body of the prisoner is interred in quicklime within the prison walls if space is available. It is the practice to toll the prison bell, or the bell of a neighbouring church, for fifteen minutes before and fifteen minutes after the execution; but the hoisting of the black flag at the moment of execution was abolished in 1902.

These regulations apply only to executions for murder; but since the passing of the Act there have been no executions for any other crime within the United Kingdom.

In Scotland capital punishment can be imposed only for treason, murder, and offences against 10 Geo. IV. c. 38, *i.e.*, wilful shooting, stabbing, strangling, or throwing corrosives with intent to murder, maim, disfigure, disable, or do grievous bodily harm, in all cases where if death had ensued the offence would have been murder. Prior to 1887 rape, robbery, wilful fire-raising, and incest, and many other crimes, were also capital offences; but in practice the pains of law were restricted at the instance of the prosecution. The sentence is carried out by hanging. It is accomplished under the supervision of the magistrates of the burgh in which it is decreed to take place; and in lieu of the inquest necessary in England and Ireland an inquiry is held at the instance of the procurator-fiscal before a sheriff or sheriff-substitute.

In Ireland capital punishment can be imposed for the same offences as in England, except offences under the Dockyards Protection Act, 1772 (12 Geo. III. c. 24), and it is carried out in the same manner.

Offences under Military Law.—Thus far only crimes against the ordinary law of the land have been dealt with. But both the Naval Discipline Act of 1866 and the Army Act empower courts-martial to pass sentence for a number of offences against military and naval laws. Such sentences are rarely if ever passed where an ordinary court is within reach, or except in time of war. The offences extend from traitorous communication with the enemy and cowardice on the field to falling asleep while acting as a sentinel on active service.

British Colonies and Possessions.—Under the Indian Penal Code sentence of death may be passed for waging war against the king (§ 121) and for murder (§ 302). If the murder is committed by a man under sentence of transportation for life the death penalty must be imposed (§ 303). In other cases it is alternative. This code has been in substance adopted in Ceylon, the Straits Settlements, and Hong-Kong, and in the Sudan. In most of the British colonies and possessions the death penalty may be imposed only in the case of high treason, wilful murder, piracy with violence. But in New South Wales and Victoria sentence of death may be passed for rape and criminal abuse of girls under ten. In Queensland the law was the same until the passing of the Criminal Code of 1899.

Throughout British South Africa the criminal law is

based on the Roman-Dutch law, and not on the English common law. Capital punishment is there lawful for treason (crimen perduellionis or læsæ majestatis), murder and rape (van Leeuwen, c. 36). Though the Roman-Dutch modes of executing the sentence by decapitation or breaking on the wheel have not been formally abolished, in practice the sentence is executed by hanging. The Roman-Dutch law as to crime and punishments has been superseded in Ceylon and British Guiana by ordinances based on the English system. Under the Canadian Criminal Code of 1892 the death sentence may be imposed for treason (§ 657), murder (§ 231), rape (§ 267), piracy with violence (§ 127), and upon subjects of a friendly power who levy war on the king in Canada (§ 68). But the judge is bound by statute to report on all death sentences, and the date of execution is fixed so as to give time for considering the report. The sentence is executed by hanging within a prison, and under conditions very similar to those in England (§§ 936-945).

Austria-Hungary.—Under the Austrian Penal Code sentence of death may be passed, *inter alia*, for the graver forms of high treason, for murder, robbery with violence causing death, incendiarism or damage to trains, steamers, &c., causing death. The sentence is carried out by public hanging, supplemented, if ineffectual, by the hands of the executioner. It is very rarely executed. The criminal law of Hungary embodied in a code of 1885 has not abolished capital punishment.

Belgium.—Under the Belgian Penal Code of 1867 the death penalty is retained for certain forms of high treason, and for assassination and parricide by poisoning. It may not be pronounced on a person under 18. The sentence is executed publicly by the guillotine. But no execution seems to have taken place since 1863.

Denmark.—Sentence of death used to be executed by the axe; the guillotine is now used.

Finland.—In Finland the death penalty is alleged not to have been inflicted since 1824; and it is said to have been abolished in 1826.

France.—Under the *ancien régime* in France, 115 crimes had become capital in 1789. The mode of execution varied, but in some cases it was effected by breaking on the wheel or burning, and was coupled with mutilation. Under the Penal Code of 1810, as amended in or after 1832, even so late as 1871, thirty offences were capital, one being perjury against a prisoner resulting in his condemnation to death (art. 361). But juries freely exercise the power of acquitting in capital cases, or of defeating the capital sentence by finding extenuating circumstances in more than seven-eighths of the cases, which compels the court to reduce the punishment by one or more degrees, *i.e.*, below the penalty of death. The sentence is executed in public by decapitation by the guillotine.

Germany.—In many of the states of Germany capital punishment had been abolished (Brunswick, Coburg, Nassau, Oldenburg in 1849; Saxe-Meiningen, Saxe-Weimar, 1862; Baden, 1863; Saxony, 1868). But it has been restored by the Imperial Criminal Code of 1872, in the case of attempts on the life of the emperor, or of the sovereign of any federal state in which the offender happens to be (§ 80), and for deliberate homicide (§ 211). The various states are allowed to choose their own instruments of death. In the old provinces of Prussia it is the axe. In Rhenish Prussia and the kingdom of Saxony the guillotine is used. Executions were public till 1851, but they are now conducted privately within the prison walls in the presence of certain specified persons.

Holland.—In Holland there have been no executions since 1860. The death penalty was abolished in 1870, and was not reintroduced in the Penal Code of 1886. The mode of execution used to be by hanging, as in England.

Italy.—Capital punishment was abolished in Tuscany as far back as 1786, and from Italy has come the chief opposition to the death penalty originated by Beccaria, and supported by many eminent jurists. Under the Penal Code of 1888 the death penalty was abrogated for all crimes, even for regicide. The cases of homicide in Italy are very numerous compared with those in England; but there are no statistics available to show any connexion between this fact and the abolition of capital punishment.

Japan.—The penalty of death is executed by hanging within a prison. It may be imposed for executing or contriving acts of violence against the Mikado or certain of his family, and for seditious violence with the object of seizing the territory or subverting the government or laws of Japan, or conspiring with foreign Powers to commence hostilities against Japan. It is inflicted for certain forms of homicide, substantially wilful murder in the first degree.

Norway.—Under Norwegian law sentence of death may be passed for murder with premeditation. But the court may as an alternative decree penal servitude for life. Sentence of death must be passed in cases where a person under sentence of penal servitude for life commits murder or culpable homicide, or causes bodily injuries in circumstances warranting a sentence of penal servitude for life, or commits robbery or the grave forms of wilful fire-raising. The sentence is carried out by decapitation; but there has been no execution since 1876.

Portugal.—There has been considerable objection in Portugal to capital punishment, and it is said to have been abolished in 1867. No one has been executed since 1846.

Rumania. — Capital punishment was abolished in Rumania in 1864.

Russia.—In 1750 under the Empress Elizabeth capital punishment was abolished; but it has since been restored, and is certainly inflicted for forms of high treason and attempts against the royal family, and breaking the quarantine laws for keeping out plague. It is difficult to ascertain whether it applies to other forms of crime; but it would seem that persons are put to death for some of the grave forms of homicide. The sentence is executed by shooting, beheading, or hanging.

Spain.—Under the Spanish Penal Code of 1870 the following crimes are capital: inducing a foreign power to declare war against Spain, killing the sovereign, parricide, and assassination. The sentence is executed in public. The criminal is conducted to the scaffold on horseback or in a cart, wearing a black tunic. A procession of priests, &c., attends him. He is seated on a scaffold and executed by the garrotte, *i.e.*, he is fastened to an upright post by an iron collar, and a knob worked by a screw or lever dislocates his spinal column, or a small blade severs the spinal column at the base of the brain.

Sweden.—The severity of the law in Sweden was greatly mitigated so far back as 1777. Under the present law the penalty of death may be imposed for certain forms of treason, including attempts on the life of the sovereign or on the independence of Sweden, or its union with Norway, and for premeditated homicide (*assassinat*), and in certain cases for offences committed by persons under sentence of imprisonment for life. Under a royal decree of 1877 it is executed by decapitation within the walls of a prison in the presence of certain officials and, if desired, of representatives of the commune in which the prison is situate. It is rarely executed, but in 1901 a man was beheaded for running amuck on a steamboat and killing and wounding a dozen people, and in 1901 a Bill to abolish capital punishment was rejected by both Houses of the Swedish Parliament.

Switzerland. — Capital punishment was abolished in Switzerland in 1874 by Federal legislation; but in 1879, in consequence of a plebiscite, each canton was empowered to restore the death penalty for offences in its territory. The Federal Government was unwilling to take this course, but was impelled to it by the fact that, between 1874 and 1879, cases of premeditated murder had considerably increased. Seven of the cantons out of twenty-two have exercised the power given to restore capital punishment. But there do not seem to have been any cases in which the death penalty was inflicted; and on the assassination of the empress of Austria at Geneva it was found that the laws of the canton did not permit the execution of the assassin.

United States of America.—Under the Federal laws sentence of death may be passed for treason against the United States and for piracy and for murder within the Federal jurisdiction. But for the most part the punishment of crime is regulated by the laws of the constituent states of the Union.

The death penalty was abolished in Michigan in 1846 except for treason, and wholly in Wisconsin in 1853. In Maine it was abolished and subsequently re-enacted, but again abolished in 1887. In Rhode Island it was abolished in 1852, but restored in 1882, only in case of murder committed by a person under sentence of imprisonment for life. In all the other states the death penalty may still be inflicted: in Alabama, Delaware, Georgia, Maryland, and West Virginia, for treason, murder, arson, and rape; in Alaska, Arizona, Kansas, New Jersey, Mississippi, Montana, New York, North Dakota, Oregon, and South Dakota for treason and murder; in Colorado, Idaho, Illinois, Iowa, Massachusetts, Minnesota, Nebraska, New Hampshire, New Mexico, Nevada, Ohio, Oklahoma, Pennsylvania, Utah, and Wyoming for murder only; in Kentucky and Virginia for treason, murder, and rape; in Vermont for treason, murder, and arson; in Indiana for treason, murder, and arson if death result; in California for treason, murder, and train wrecking; in North Carolina for murder, rape, arson, and burglary; in Florida, Missouri, South Carolina, Tennessee, and Texas for murder and rape; in Arkansas and Louisiana for treason, murder, rape, and administering poison or use of dangerous weapons with intent to murder. Louisiana is cited by Girardin (*le droit de punir*) as a state in which the death penalty was abolished in 1830. Under the influence of the eminent jurist, Livingston, who framed the state codes, the legislature certainly passed a resolution against capital punishment. But since as early as 1846 it has been there lawful, subject to a power given to the jury, to bring in a verdict of guilty, "but no capital punishment," which had the effect of imposing a sentence of hard labour for life. In certain other states the jury has under local legislation the right to award the sentence. The constitutionality of such legislation has been doubted, but has been recognized by the courts of Illinois and Iowa. Sentence of death is executed by hanging by the neck except in New York and Ohio, where it is carried out by "electrocution," or by passing through the body of the convict a current of electricity of sufficient intensity to cause death and until death is caused. The execution is carried out privately in a specified prison, only certain specified persons or classes of persons are allowed to be present, and no coroner's inquest is held (Ohio Stat., §§ 7338-7344, New York State Laws of 1888, c. 489). The validity of the New York law was attacked, largely on the ground that the method of death which was prescribed under it was a "cruel and unusual punishment" and therefore contrary to one of the clauses of the Constitution of the United States; but the constitutionality of the law was finally upheld both in the state and Federal courts. Through the United States as a whole public opinion is certainly not against capital punishment.

With the mitigation of the law as to punishment the agitations against capital punishment have lost their force. But many Continental and American writers, and some English writers and associations, advocate the total abolition of the death punishment. Émile de Girardin, writing against all forms of punishment, said that he would abolish that of death last as being the least cruel and the most effectual. The ultimate argument of the opponents is that society has no right to take the life of any one of its members on any ground. But they also object to capital punishment: (1) on religious grounds, because it may deprive the sinner of his full time for repentance; (2) on medical grounds, because homicide is usually if not always evidence of mental disease or irresponsibility; (3) on utilitarian grounds, because capital punishment is not really deterrent, and is actually inflicted in so few instances for murder that criminals discount the risks of undergoing it; (4) on legal grounds, *i.e.*, that the sentence being irrevocable and the evidence often circumstantial only, there is great risk of gross injustice in executing a person convicted of murder; (5) on moral grounds, that the punishment does not fit the case nor carry out the true function of punishment, namely, the reformation of the offender.

The question of abolition.

The punishment is probably retained, partly from ingrained habit, partly from a sense of its appropriateness for certain crimes, but also that the *ultima ratio* may be available in cases of sufficient gravity to the commonweal. The apparent discrepancy between the number of trials and convictions for murder is not in England any evidence of hostility on the part of juries to capital punishment, which has on the whole lessened rather than increased since the middle of the 19th century. It is rarely if ever necessary in England, though common in America, to question the jurors as to their views on capital punishment. The reasons for the comparatively small number of convictions for murder seem to be: (1) that court and jury in a capital case lean *in favorem vitæ*, and if the offence falls short of the full gravity of murder, conviction for manslaughter only results; (2) that in the absence of a statutory classification of the degrees of murder, the prerogative of mercy is exercised in cases falling short of the highest degree of gravity as recognized by lawyers and public opinion; (3) that where the conviction rests on circumstantial evidence the sentence is not executed unless the circumstantial evidence is conclusive; (4) that charges of infanticide against the mothers of illegitimate children are treated mercifully by judge and jury, and usually terminate in acquittal, or in a conviction of concealment of birth; (5) that many persons tried as murderers are obviously insane; (6) that coroners' juries are somewhat recklessly free in returning inquisitions of murder without any evidence which would warrant the trial of the person accused.

The medical doctrine, and that of Lombroso with respect to criminal atavism and irresponsibility have probably tended to incline the public mind in favour of capital punishment, and Sir James Stephen and other eminent jurists have even been thereby tempted to advocate the execution of habitual criminals. It certainly seems strange that the community should feel bound carefully to preserve and tend a class of dangerous lunatics, and to give them, as Charles Kingsley says, "the finest air in England and the right to kill two gaolers a week."

The whole question of capital punishment was considered by a royal commission appointed in 1864, which

reported in 1866 (Parl. Pap. 1866, 10,438). The commission took the opinions of all the judges of the supreme courts in the United Kingdom and of many other eminent persons, and collected the laws of other countries so far as this was ascertainable. The commissioners differed on the question of the expediency of abolishing or retaining capital punishment, and did not report thereon. But they recommended: (1) that it should be restricted throughout the United Kingdom to high treason and murder; (2) alteration of the law of homicide so as to classify homicides according to their gravity, and to confine capital punishment to murder in the first degree; (3) modification of the law as to child murder so as to punish certain cases of infanticide as misdemeanours; (4) authorizing judges to direct sentence of death to be recorded; (5) the abolition of public executions.

Of these suggestions Parliament has carried out only the last, from which the commissioners averse from capital punishment dissented; and it is improbable that the question will again assume any importance until a criminal code is introduced. At the present time, when a trial for murder takes place, there is frequently a good deal of newspaper agitation for reprieve of the prisoner. But this is usually dictated more by desire to re-try the case in the Press, and to criticize the evidence or the tribunal, than to advocate the theories of absolute opponents to capital punishment.

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Capitanata, the former name, down to 1871, of the Italian province of Foggia.

Capiz, the capital of the province of the same name in the Island of Panay, Philippine Islands. It is some five miles from the north coast, on a river of sufficient depth to admit small steamers. It is a healthful, although rather hot, town, with good government buildings. Alcohol is manufactured in large quantities from the fermented juice of the nipa palm, which grows plentifully in the neighbouring swamps. Rice and sugar are raised in abundance. Tobacco, Indian corn, and cacao are produced to a limited extent. Fishing, and the weaving of fabrics of cotton, hemp, and pine-apple fibre are important industries. The language is Visayan. Population, 25,000.

Capo d'Istria, a fortified seaport town of Austria, in the margraviate of Istria. In addition to the production of salt, its principal industries are weaving, dyeing, and shipbuilding. Trade is chiefly in sea-salt, wine, and oil. It is also a sea-bathing resort. Population (1890), 10,706; (1900), 10,711, mostly Italian.

Capri, an island of the province of Naples, Campania, Italy, at the S. entrance of the Gulf of Naples. It is visited by some 30,000 strangers every summer, whilst many German and other artists stay there all the year round. The air is pure, the winter mean being 50° Fahr. The island is also famous for its wine. Since 1874 there has been a driving-road up to Anacapri (pop. 2500). Population of Capri, the chief town, 3700; of the entire island, about 6500.

Caprivi de Caprera de Montecuccoli, Georg Leo von, COUNT (1831-1899), German soldier and statesman, was born 24th February 1831 at Charlottenburg. The family springs from Carniola, and the name was originally written Kopriva; in the 18th century one branch settled in Wernigerode, and several members entered the Prussian service; the father of the Chancellor held a high judicial post, and was made a life member of the Prussian House of Lords. Caprivi was educated in Berlin, and entered the army in 1849; he took part in the campaign of 1866, being attached to the staff of the 1st army. In 1870 he served as chief of the staff to the 10th army corps, which formed part of the 2nd army, and took part in the battles before Metz as well as in those round Orleans, in which he highly distinguished himself. After the peace he held several important military offices, and in 1883 was made Chief of the Admiralty, in which post he had to command the fleet and to organize and represent the department in the Reichstag. He resigned in 1888, when the command was separated from the representation in Parliament, and was appointed commander of the 10th army corps. Bismarck had already referred to him as a possible successor to himself, for Caprivi had shown great administrative ability, and was unconnected with any political party; and in March 1890 he was appointed Chancellor, Prussian Minister President, and Foreign Minister. He was quite unknown to the public, and the choice caused some surprise, but it was fully justified. The chief events of his administration, which lasted for four years, are narrated elsewhere, in the article on Germany. He showed great ability in quickly mastering the business, with which he was hitherto quite unacquainted, as he himself acknowledged; his speeches in the Reichstag were admirably clear, dignified, and to the point. His first achievements were the treaty with Great Britain in 1890, for which he was bitterly attacked by the colonial parties. The commercial treaties with Austria, Rumania, &c., followed; by concluding them he earned the express commendation of the Emperor and the title of Count, but he was from this time relentlessly attacked by the Agrarians, who made it a ground for their distrust that he was not himself a landed proprietor; and from this time he had to depend much on the support of the Liberals and other parties who had been formerly in opposition. The reorganization of the army caused a parliamentary crisis, but he carried it through successfully, only, however, to earn the enmity of the more old-fashioned soldiers, who would not forgive him for shortening the period of service. His position was seriously compromised by the failure in 1892 to carry an Education Bill which he had defended by saying that the question at issue was Christianity or Atheism, and he resigned the presidency of the Prussian ministry, which was then given to Count Eulenburg. In 1894 a difference arose between Eulenburg and Caprivi concerning the bill for an amendment of the Criminal Code (the *Umsturz Vorlage*), and in October the Emperor dismissed both. Caprivi's fall was probably the work of the Agrarians, but it was also due to the fact that, while he showed very high ability in conducting the business of the country, he made no attempt to secure his personal position by forming a party either in Parliament or at Court. He interpreted his position rather as a soldier; he did his duty, but did not think of defending himself. He suffered much from the attacks made on him by the followers of Bismarck, and he was closely associated with the social ostracism of that statesman; we do not know, however, in regard either to this or to the other events of his administration, to what extent Caprivi was really the author of the policy he carried out, and to what extent he was obeying the orders of the Emperor. With a loyalty which cannot be too highly praised, he always refused, even after his abrupt dismissal, to justify himself, and he could not be persuaded

even to write memoirs for later publication. The last years of his life were spent in absolute retirement, for he could not return even to the military duties which he had left with great reluctance at the orders of the Emperor. He died unmarried on 6th February 1899, at the age of sixty-eight.

See *Die Reden des Grafen v. Caprivi* (Berlin, 1893).

(J. W. He.)

Capstan (Windlass), an appliance used on board ship and on dock walls in connexion with weighing anchor and transporting ship. Its earlier forms were of a comparatively simple character, but, as heavier cables were supplied to ships, the difficulty when riding was in holding and veering. A new cable-holder made by Mr W. H. Harfield was tried in H.M.S. *Newcastle* and proved effective; its first development was the application in the form of a windlass secured to the deck driven by means of a messenger chain from the capstan, fitted in H.M.S. *Inflexible* (Fig. 1).

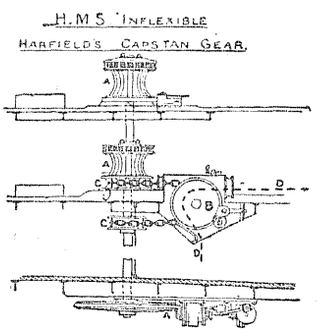


Fig. 1.

The capstans and engine are shown at A, A, A, and the windlass B is driven by messenger chains C, C. The four cables (dotted line D, D) lead to their respective cable-holders, fitted with a brake similar to that in Fig. 2, and by these means each cable-holder can be connected to the main driving shaft, and any cable hove-in or veered independently of the other; by using steam-power instead of hand- the slow motion is obviated. In H.M.S. *Collingwood* steam-power is used to work the windlass directly by means of worm gearing; the windlass is divided into two parts, so that the one on the port side can be worked independently of that on the starboard, and *vice versâ*. An independent capstan in both ships, arranged to take either of the cables, can be worked by hand or steam. In the *Collingwood's* windlass, the cables remain on their holders and can be hove-in or veered without touching the chain. Fig. 2 is Harfield's frictional brake, which also acts as a connector. A is the cable-holder loose on the shaft B, C and C are a series of plates connected to the spindle by a suitable carrier, D and D another series connected to the cable-holder, and E a plate into which the bars are inserted, revolving the screw F. By means of the latter the two series of discs are pressed together, obtaining the necessary amount of friction for veering slowly or rigidly connecting; when the top plate is screwed back the cable-holder revolves freely. Fig. 3 is the gear fitted in the *Formidable* class (15,000 tons). The two cable-holders on the upper deck, A, are each fitted with a frictional brake for veering and connecting, the former being worked from below the armoured deck by steam-engine B and worm-wheel C, and the compound clutch at D enables the cables to be worked together, or separately, or simultaneously with one "heaving in" and the other veering. The middle-line capstan E, on the upper deck, is not fitted with brake gear, but will take the main cables, and, by portable whelps, wire and hempen hawsers; it can be worked by steam from engine B, through worm-wheel F, or by capstan bars GG (Capstan, ninth edition). The capstans are of cast-steel, capable of taking $2\frac{9}{16}$-inch cables, and can be controlled from the upper deck or engine-room. The capstan engines have cylinders of 14 inches in diameter, with a 13-inch stroke, and are designed for a steam pressure of 300 lb to the square inch. Fig. 4 shows the upper deck of the *Irresistible* (*Formidable* class) fitted by Messrs Clarke, Chapman, and Co.

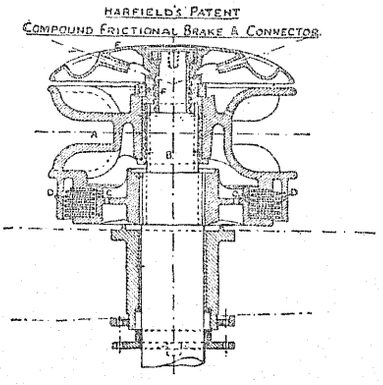


Fig. 2.

The electrical capstan (Harfield), introduced in H.M. ships for stern moorings and warping, is illustrated in Fig. 5. The capstan is on the upper deck, the cable-holder A works the stern moorings, outside of which are the portable whelps B, B, for steel-wire hawsers; the capstan is driven through the worm-wheel C by the motor D, and can be disconnected by the clutch E for working

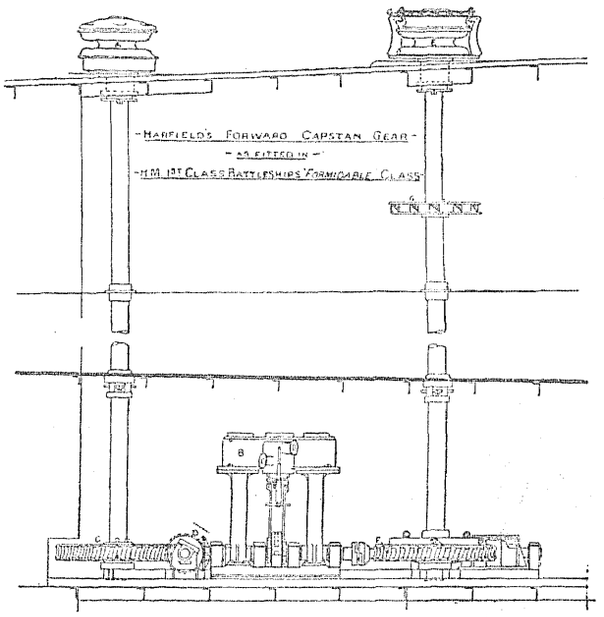


Fig. 3.

by hand. The electric motor is controlled from the upper deck by the lever F, working through the main switch G and the resistances H. This design is somewhat extravagant in electrical consumption, but a stern capstan is seldom used, even then only for a short period, and in its favour are perfect control and noiseless working, and no automatic brake is required.

In the electrical capstan (Clarke, Chapman, and Co.), the motor drives the vertical shaft of the capstan by means of a worm and worm-wheel. The gear is fitted with an electric brake actuated by a solenoid; when the current is passing in the solenoid the brake is held out of action against the force exerted by a spring, but, when the circuit is broken, the spring causes the brake to act. The contacts are in the upper portion of the resistance coil, and its controlling spindle is worked from the deck; from the off-contact point one direction of the rotation of the switch causes the motor to run in

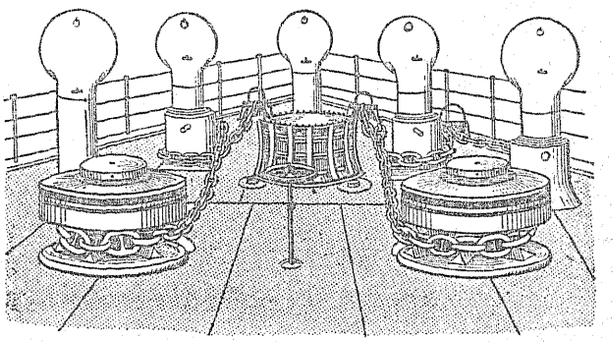


Fig. 4.

one direction and the opposite direction reverses it. The motor will give up to about 60-belt horse-power. To meet the difficulty in warping when the ship remains stationary instead of moving, and when the armature of the motor would run the risk of burning owing to the rush of current, an automatic circuit-breaker is inserted in the circuit, adjusted to break at the maximum current which the machine is intended to carry. When the automatic circuit-breaker acts, it inserts a resistance in the circuit capable of taking up the whole back E.M.F. of the armature; therefore, the current through the armature remains as it would be at full load, but cannot be exceeded. By these means the torque due to this current in the armature is maintained, but the latter cannot turn until the ship moves, when it would commence to rotate and

generate back E.M.F.; on this being effected the automatic switch must be replaced and remain in place so long as the current keeps below the maximum for which it is adjusted. The speed of the motor is 380 revolutions per minute, and with this speed the lift is 15 tons, at the rate of 25 feet per minute.

All capstans for H.M. ships are tested for lifting power and speed; with foremast capstans the anchor is usually

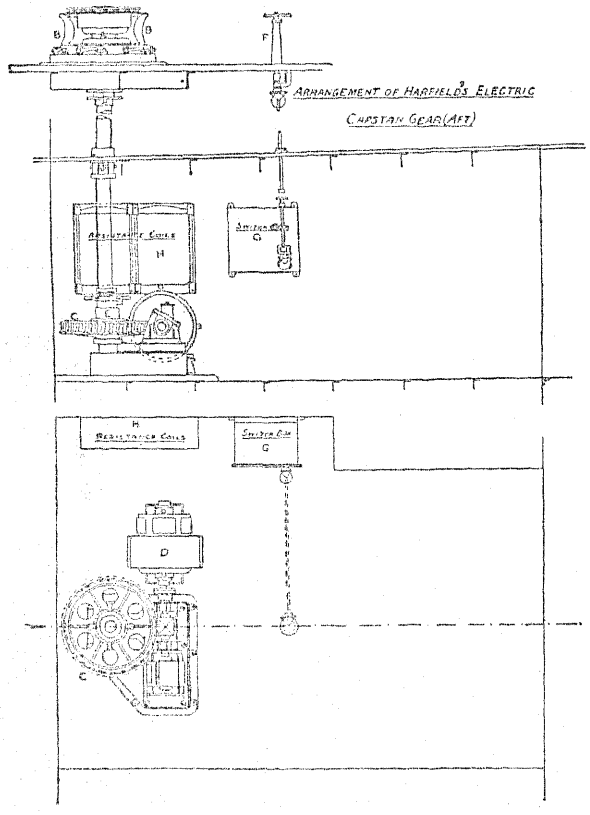


Fig. 5.

let go in not less than 25 fathoms' water and the speed ascertained by observing the time taken to heave-in not less than a length of cable, 75 fathoms. In the mercantile marine various designs of steam windlasses are used, generally fitted with warping ends for working ropes; in case of failure of steam, hand-power with "wee-gee" motion is employed, but where a warping capstan is fitted it is worked with capstan bars. Capstans on dock walls in H.M. dockyards are usually driven by hydraulic or air pressure conveyed through pipes to small engines underneath the capstans. (J. W. D.)

Capua, a fortified garrison town and archiepiscopal see of the province of Caserta, Campania, Italy, on the river Volturno, 7 miles N.W. from Caserta by rail. The cathedral, dating originally from the 11th century, has been entirely modernized. The other buildings embrace the Campanian Museum (archæological, 1874), and a tower and mortuary chapel, commemorative of the slaughter of the inhabitants when the town was captured by Cesare Borgia in 1501. The fortifications were planned by Vauban, and extended in 1855. The manufacture of fireworks is a speciality. Bricks are also made. Population, about 14,500.

Caracal, a town in Rumania, chief town of the district of Romanati. It is a seat of a court of first instance, and has eleven churches and a school of arts and crafts. The town derives its name from the Emperor Caracalla, who, in the year 217, built a tower there, of which the ruins are still to be seen. Population (1895), 11,000; (1900), 12,025.

Caracas, capital city of Venezuela and of the federal district, situated in 67° 4′ 45″ W. long. and 10° 30′ N. lat., 23 miles S.S.E. of La Guaira, its port, by rail; 3018 feet above sea-level. The city, including the six outlying parishes, forms the federal district, which has an area of 45 square miles and a population of about 100,000. There are two telephone companies and two banking institutions—the bank of Venezuela, with a capital of 8,000,000 bolivars and a reserve of 974,753·39 bolivars, and the bank of Caracas, a joint-stock company with a capital of 6,000,000 bolivars and a reserve fund of 345,928 bolivars. Four railway lines start from Caracas. The line to Port La Guaira is a bold undertaking because of the height of Mount Avila and the sinuosities of the land over which it travels; but the longest line goes to Valencia and Puerto Cabello, crossing the high cordilleras surrounding Caracas, and dropping into the valleys of Aragua. Caracas is the residence of the archbishop of Venezuela, the dioceses suffragan to it being those of Ciudad Bolivar, Calabozo, Barquisimeto, Mérida, and Maracaibo. The city is lighted by both gas and electricity. Population, 72,429.

Caraman, or KARAMAN (*Laranda*, a name still used by the Christians), a town in the Konia viláyet of Asia Minor, situated on the plain north of Mount Taurus. The modern name is derived from Karaman, to whom it was granted by Sultan Ala ed-Dín of Rúm. It has few industries and little trade, but the mediæval walls and the mosques are interesting, and the old Seljúk *medresse*, or college, is one of the most beautiful buildings in Asia Minor. Population, 5000 (Moslems, 4500; Christians, 500).

Caramania, or KARAMANIA, formerly an independent province in the south of Asia Minor, named after Karaman, the son of an Armenian convert to Islám, who married a daughter of the Seljúk sultan of Rúm, and was granted Laranda (Karaman), and made governor of Selefke, 1223-45. On the collapse of the Seljúk empire, Karaman's grandson, Mahmúd, 1279-1319, founded a state, with its capital at Konia, which included Pamphylia, Lycaonia, and large parts of Cilicia, Cappadocia, and Phrygia. The state was frequently at war with the kings of Lesser Armenia, the Lusignan princes of Cyprus, and the knights of Rhodes. It was also engaged in a long struggle for supremacy with the Osmanli Turks, which only ended in 1472, when it was annexed by Muhammad II. The Osmanlis divided Karamania into Kharij, north, and Ichili, south of the Taurus. The name is now often given by geographers to Ichili only.

Carapequa, an important town of Paraguay, founded in 1725. The adjacent country cultivates cotton, tobacco, corn, sugar-cane, and mandioca. It has two schools, a church, many modern edifices and business houses, a post-office, and a sub-department of the Agricultural Bank. Population, 13,000.

Carbondale, a city of Lackawanna county, Pennsylvania, U.S.A., situated in 41° 34′ N. lat. and 75° 30′ W. long., on Lackawanna river, a branch of the Susquehanna, in the north-eastern part of the state, at an altitude of 1080 feet. It is a coal-mining town, being situated in the midst of the anthracite coal region of the United States. It is served by three railways, the Delaware and Hudson, the Lehigh Valley, and the Delaware, Lackawanna and Western. Population (1880), 7714; (1890), 10,833; (1900), 13,536.

Carborundum. See ELECTRO-METALLURGY.

Carcar, a town situated on high ground near the east coast of Cebu, Philippine Islands, in 10° 7′ N. It was founded in 1624. The surrounding country, though rugged, is quite fertile, and produces sugar in considerable quantity. The language is Cebu-Visayan. Population, 30,000.

Cardenas, a town and seaport in Cuba, on the north coast, in 81° 12′ W., 76 miles E. of Havana. It was founded in 1828, is one of the few towns of Cuba built in the 19th century, and is a thriving place. It lies on a spacious bay sheltered by a long promontory. It is one of the principal sugar-exporting places of the island, and is connected by rail with Matanzas, Havana, Santa Clara, and Cienfuegos, and by the regular steamers with all the coast towns. Population, 21,940.

Cardiff, a municipal, county (1888), and parliamentary borough and seaport of England, on the Taff, 1 mile above its outfall into the estuary of the Severn, 40½ miles W. of Bristol, 45½ miles E.S.E. of Swansea, 170 miles by rail W. of London, capital of the principality of Wales, and chief town of the county of Glamorgan; on the Great Western railway, and in direct and manifold railway communication with the coal and mineral districts of South Wales. The borough is divided into 10 wards under a mayor, 10 aldermen, and 30 councillors. From 2624 houses in 1851, Cardiff grew to 20,476 houses in 1891 and 28,009 houses in 1901. The waterworks, purchased by the corporation in 1879, have since been extended and a new supply, from the Taff Fawr Valley, provided at a cost, up to 1897, of over £1,139,452. The corporation have laid down lines for electric tramways and built power-stations, &c. About £500,000 will be laid out on these and the purchase and equipment of the existing lines. Various other public works are being actively pushed forward. The corporation already own the electric light undertaking, which they are extending. The Great Western railway in 1899 quadrupled its lines between Cardiff and Newport, and largely extended and improved its station at Cardiff, and in 1900 opened a new station at Roath. The network of railways and sidings around the Bute Docks comprises a length of about 120 miles. An iron swing bridge, Clarence Bridge, over the Taff, connecting Grangetown with the docks, was opened in 1890. New wharves and warehouses have been erected at all the principal towns and villages along the canal between Cardiff and Merthyr-Tydfil.

The educational institutions include the University College (1883), a constituent college of the University of Wales, soon to be transferred to new buildings in Cathays Park; Schools of Science and Art (1891); the Baptist Theological College, stationary in Cardiff since 1893; a higher-grade school (1895), and many other board and national schools; 2 intermediate schools; a school of cookery (1890); a free library and museum (1882), extended and reopened (1896) at a cost of £20,000; a museum and art gallery, for which new buildings, at an estimated cost of £13,500, are to be erected in Cathays Park. Other recent public institutions are the market hall (1891); a new post-office (1898) costing £75,000; a new custom-house (1899); a new Government stamp-office (1900); baths (1896); a theatre; mining engineers' institute (1890); the infirmary, erected (1883) at a cost of over £40,000; Roath Park (120 acres), opened 1894; Ely Park; Canton Park; besides fifteen open spaces acquired since 1890. Cathays Park, in the centre of the town, 60 acres in area, was purchased in 1900 for £160,000; and, in addition, £44,000 has already been spent in laying it out. In this park, moreover, new municipal buildings and law courts are to be erected at a cost of £233,000.

At the mouth of the three rivers—Rhymney, Taff, and Ely—within a dozen miles of the great coal and iron deposits of South Wales, comprising a coalfield estimated at 1000 square miles in area, with a storage capacity of over 30,000 million tons, 50 miles nearer London than Liverpool is, Cardiff commands unrivalled resources and an unsurpassed position as a port of trade. Accordingly, since by the construction of the canal and railways the mineral wealth of the hills has found free outlet to Cardiff, and thence, by her docks and capacious, safe, and readily accessible harbour, to all parts of the world, the export trade has grown in magnitude at a rate unexampled, till now Cardiff is the third largest exporting port of the United Kingdom and the heaviest coal-exporting port of the world, its coal shipments, 11,925,975 tons in 1898, largely exceeding those of the Tyne ports. An official estimate rates the increase of coal shipments at 7½ per cent. per annum for the twenty-four years 1864-87, and sees no reason to doubt the continuance of the same rate of increase.

The following is a list of the Bute docks and basins, with their respective dimensions:—

Dock.	Acreage.	Dimensions.	Quayage.	Depth on Sills.
West Dock (1839)	18	4000 ft. by 200 ft.	8800 ft.	28 ft. 8½ in. springs
,, Basin (1839)	1½	300 ft. by 200 ft.	..	18 ft. 8½ in. neaps.
,, Lock . . .	..	152 ft. by 36 ft.		
East Dock (1855) .	44	1000 ft. by 500 ft. 3300 ft. by 500 ft.	9360 ft.	31 ft. 8½ in. springs.
,, Basin (1855)	2½	380 ft. by 250 ft.	..	21 ft. 8½ in. neaps.
,, Lock . . .	..	200 ft. by 49 ft.		
Roath Dock (1887)	33½	2400 ft. by 600 ft.	7520 ft.	35 ft. 9 in. springs.
,, Basin (1874)	12	1000 ft. by 550 ft.	2700 ft.	25 ft. 9 in. neaps.
,, Lock (1887)	1½	350 ft. by 80 ft. 600 ft. by 80 ft.		
Glam. Canal Float (1798)	12	5500 ft. by 100 ft.	11,000 ft.	18 ft. 9 in. springs.
Glam. Canal Basin		485 ft. by 130 ft.		8 ft. 9 in. neaps.
Total Docks .	124¾	..	39,380 ft.	42 ft. springs.
New South Dock .	42	2600 ft. by 650 ft.	7,460 ft.	32 ft. neaps.
,, ,, Lock .	2½	700 ft. by 160 ft.	..	..
Grand Total .	169¼	..	46,840 ft.	..

Graving Docks { 10 in number up to 600 feet in length and 60 feet entrance.

Timber ponds, measuring 28 acres, have also been constructed for the accommodation of the fast-growing timber trade. The South Bute Dock, still in process of construction, is on the foreshore, with a seaward embankment extending out to a line nearly opposite the mouth of the Ely river. Connecting with the Roath Dock, it will have no basin, but a lock with sea gates, and practically serve as a low-water dock. Forty-two acres in area, it will accommodate the very largest steamers, cargo or passenger. On the completion of the new dock, the Bute Docks will have a floating area, exclusive of the Glamorgan canal, of 157 acres; with the canal, float, and basin, 169¼ acres; and further, with the timber floats, 197¼ acres, an area which, apart from the other docks within the limits of the customs port, constitutes Cardiff the third port in the kingdom for extent of wet-dock accommodation. The entrance channel to the docks runs out about 1¼ miles to a point opposite Penarth Head, with a low-water pier. The depth of water at high-water springs is 43 feet, 8 inches; at low-water neaps, 15 feet. The new dock entrance lock and embankment will extend farther out in the channel, and supersede the present pier. In the entrance channel are two floating pontoons for coasting

steamboat traffic. There is also a harbour, dug out of the mud to the west of the channel, for mooring the pilot boats, and ample accommodation opposite (on east side) for the large fleet of tug boats. The Windsor Dock Company, furthermore, are seeking powers to construct a dock on the west side of Cardiff, at a cost of £825,000.

The mechanical erections at the Bute Docks include 50 coal staiths, hydraulic lifts, and cranes for loading; 57 cranes for discharging; 1 shear legs; 10 graving docks; 1 gridiron; 2 pontoons, and 2 pontoon docks. Eleven of the cranes are "Lewis-Hunter" patent coal cranes, lifting up to 30 tons; and, loading simultaneously as many hatches as a vessel may have, will in 24 hours stow as much as 7000 tons and load vessels carrying 10,000 tons.

Large warehouses and transit sheds have been erected at the West, East, and Roath Docks for housing grain, provisions, &c. One flour-mill cost £80,000. One warehouse will hold 75,000 quarters of grain. There is also extensive wharf accommodation for heavy goods such as timber and iron ore, cold storage for dead meat, and lairs for live cattle. The capital invested in these docks, including Penarth and Barry Docks, is estimated at 8 to 9 millions.

The industries of Cardiff include iron-founding; iron, steel, and copper works; flour-mills; biscuit factory; shipbuilding; tin enamel, chemical, waggon and printing works; sail-making, wire and hemp roperies, coach-building, &c. The Dowlais blast-furnaces employ about 300 men, and the steel works in full swing, 3000 men—the iron and steel works covering 82 acres. One milling firm has the capacity to supply all the flour needed by a population of 600,000.

Registered shipping in 1888, 290 vessels of 151,972 tons; in 1898, 285 of 204,018 tons; in 1899, 270 of 212,058 tons. Entered in 1888, 12,973 vessels of 5,767,616 tonnage; in 1898, 12,136 of 6,378,189 tonnage; in 1899, 11,824 of 8,837,234 tonnage. Cleared in 1888, 13,274 vessels of 6,083,762 tonnage; in 1898, 12,179 of 6,737,821 tonnage; in 1899, 11,845 of 9,003,275 tonnage. Imports of foreign and colonial merchandise in 1888 amounted to the value of £2,165,961; in 1898, £2,612,327; in 1899, £3,352,191. Exports of the produce of the United Kingdom in 1888 were valued at £4,873,106; in 1898, £5,521,350; in 1899, £8,662,147. Of the total imports in 1899, valued at £3,352,191, the most important articles were wheat, valued at £812,523; iron ore, £589,094; wood of all sorts, £1,112,289. Of the exports in 1899, valued at £8,662,147, coal, coke, cinders, and patent fuel alone amounted to £8,308,533. The import of timber in 1845 was 6965 loads; in 1855, 31,829 loads; in 1865, 103,170 loads; in 1885, 373,398 loads; in 1895, 689,871 loads. The iron-ore trade, first coastwise and then oversea, has increased thirteen times over since 1850. Cardiff publishes 4 daily, 1 bi-weekly, and 2 weekly newspapers, and has 15 banks. Area of municipal borough, 8408 acres; population (1881), 82,761; (1891), 128,915; (1901), 164,315. Area of parliamentary borough, comprising the contributory boroughs of Cardiff, Cowbridge, and Llantrisaint, 12,247 acres; population (1881), 85,862; (1891), 132,229; (1901), 180,000. It has been observed that from 1841 to 1891 the population increased, roundly speaking, 10,000 for every additional million tons of coal shipped. Moreover, if to the population of the municipal borough be added that of Penarth and Barry, the total population is 205,675 (1901).

Cardigan, a municipal borough, seaport, and county town of Cardigan, extending into Pembrokeshire, Wales, 274 miles W. by N. of London by rail, on the Teifi, 5 miles from its mouth. Since 1885 the parliamentary representation of the borough has been merged in that of the county. The old endowed grammar-school has been united with an intermediate school. In 1898 the registered shipping was 29 vessels of 1135 tons; in 1898, 415 vessels of 18,274 tons entered, and 393 of 17,401 tons cleared. Area, 4926 acres; population (1881), 3669; (1901), 3511. There is a parish of Cardigan.

Cardigan, a maritime county of South Wales, bounded on the N. by Merioneth, on the E. by Montgomery, Radnor, and Brecon, on the S. by Carmarthen and Pembroke, and on the W. by Cardigan Bay.

Area and Population.—The area of the ancient county is 440,630 acres, or 688 square miles. The population in 1881 was 70,270, and in 1891 was 62,630, of whom 27,365 were males and 35,265 females, the number of persons per square mile being 91, and of acres to a person 7·04. In 1901 the population was 60,237. The area of the administrative county is 443,071 acres, with a population in 1891 of 63,467. The area of the registration county is 595,285 acres, with a population in 1891 of 86,383. Within its area there was, between 1881 and 1891, a decrease in the population of 9·20 per cent. The excess of births over deaths between 1881 and 1891 was 6971, but the decrease in the resident population was 8754. The following table gives the numbers of marriages, births, and deaths, with the number and percentage of illegitimate births, for 1880, 1890, and 1899:—

Year.	Marriages.	Births.	Deaths.	Illegitimate Births.	
				No.	Percentage.
1880	543	2625	1882	220	8·4
1890	502	2078	1641	171	8·2
1899	506	1964	1604	141	6·1

In 1891 the number of Scots in the county was 123, of Irish 98, and of foreigners 46; while 3979 could speak English, 61,624 Welsh, and 1711 English and Welsh.

Constitution and Government.—The county returns one member to Parliament, and it has no parliamentary borough. There are three municipal boroughs, Aberystwith (8013), Cardigan (3511), and Lampeter (1722). The urban districts are Aberayron (1327) and New Quay (1234). The county is in the south-western circuit, and the assizes are held at Lampeter; the boroughs of Aberystwith and Cardigan have separate commissions of the peace, but no separate court of quarter sessions. The ancient county contains 66 entire ecclesiastical parishes and districts, and part of one other. It is entirely in the diocese of St. Davids.

Education.—At Aberystwith is a university college, in connexion with which there is a day training college for schoolmasters and mistresses. The number of elementary schools in the county on 31st August 1899 was 107, of which 75 were board and 32 voluntary schools, the latter including 27 National Church of England schools, and 5 "British and other." The average attendance at board schools was 5989, and at voluntary schools 2264. The total school board receipts for the year ending 29th September 1899 were over £19,129. The income under the Agricultural Rates Act was over £1905.

Agriculture.—About three-fifths of the total area of the county is under cultivation, and of this more than five-ninths is in permanent pasture. There are also, in addition, about 129,000 acres in hill pasture and about 16,000 acres under woods. Within the last twenty years the acreage under corn crops has decreased by about one-seventh. Wheat has only slightly decreased in acreage, and occupies about one-eighth of the corn acreage, barley occupying considerably more than one-fourth and oats considerably more than one-half. Potatoes occupy a rather larger acreage than turnips. The following table gives the larger main divisions of the cultivated area at intervals of five years from 1880:—

Year.	Total Area under Cultivation.	Corn Crops.	Green Crops.	Clover.	Permanent Pasture.	Fallow.
1880	276,236	61,833	13,123	44,023	155,179	2078
1885	281,478	58,792	13,671	44,854	162,951	1210
1890	283,932	56,214	13,866	47,270	164,827	1740
1895	269,746	52,981	12,812	42,238	160,858	823
1900	272,493	49,447	13,257	51,995	156,905	853

The following table gives particulars regarding the principal live stock during the same years:—

Year.	Total Horses.	Total Cattle.	Cows or Heifers in Milk or in Calf.	Sheep.	Pigs.
1880	13,873	62,917	25,747	213,343	18,979
1885	13,991	67,299	27,010	211,462	22,218
1890	14,714	65,500	26,811	221,652	25,489
1895	16,053	65,336	25,565	221,533	24,308
1900	17,573	72,229	26,967	274,955	22,897

Industries and Trade.—According to the annual report of the inspector of factories for 1898 (1900), the number of persons engaged in all factories and workshops in 1897 was 1359, as compared with 1357 in 1896. The total number of persons employed in mines and quarries in 1899 was 682. Copper-mining is now almost extinct. The output of lead is also declining, 2072 tons, valued at £18,143, being dug in 1885, and 598 tons, valued at £5823, in 1899. Of zinc 3273 tons, valued at £8760, were obtained in 1885, and 3328 tons, valued at £14,585, in 1898, but in 1899 only 1819 tons, valued at £10,303, were got. Clay and sandstone are also raised. The total quantity of fish landed at New Quay (Cardigan), Aberayron, and Aberystwith in 1899 was 2875 cwts., valued at £2921.

AUTHORITIES.—Sir R. MEYRICK. *History and Antiquities of the County of Cardigan.* London, 1810.—J. G. WILLIAMS. *A Short Account of the British Encampments lying between the Rivers Rheidol and Llyfnant in the County of Cardigan in their connexion with the Mines.* Aberystwith, 1866.—J. R. PHILLIPS. *List of the Sheriffs of Cardiganshire from A.D. 1539 to A.D. 1868.* See also the various Guides to South Wales. (T. F. H.)

Carducci, Giosue (1836-——), Italian poet, was born at Val-di-Castello in Tuscany, 27th July 1836. His father was a physician, and Carducci received a good education. He began life as a public teacher, but soon took to giving private lessons at Florence, where he became connected with a set of young men, enthusiastic patriots in politics, and in literature bent on overthrowing the reigning romantic taste by a return to classical models. These aspirations have always constituted the mainsprings of Carducci's poetry. In 1860 he became professor at Bologna, where, after in 1865 astonishing the public by a defiant *Hymn to Satan*, he published in 1867 *Levia Gravia*, a volume of lyrics which not only gave him an indisputable position at the head of contemporary Italian poets, but made him the head of a school of which the best Italian men of letters have been disciples, and which has influenced all. Several other volumes succeeded, the most important of which were the *Decennalia* (1870), the *Nuove Poesie* (1873), and the three series of the *Odi Barbare* (1877-89). The employment of the antique metrical forms in these has occasioned fierce literary controversies, hardly yet allayed. It is not likely that Carducci's example will be largely imitated, for the excellent reason that it is incapable of imitation except by a consummate metrist, but its indirect inculcation of a robust and manly style has been of the highest value. Rallied to the Savoy dynasty, Carducci enjoys the dignity of a senator of the Italian kingdom, and occupies a position of authority as citizen as well as writer.

Cardwell, Edward Cardwell, VISCOUNT (1813-1886), English statesman, was the son of a merchant of Liverpool, where he was born on 24th July 1813. After a brilliant career at Oxford, where he gained a double first-class, he entered Parliament as member for Clitheroe in 1842, and in 1845 was made secretary to the Treasury. He supported Sir Robert Peel's free-trade policy, and went out of office with him. In 1847 he was elected for Liverpool, but lost his seat in 1852 for having supported the repeal of the navigation laws. He soon found another constituency at Oxford, and upon the formation of Lord Aberdeen's coalition ministry in 1853 became president of the Board of Trade, although debarred by the jealousy of his Whig colleagues from a seat in the Cabinet. In 1854 he carried, almost without opposition, a most important and complicated act consolidating all existing shipping laws, but in 1855 resigned, with his Peelite colleagues, upon the appointment of Mr Roebuck's Sebastopol inquiry committee, declining the offer of the chancellorship of the Exchequer pressed upon him by Lord Palmerston. In 1858 he moved the famous resolution condemnatory of Lord Ellenborough's despatch to Lord Canning on the affairs of Oude, which for a time seemed certain to overthrow the Derby Government, but which ultimately dissolved into nothing. He obtained a seat in Lord Palmerston's Cabinet of 1859, and after filling the uncongenial posts of secretary for Ireland and chancellor of the duchy of Lancaster (1861), became secretary for the colonies in 1864. Here he reformed the system of colonial defence, refusing to keep troops in the colonies during time of peace unless their expense was defrayed by the colonists; he also laid the foundation of federation in Canada and, rightly or wrongly, censured Sir George Grey's conduct in New Zealand. Resigning with his friends in 1866, he again took office in 1868 as secretary for war. In this post he performed the most memorable actions of his life by the abolition of purchase and the institution of short service, measures which excited more opposition than any of the numerous reforms effected by the Gladstone Government of that period, but which were entirely justified by their successful working afterwards. On the resignation of the Gladstone ministry in 1874 he was raised to the peerage as Viscount Cardwell of Ellerbeck, but took no further prominent part in politics. His mental faculties, indeed, were considerably impaired during the last few years of his life, and he died at Torquay on 15th February 1886. He was not a showy, hardly even a prominent politician, but effected far more than many more conspicuous men. The great administrator and the bold innovator were united in him in an exceptional degree, and he allowed neither character to preponderate unduly. (R. G.)

Cardwell, a town of Queensland, Australia, 950 miles N.W. of Brisbane, on Rockingham Bay, in the county of Cardwell. It has one of the finest harbours in the colony, easy of access in all weathers. Various minerals, including gold, exist in the district. The dugong fishery is carried on and the oil extracted. Population, about 3500.

Carey, Henry Charles (1793-1879), American political economist, was born in Philadelphia 15th December 1793, and at the age of twenty-eight succeeded his father, Mathew Carey—an influential economist, political reformer, editor, and publisher, of Irish birth, but between 1783 and his death in 1839 a resident of Philadelphia—as a member of the publishing firm of Carey and Lea, which was long the most conspicuous in America. Among Mathew Carey's many writings had been a collection (1822) of *Essays on Political Economy*, one of the earliest of American treatises favouring Protection, and Henry C. Carey's life-work was devoted to the propagation of the same theory. He retired from business in 1838, almost simultaneously with the appearance (1837-40) of his *Principles of Political Economy.* This treatise, which was translated into Italian and Swedish, soon became the standard representative in the United States of the school of economic thought which, with some interruptions, has dominated the tariff system of that country for the past half-century; and it exercised a manifest influence upon the writings of such later Protectionists as Bowen, Greeley, and Thompson. To Carey's arguments, more than to those of any other writer, was due the freedom with which his followers, in economic literature and in legislative action, were led to consider the

Principles of Political Economy applied to the Condition, Resources, and Institutions of the American People (the title of Francis Bowen's text-book, 1856), instead of regarding the subject as one leading to general or absolute results. Carey's first large work on political economy was preceded and followed by many smaller volumes on wages, the credit system, interest, slavery, copyright, &c.; and in 1858-59 he gathered the fruits of his lifelong labours into *The Principles of Social Science*, in three volumes. Carey laid chief stress upon the attainment, through political economy, of beneficent results, intellectual, moral, and financial, to the individual man, whether capitalist, workman, or consumer, and upon a constant claim that the rise of wages is the measure of economic prosperity, inasmuch as in a period of high wages an increased proportion of the value of the product goes to the labourer, while the capitalist receives a smaller proportion though a larger gross amount. He died in Philadelphia, 13th October 1879. [See vol. xix. of the ninth edition of the *Encyclopædia Britannica* (pp. 384-5).]

CARICATURE.

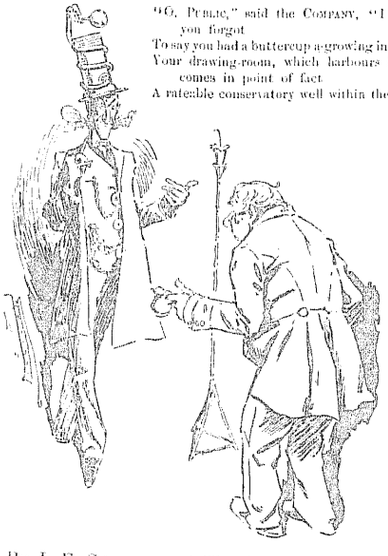
Great Britain. — During the last quarter of the 19th century the term caricature, somewhat loosely used at all times, came gradually to cover almost every form of humorous art, from the pictorial wit and wisdom of Sir John Tenniel to the weird grotesques of Mr S. H. Sime, from the gay and spirited pleasantries of Randolph Caldecott to the graceful but sedate fancies of Mr Walter Crane. It is made to embrace alike the social studies—whether satirical or sympathetic—of Du Maurier and Keene, the political cartoons of Mr Harry Furniss and Mr F. C. Gould, the unextenuating likenesses of "Ape," and "Spy," and "Max," the subtle conceits of Mr Linley Sambourne, the whimsicalities of Mr E. T. Reed, the exuberant burlesques of Mr J. F. Sullivan, the frank buffooneries of the late W. G. Baxter. Of these diverse forms of graphic humour, some have no other object than to amuse, and therefore do not call for serious notice. The perpetrations of Mr Max Beerbohm ("Max"), for instance, need not be commented upon, though too original to be overlooked; while of the work of "Spy" (Mr Leslie Ward), in *Vanity Fair*, one need only say that if it does not rival the occasional brilliancy of his predecessor "Ape" (Carlo Pellegrini), it maintains a higher average of merit. The pupil, too, is much more genial than the master. Unlike "Ape" and his compatriots of the 17th century, to whose "caricaturas" Addison's *Spectator* applied the description, he does not "transform the most agreeable beauty into the most odious monster"; his feeling for comeliness forbids: when his subject is good-looking, he is content if his pencil evokes the comment, "How ridiculously like!" But caricature of this kind is merely an entertainment. Here we are concerned rather with those branches of caricature which, merrily or mordantly, reflect and comment upon the actual life we live. In treating of recent caricature of this kind, we must give the first place to *Punch*. Mr Punch's outlook upon life has not changed much since the 'seventies. His influence upon the tone of caricature made itself felt most appreciably in the days of John Leech and Richard Doyle. Their successors but follow in their steps. In their work, says a clever German critic, is to be found no vestige of the "sour bilious temper of John Bull" that pervaded the pictures of Hogarth and Rowlandson. Keene and Du Maurier, he declares, are not caricaturists or satirists, but amiable and tenderly grave observers of life, friendly optimists. The characterization is truer of Keene, perhaps, than of Du Maurier. Keene's sketches are almost always cheerful; almost without exception, they make you smile or laugh. In many of Du Maurier's, on the other hand, there is an underlying seriousness. They are aphorisms, criticisms, verdicts upon character and conduct: the work of a less cynical La Rochefoucauld, expressing himself with a pencil as well as with a pen. While Keene looks on at life with easy tolerance, an amused spectator, Du Maurier shows himself sensitive, emotional, sympathetic, taking infinite delight in what is pretty and gay and charming, but hurt and offended by the sordid and the ugly. Thus while Keene takes things dispassionately as they come, seeing only the humorous side of them, we find Du Maurier ever and anon attacking some new phase of snobbishness, or philistinism, or cant. For all his kindliness in depicting congenial scenes, he is at times as unrelenting a satirist as ever Rowlandson was: the difference in their methods is but the difference between the sword-play of Richard and the sword-play of Saladin. The other *Punch* artists whose chief work is in the same field as Keene's and Du Maurier's resemble the former in this respect rather than the latter. Mr Raven-Hill recalls Charles Keene not merely in temperament but in technique; like Keene, too, he finds his subjects principally in *bourgeois* life. Mr J. Bernard Partridge, though, like Du Maurier, he has an eye for physical beauty, is a spectator rather than a critic of life. Mr Phil May, a modern Touchstone, is less easily classified. Though he wears the cap and bells, he is alive to the pity of things; he sees the pathos no less than the humour of his street-boys and "gutter-snipes." He is, however, a jester primarily: a jester with an almost unrivalled faculty for pictorial expression; an artist, too, of high achievement. Two others stand out as masters of the art of social caricature—the late Frederick Barnard and Mr J. F. Sullivan. Barnard's illustrations to Dickens, like his original sketches, have a lively humour all their own—the humour of irrepressible high spirits—and endless invention. High spirits and invention are characteristics also of Mr Sullivan. It is at the British artisan and petty tradesman—at the grocer given to adulteration and the plumber who outstays his welcome—that he aims his most boisterous fun. He rebels too, delightfully, against red tape and all the petty tyrannies of officialdom. In fact, there is hardly a grievance known to London and its suburbs which has not been hilariously vented by Mr Sullivan. In political caricature Sir John Tenniel has remained the leading artist of the period. The death of Abraham Lincoln, Bismarck's fall from power, the tragedy of Khartum—to subjects such as these, worthy of a great painter, Tenniel has brought a classic simplicity and a sense of dignity unknown previously to caricature. It is hard to say in which field Tenniel most excels—whether in those ingenious parables in which the British Lion and the Russian Bear, John Chinaman, Jacques Bonhomme, and Uncle Sam play their part — or in the ever-changing scenes of the great parliamentary Comedy—or in sombre dramas of Anarchy, or Famine, or Crime—or in those London extravaganzas in which the symbolic personalities of Gog and Magog, Father Thames and the Fog Fiend, the duke of Mudford, and Mr Punch himself, have become familiar. Subjects similar to these have been treated also for many years by Mr Linley Sambourne in his fanciful and often beautiful designs. In the field of humorous portraiture also Mr Sambourne has made his mark, and he may be said almost to have originated, in a small way, that practice of illustrating

By Sir John Tenniel (*Punch*).

By Linley Sambourne (*Punch*).

The Pursuit of Pleasure.

By Raven Hill (*Mr. Punch's Holiday Book*).

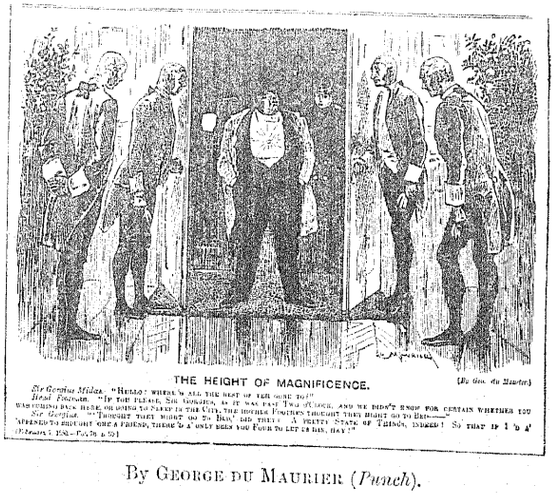


"O, Public," said the Company, "I notice you forgot
To say you had a buttercup a-growing in a pot:
Your drawing-room, which harbours it, becomes in point of fact
A rateable conservatory well within the Act."

By J. F. Sullivan ("The Great Water Joke.")

By Phil May (*Phil May's Annual*).

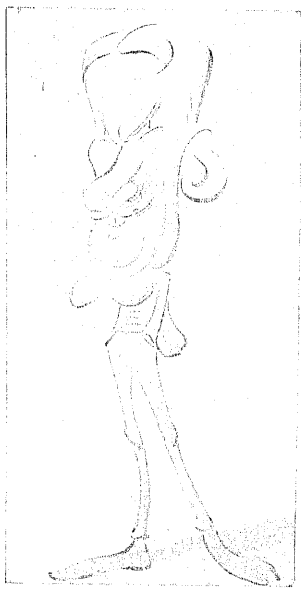
By Charles Keene (*Punch*).



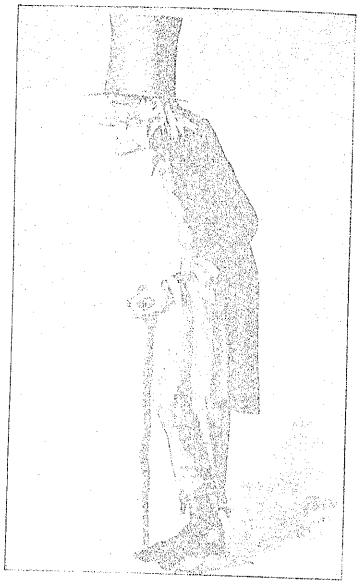
By George du Maurier (*Punch*).

EXAMPLES OF ENGLISH CARICATURE.

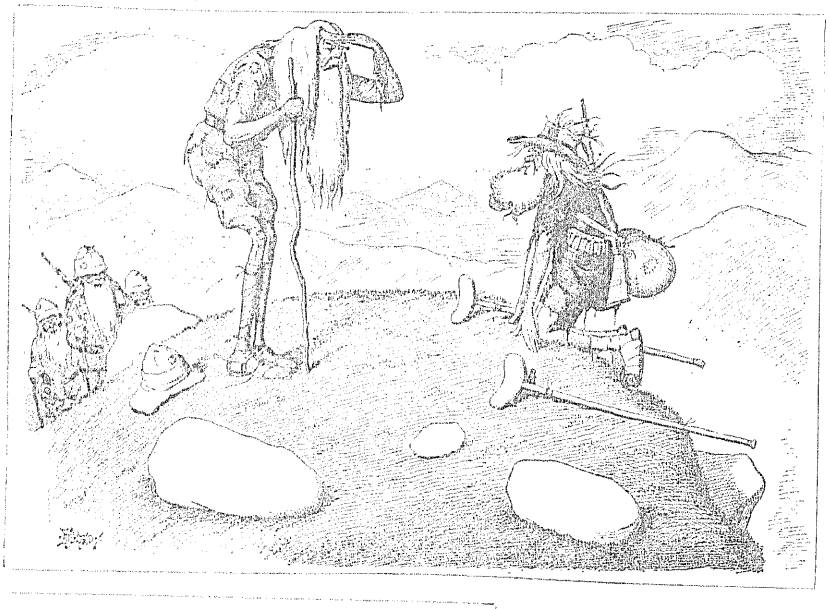
Benjamin Disraeli. The First *Vanity Fair* Cartoon, 30th January 1869. By Carlo Pellegrini ("Ape").



Mr George Bernard Shaw. By Max Beerbohm ("Max").



Professor Owen, 1873. The First *Vanity Fair* Cartoon by Leslie Ward ("Spy").



Unrecorded History.—The Top of a Kopje, A.D. 1950.

The aged Rip-Van-Kitchener (aside to his venerable Tommies). "Aha! The only survivor 'coming in' at last!"

The Last of the Boers. "Vaid a moment! Vor derms you gif me; mein gombleet independence?—oddervise I bleib always on gommando." By E. T. Reed, *Punch's Almanac*, 1901.

Mr Punch's Puzzle-Headed People. No. 6. "All Harcourts." *Punch*, 9th November 1889. By Harry Furniss.

"O the Ogre." By F. C. Gould (from *The Struwelpeter Alphabet*, published by Grant Richards).

EXAMPLES OF ENGLISH CARICATURE.

the doings of Parliament with comic sketches in which Mr Furniss, Mr E. T. Reed, and Mr F. C. Gould are his most notable successors. Mr Furniss has satirized the Royal Academy as effectively as the Houses of Parliament. But he is above all the illustrator of Parliament—the creator of Mr Gladstone's collars, the thief of Lord Randolph Churchill's inches, the immortalizer of so many otherwise obscure politicians, the "artistic contortionist," to use his own expression, who has worked the House of Commons and its doings into so many hundreds of eccentric designs. Though Mr Furniss is a man of strong views, and upholds them with his pencil *à outrance*, he has never been, as is Mr F. C. Gould (of the *Westminster Gazette*), a politician first and a caricaturist afterwards. Mr Gould is an avowed partisan, and his caricatures are among the most formidable weapons of which the Radical party can boast. Caustic and witty and telling, not specially well drawn, but well drawn enough—the likenesses unfailingly caught and recognizable at a glance—his "Picture Politics," as he calls them, have in this way won him a quite unique place in the ranks of caricaturists. There is no evidence of such strenuousness in the work of Mr E. T. Reed (of *Punch*). In his parliamentary sketches, as in his "Animal Land" and "Prehistoric Peeps," Mr Reed is a wholly irresponsible humorist. One finds keen satire, however, in those "Ready-made Coats of Arms" in which he has turned at once his heraldic lore and his insight into character to such excellent account; as also in such drawings as his fancy portrait "by induction" of his laundress (a virago belabouring his shirts with a spike-studded club), and that more serious picture in which he has drawn a parallel between the *tricoteuses* awaiting with grim enjoyment the fall of the guillotine and those modern English gentlewomen who flock to the Old Bailey as to the play. Here we have the true Hogarthian touch.

It would be too much to say that in the field of comic journalism, since 1870, it has been a case of "Eclipse first, and the rest nowhere"; but though there have been some notable competitors with *Punch*, there has never been a really "good second." In Matt Morgan the *Tomahawk* (1865-67) could boast an original cartoonist after Tenniel's style, but without Tenniel's power and humour, and unsupported by a staff of wits and men of letters such as the great *Punch* artist has always had behind him to keep him well stocked with ideas. Morgan's *Tomahawk* cartoons gained in effect from an ingenious method of printing in two colours. In Fred Barnard, W. G. Baxter, and Mr J. F. Sullivan, *Judy* (founded in 1867) possessed a trio of pictorial humorists of the first rank, and in W. Bowcher a political cartoonist thoroughly to the taste of those hot and strong Conservatives to whom *Punch's* neutrality or, at the most, faint Whiggery, was but Radicalism in disguise. His successor, Mr William Parkinson, was not less loyal to Tory ideas, though more urbane in his methods. *Fun* has had cartoonists of high merit in Mr Gordon Thomson and in Mr John Proctor, who worked also for *Moonshine* (founded in 1879). *Moonshine* afterwards enlisted the services of Mr Alfred Bryan, to whose clever pencil the Christmas number of the *World* was indebted for many years. *Ally Sloper*, founded in 1884, is notable only as the widely circulated medium for W. G. Baxter's wild humours, kept up in the same spirit by Mr W. F. Thomas, his successor. *Pick-me-up*, the latest addition of any note to the comic press of London, could once count a staff which rivalled at least the social side of *Punch*; Mr Raven-Hill, Mr Phil May, Mr Greiffenhagen, and Mr Dudley Hardy have all contributed in their time to its sprightly pages, while Mr S. H. Sime made it the vehicle for his "squint-brained" imaginings. The *Will o' the Wisp*, the *Butterfly*, and the *Unicorn*, kindred ventures, though on different lines, all met with an early death. *Lika Joko*, founded in 1894 by Mr Harry Furniss, who in that year abandoned *Punch*, was also short-lived. To this brief list of purely comic or satirical journals should be added the names of several daily and weekly publications—and among monthlies the *Idler*, with its caricatures by Mr Scott Rankin, Mr Sime, and Mr Beerbohm—which have made a special feature of humorous art. Among these are the *Graphic*, whose Christmas numbers were first brightened by Randolph Caldecott; the *Daily Graphic*, enlivened sometimes by Mr Phil May and Mr A. S. Boyd; *Vanity Fair*, with its grotesque portraits; *Truth*, to whose Christmas numbers Mr F. C. Gould contributed some of his best and most ambitious work, printed in colours; the *Sketch*, with Mr Phil May and others; *Black and White*, with Mr Henry Meyer; the *Pall Mall Gazette*, first with Mr F. C. Gould, and later with Mr G. R. Halkett. The *St Stephen's Review*, whose crudely powerful cartoons, the work of Tom Merry, were so popular, ceased publication in 1892. A tribute should be paid in conclusion to the coloured cartoons of the *Weekly Freeman* and other Irish papers, often remarkable for their humour and talent. (See CARTOON and ILLUSTRATION.)

No one has written so well and wittily upon "Social Pictorial Satire" as George du Maurier in his little volume thus entitled, in which he deals more particularly with the work of Leech and Keene, and with his own. Satire, both social and political, will be found treated of or touched upon in a series of articles upon "Our Graphic Humorists," as well as in miscellaneous papers by George du Maurier, Mr Linley Sambourne, Mr M. H. Spielmann, and others, in recent volumes of the *Magazine of Art*. Mr Spielmann's *History of Punch* contains also much information on the subject. The various histories of caricature do not include many of the artists of to-day, but there are interesting allusions to some of them in Muther's *Modern Painting*, vol. ii., and in *L'Art du Rire et de la Caricature*, by Arsène Alexandre.

(F. W. W.)

France.—In that peculiar branch of art which is based on irony, fun, oddity, and wit, and in which Daumier, next to "Gavarni," remains the undisputed master, France can show an unbroken series of draughtsmen of strong individuality. Though "Cham" died in 1879, Eugène Giraud in 1881, "Randon" in 1884, "André Gill" in 1885, "Marcelin" in 1887, Edouard de Beaumont in 1888, Lami in 1891, Grévin in 1892, and "Stop" in 1899, a new group has arisen under the leadership of the veterans "Nadar" and Carjat. Mirthful or satirical, and less philosophical than of yore, neglecting history for incident, and humanity for the puppets of the day, their drawings, which illustrate daily events, will perpetuate the manner and anecdotes of the time, though the illustrations to newspapers, or in prints which need a paragraph of explanation, show nothing to compare with the *Propos de Thomas Virelocque* by "Gavarni." Quantity perhaps makes up for quality, and some of these artists deserve special mention. "Draner" and "Henriot" are journalists, carrying on the method first introduced by "Cham" in the *Univers Illustré*: realistic sketches, with no purpose beyond the droll illustration of facts, amusing at the time, but of no value to the print-collector. M. Forain, born at Reims, 23rd October 1852, studied at the École des Beaux Arts under Gérôme and Carpeaux. He first worked for the *Courrier Français* in 1887, and afterwards for *Figaro*; he was then drawn into the polemical work of politics. Though he has created some great types of flunkeydom, the explanatory story is more to him than the picture, which is often too sketchy; reduced reproductions of his work have been issued in volumes, a common form of popularity never attempted with Daumier's fine lithographs. M. Willette, born at Châlons-sur-Marne in 1857, a son of Colonel Willette, the aide-de-camp to Marshal Bazaine, worked for four years in Cabanel's studio, and so gained an artistic training which alone would have distinguished him from his fellows, even without the delightful poetical fancy and Watteau-like grace which are somewhat unexpected amid the ugliness of modern life. His work has the value, no doubt, of deep and various meaning, but it has also intrinsic artistic worth. M. Willette is, in fact, the ideal delineator of the voluptuous and highly spiced aspects of contemporary life. "Caran d'Ache," a native of Moscow, born in 1859, borrowed from the German caricaturists his methods of illustrating "a story without words." He makes fun even of animals, and is a master of canine physiognomy. His simple and unerring outline is a method peculiarly his own; now and again his wit rises to grandiloquence, as in his *Bellona*, rushing on an automobile through massacre and conflagrations, and in his *Epopée* (Epic) of shadows thrown on a sheet. M. Léandre, born at Champsecret (Orne), in 1862, is, like "André Gill," a draughtsman of monstrosities; he can get a perfect likeness of a face while exaggerating some particular feature, gives his figure a hump-back, as Dantan did in his

statuettes, and has a facial dexterity which sometimes does scant justice to his very original wit. M. Steinlen, born at Lausanne in 1859, came to Paris in 1881. He should be studied in his illustrations to *Bruant*. He knows the inmost core of the Butte-Montmartre, and depicts it with realistic and brutal relish. M. Robida, born at Compiègne in 1848, collaborated with Decaux in 1871 to found *La Caricature;* he is a paradoxical seer of the possible future and a curiosity-hunter of the past. Old Paris has no secrets from him; he knows all the old stones and costumes of the Middle Ages, and has illustrated Rabelais; and for fertility of fancy he reminds us of Gustave Doré. "Bac," born at Vienna, 15th August 1859, has infused a strain of the Austrian woman into the Parisienne; representing her merely as a pleasure- and love-seeking creature, as the toy of an evening, he has recorded her peccadilloes, her witcheries, and her vices. Others who have shot folly as it flies are M. Albert Guillaume, who illustrated the Exhibition of 1900 in a series of remarkable silhouettes; "Mars"; "Henri Somm"; Gerbault; and Grün. M. Huard is a sort of Holbein of provincial life, depicting to perfection the country townsfolk in their elementary psychology. M. Hermann-Paul, M. Forain's not unworthy successor on the *Figaro*, is a cruel satirist, who in a single face can epitomize a whole class of society, and could catalogue the actors of the *comédie humaine* in a series of drawings. M. Jean Veber loves fantastic subjects, the gnomes of fairy-tales and myths; but he has a biting irony for contemporary history, as in the *Butcher's Shop*, where Bismarck is the blood-stained butcher. M. Abel Faivre, a refined and charming painter, is a whimsical humorist with the pencil. He shows us monstrous women, fabulously hideous, drawing them with a sort of realism which is droll by sheer ugliness. Toulouse-Lautrec startles us by extraordinary dislocations, scrawled limbs, and inexplicable anatomy; he has left an inimitable series of sketches of Mme. Yvette Guilbert when she was at her thinnest. M. Valotton reproduces crows in blots of black with a Japanese use of the brush. M. Jeanniot, a notable illustrator, sometimes amuses himself by contributing to *Le Rire*, *Le Sourire*, *Le Pompon*, *L'Assiette au Beurre*, etc., drawing the two types he most affects: the fashionable world, and soldiers. M. Ibels, Capiello, and many more might be enumerated, but it is impossible to chronicle all the clever humorous artists of the illustrated papers.

It is the frequent habit of French caricaturists to employ a *nom-de-guerre*. We therefore give here a list of the genuine names represented by the pseudonyms given above:—

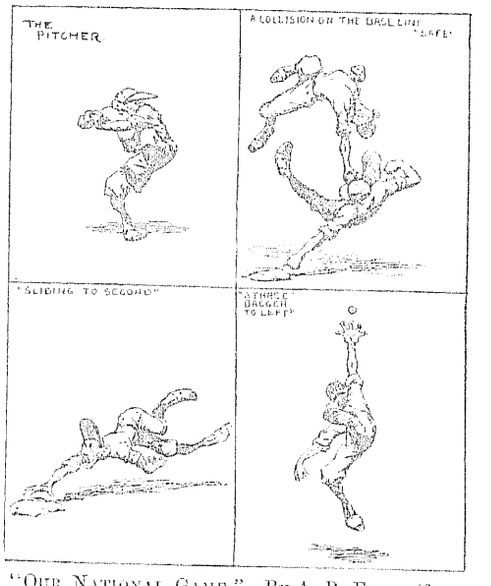
"Cham"	= Comte Amédée de Noé.
"Randon"	= Gilbert.
"André Gill"	= L. A. Gosset de Guine.
"Marcelin"	= Emile Planat.
"Stop"	= L. P. Morel-Retz.
"Nadar"	= Félix Tournachon.
"Gavarni"	= S. G. Chevallier.
"Draner"	= Jules Renard.
"Henriot"	= Henri Maigrot.
"Caran d'Ache"	= E. Poiré.
"Bac"	= Ferdinand Bach.
"Henri Somm"	= H. Sommier.
"Mars"	= Maurice Bonvoisin.

AUTHORITIES.—CHAMPFLEURY. *Histoire de la Caricature en France.*—ARMAND DAYOT. *Les Maîtres de la Caricature française en XIX^e Siècle.*—ARSÈNE ALEXANDRE. *L'Art du Rire.*—ÉMILE BAYARD. *La Caricature en France.*—J. GRAND-CARTERET. *Les Mœurs et la Caricature en France.*—AD. BRISSON. *Nos Humoristes.*

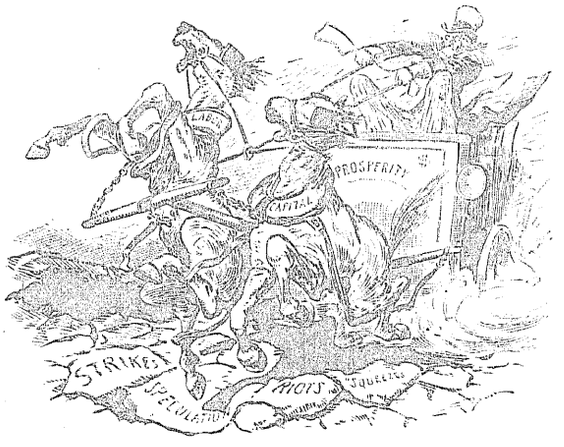
(A. DA.)

Germany.—During the last quarter of the 19th century German caricature flourished principally in the comic papers *Kladderadatsch* and *Fliegende Blätter*, the former a political paper with little artistic value, in which the ideas alone are clever, whilst the illustrations are merely a more or less clumsy adjunct to the text, while the *Fliegende Blätter*, on the contrary, has artistic merit as well as wit. Wilhelm Busch, the most brilliant German draughtsman of the last generation, made his *début* with an illustrated poem "The Peasant and the Miller," and won a world-wide reputation with the following works: *Pater Filucius*, *Die Fromme Helene*, *Max und Moritz*, *Der heilige Antonius*, *Maler Kleksel*, *Balduin Bählamm*, *Die Erlebnisse Knopps des Junggesellen*. Busch stands alone among caricaturists, inasmuch as he is both the author and the illustrator of these works, his witty doggerel supplying Germany with household words. The drawings that accompany the text are amazing for the skill with which he hits the vital mark; the essential point is seized with the least possible elaboration. A flourish or two and a few touches are enough to set before us figures of intensely comical aspect. This distinguishes Busch from Adolf Oberländer, who became the chief draughtsman on *Fliegende Blätter*. Busch's drawings would have no meaning apart from the humorous words. Oberländer works with the pencil only. Men, lions, tigers, hares, dogs, trees, houses, plants, are endowed by him with a mysterious life of their own. Without the help of any verbal joke, he achieves the funniest results simply by seeing and accentuating the comical side of everything. His drawings are caricature in the strict sense of the word, its principle being the exaggeration of some natural characteristic. The new generation of contributors to *Fliegende Blätter* do not work on these lines. Busch and Oberländer were both offshoots of the romantic school; they made fun of modern novelties. Hermann Schlittgen, René Reinicke, Adolf Hengeler, and Fritz Wehle are the sons of a self-satisfied time, triumphing in its own *chic*, elegance, and grace; hence they do not parody what they see, but simply depict it. The wit lies exclusively in the text; the illustrations aim merely at a direct representation of street or drawing-room scenes. It is this which gives to *Fliegende Blätter* its value as a pictorial record of the history of German manners. Its pages are a permanent authority on the subject for those who desire to see the social aspects of Germany during the last quarter of the 19th century. At the same time a falling-off in the brilliancy of this periodical has been perceptible. Its fun has become domestic and homely; it has faithfully adhered to the old technique of wood-engraving, and has made no effort to keep pace with the modern methods of reproduction. These have, in fact, undergone a complete revolution in two different ways: on the one hand, wood-printing, engraving, and lithography in colour have been developed to a high degree of perfection, and the improvement in the mechanical technique of engraving allows of a reproduction in facsimile of the most delicate shades of colour; on the other hand, the art of the poster has aroused a previously dormant feeling for decorative design and the expressive value of pure lines. Toulouse-Lautrec, Steinlen, and Grasset have, in France, worked out to its utmost finality a technique derived from the style of Hokusai and Utarnaro. German caricature, to live and flourish, must keep pace with this development; it had to take into its service the gay effects of colour, and derive fresh inspiration from the sweeping lines of the ornamental draughtsman. This led to the appearance of three new weekly papers: *Jugend*, *Das Narrenschiff*, and *Simplicissimus*. *Jugend*, started in 1896 by Georg Hirth in Munich, collected from the first a group of gifted young artists, more especially Bernhard Pankok and Julius Diez, who based their style on old German wood-engraving; Fidus, who lavished the utmost beauty of line in unshaded pen-and-ink work; Rudolf Wilke, whose grotesques have much in common with Forain's clever drawings; Angelo

By W. A. Rogers (from *Harper's Weekly*).



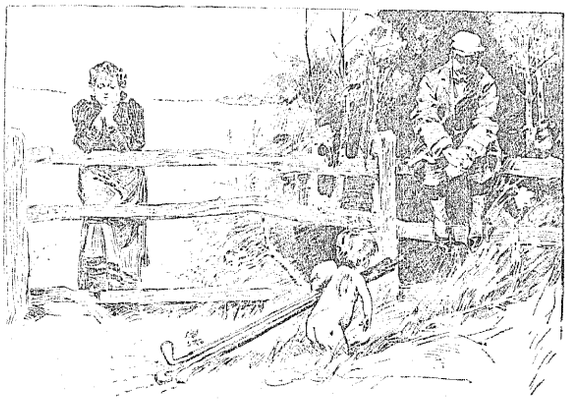
"Our National Game." By A. B. Frost (from *Harper's Magazine*, Jan. 1890; copyright 1890, by Harper & Brothers, New York & London).



"An Ill-matched Team." By C. G. Bush (from the *New York World*).

"He'll be Lucky if he gets his Trousers Back." By Homer Davenport (from the *New York Journal*).

"Who Stole the People's Money?" "'Twas Him." By Thomas Nast (from *Harper's Weekly*).



"Golf is not the only Game on Earth." By C. D. Gibson (by permission of James Henderson and Sons, London).

EXAMPLES OF AMERICAN CARICATURE.

Jank and R. M. Eichler, who work with a delightful *bonhomie*. Among the draughtsmen on the *Narrenschiff* (The Ship of Fools), Hans Baluschek is worthy of mention as having made the types of Berlin life all his own; and while this paper gives us for the most part inoffensive satire on society, *Simplicissimus*, first printed at Munich and then at Zurich, under the editorship of Albert Langen, shows a marked Socialist and indeed Anarchist tendency, subjecting to ridicule and mockery everything that has hitherto been held as unassailable by such weapons; it reminds us of the scathing satire of Honoré Daumier in *La Caricature* at the time of Louis Philippe. Thomas Theodor Heine is unsurpassed in this style for his power of expression and variety of technique. Here we admire his delicate draughtsmanship; there he gives us the broad and monumental grotesque; or, again, we find him drawing his figures with the heavy line of heraldic ornament. His laughter is often insolent, but he is more often the preacher, scourge in hand, who ruthlessly unveils all the dark side of life. Next to him come Paul, the incomparable limner of student life and the manners and customs of the Bavarian populace; E. Thöny, the wonderfully clever caricaturist of the airs and assumption of the Prussian *Junker* and the Prussian subaltern; J. C. Eugh and F. von Regnieck, who make fun of the townsman and political spouter in biting and searching satire. The standard of caricature is at the present time a high one in Germany; indeed, the modern adoption of the pen-line, which has arisen since the impressionists in oil-painting repudiated line, had its origin in the influence of caricature. (R. MR.)

United States.—The proverbial irreverence of the American mind even towards its most cherished personages and ideals has made it particularly fallow ground for the growth of caricature. The seeds of this, as of the other arts in whose cultivation America is now so strenuously engaged, were borne across the ocean on the winds of immigration. They were slow in taking root, and the first growths led a precarious and stunted existence, in sharp contrast with their present prevalence and prosperity, which flourish in places even to rankness. In the early period of American caricature, almost the only native name is that of F. O. C. Darley, an illustrator of some importance; the other names include the engraver Paul Revere (chiefly famous for a picturesque exploit in the War of Independence); a Scotsman, William Charles; the Englishmen, Matt Morgan and F. P. Bellew; and the Germans, Thomas Nast and Joseph Keppler.

The name of Thomas Nast overshadows and sums up American political caricature, as the word Homer typifies Greek epopee. Nast, who was born in Bavaria, 27th September 1840, was brought to America at the age of six; and as his training and all his interests were strongly American, he may be forgiven the accident of birth. At fourteen he was an illustrator on *Leslie's Weekly*, and was sent at twenty to England to illustrate the famous Sayers-Heenan prize-fight. He then went as recorder of Garibaldi's warfare. He returned to America known only as an illustrator. The Civil War did not awaken his latent genius till 1864, when he published a cartoon of fierce irony against the political party which opposed Lincoln's re-election and advocated peace measures with the Southern confederacy. This cartoon not only made Nast famous, but may be said to contain the germ of American caricature; for all that had gone before was too crude in technique to pass muster even as good caricature.

The magnificent corruption of Tammany Hall under the leadership of Alderman Tweed, the first of the great municipal "bosses," gave Nast a subject worth attacking. Siegfried, earnest but light-hearted, armed with the mightier sword of the ridiculing pen, assailed the monster ensconced in his treasure-cave, and after a long battle won a brilliant victory. Nast did not always rely on a mere picture to carry his thrust; often his cartoon consisted of only a minor figure or two looking at a large placard on which a long and poignantly-worded attack was delivered in cold type. At other times the most ingenious pictorial subtlety was displayed. This long series runs almost the whole gamut of caricature, from downright ridicule to the most lofty denunciation. A very happy device was the representation of Tweed's face by a money-bag with only dollar marks for features, a device which, strangely enough, made a curiously faithful likeness of the "boodle"-loving despot. When, finally, Tweed took to flight, to escape imprisonment, he was recognized and caught, it is said, entirely through the wide familiarity given to his image in Nast's cartoons. Though Nast kept up for many years a running fire of comment on the legitimate subjects open to an alert and brilliant caricaturist (a cartoon on Napoleon III. being one of his best works), and though he had technical skill enough to illustrate many subjects well (an annual Santa Claus picture being an important yearly event in the nursery world), he will always be remembered for having earned one of the most direct and most difficult material victories ever granted to caricature.

When Nast retired from *Harper's Weekly* he was succeeded by Charles Green Bush (born at Boston, 1872), who speedily showed his ability to wear the mantle well. With even larger technical resources, he has poured forth a series of cartoons of remarkable evenness of skill and interest; he soon left weekly for daily journalism. Mr Bush was, in 1901, the recognized dean of American caricature. He has never won, single-handed, such a battle as Nast's, but his drawings have a more general, perhaps a more lasting interest. When he left *Harper's Weekly* he was succeeded by W. A. Rogers, who was called in from general illustration and has composed many ingenious and some telling cartoons.

The vogue which, through Nast, *Harper's Weekly* gave to caricature, prepared the way for the first purely comic weekly that escaped the grim fate which frequently attends the birth of comic papers. This was *Puck*, founded by two Germans, and for long published in a German as well as an English edition. It is worth noting that not only the founders but the spirit of American caricature have been rather German than English, the American comic papers more closely resembling *Fliegende Blätter*, for example, than *Punch*. One of the founders of *Puck* was Joseph Keppler, long its chief caricaturist. It has cast its influence generally in favour of the Democratic party. The Republican party soon found a champion in *Judge*, a weekly which resembles *Puck* closely in its crude-coloured pages, though somewhat broader and less ambitious in the spirit and execution of its black-and-white illustrations. These two papers have kept rather strictly to permanent staffs, and have furnished the opening for many popular draughtsmen, such as Bernhard Gillam (died 1896), and his brother, Victor Gillam; J. A. Wales; E. Zimmerman, whose extremely plebeian and broadly treated types often obscure their genuine observation and Falstaffian humour; Grant Hamilton; Frederick Opper, for many years devoted to the trials of suburban existence, more recently concerned in combating the trusts; C. J. Taylor, a graceful technician; H. Smith; Frank A. Nankivell, whose pretty athletic girls are prone to attitudinizing; J. Mortimer Flagg; F. M. Howarth; Mrs Frances O'Neill Latham, whose personages are singularly well modelled and alive, and Miss Baker Baker, a skilful draughtswoman of animals.

A stimulus to genuine art in caricature was given by the establishment of the well-groomed society weekly, *Life*, edited by J. A. Mitchell, a clever draughtsman as well as an original writer. It is to this weekly that America owes the discovery and encouragement of its most remarkable penman, Charles Dana Gibson, whose technique has developed through many interesting phases from an exceeding delicacy to a sculpturesque boldness of line without losing its rich texture or becoming monotonous. Mr Gibson is chiefly beloved by his public for his almost idolatrous realizations of the beautiful American woman of various types, ages, and environments. His works are, however, full of the most subtle character-observations, and American men of all walks of life, and foreigners of every type, impart as much importance and humour to his pages as his "Gibson girls" give radiance. His resemblance to Du Maurier, in reverence for the beautiful woman beautifully attired, has led some critics to set him down as a mere disciple, while his powerful individuality has led other critics to accuse him of monotony; but a serious examination of his work is held by others to show that he has gone beyond the genius of Du Maurier in sophistication, if not in variety of subjects and treatment, while it would be hard to find another artist who has so studiously tried new experiments in the new fields opened by modernized processes of photo-engraving. He has been an important influence in both English and American line-illustration.

Among other students of society, particular success has been granted to C. S. Reinhart (1844-1896), Charles Howard Johnson (died 1895), H. W. McVickar, S. W. van Schaick, A. E. Sterner, W. H. Hyde, W. T. Smedley, and A. B. Wenzell, each of them strongly individual in manner and often full of *verve* and truth.

Life, and other comic papers, including for many years *Truth*, also brought forward caricaturists of distinct worth and a marked tendency to specialization. F. E. Atwood (died 1900) was ingenious in cartoons lightly allegorical; Oliver Herford has shown a fascination elusive of analysis in his drawings as in his verse; T. S. Sullivant has made a quaintly intellectual application of the world-old devices of large heads, small bodies, and general upsetting of the rule of three; Peter Newell has developed individuality both in treatment and humour; E. W. Kemble stands well to the front among the exploiters of negro life; and H. B. Eddy, Augustus Dirk, Robert Wagner, A. Anderson, F. Sarka, and T. Swinnerton have all found manners and moods quite their own.

In distinction from the earlier period, the present school of American caricature is strongly national, not only in subject, but in origin, training, and in mental attitude, exception being made of a few notable figures such as Michael Angelo Woolf, born in England, and of a somewhat Cruikshankian technique. He came to America while young, and contributed a long series of what may be called slum-fantasies, rich in a spirit often equivocal with laughter and sorrow, at times strangely combining extravagant melodrama with a most plausible and convincing impossibility. His drawings must always lie very close to the affections of the large audience that welcomed them. American also by adoption is Henry Mayer, a German by birth, who has contributed to many of the chief comic papers of France, England, Germany, and America. His work is as full of variety as it is cosmopolitan, and its exuberant spontaneity finds skill ready for every flight of whim.

Entirely native in every way is the art of A. B. Frost (born 1851), who is prominent in the fields of pure humour as comment on real or apparently real life among the common people. His caricature—for he is also an illustrator of versatility and importance—is distinguished by its anatomic knowledge, or, rather, anatomic imagination. Violent as the action of his figures frequently is, it is always convincing. Such triumphs as the tragedy of the kind-hearted man and the ungrateful bull-calf; the spinster's cat that ate rat-poison by mistake and went mad; the discomfiture of the two deserters with the clothes-basket; and many others, force the most serious to laughter by their amazing velocity of action and their unctuousness of expression; but they fasten on the memory, and for years the mere thought of them brings back the old-time merriment. Frost is to American caricature what "Artemus Ward" has been to American humour. Frost's field of publication has been chiefly the monthly magazine.

The influence of the weekly periodicals has been briefly traced. A more recent development has been the entrance of the omnivorous daily newspaper into the field of both the magazine and the weekly. For many years almost every newspaper has printed its daily cartoon, generally of a political nature. Few of the cartoonists have been able to keep up the pace of a daily inspiration, though Mr C. G. Bush has been unusually successful in the attempt. But an occasional success atones in the public mind for many slips, and the cartoonists are known and eagerly watched. The most influential has doubtless been Homer C. Davenport, whose slender artistic resources have been eked out by a vigour and mercilessness of assault rare even in American annals. He has a Rabelaisian complacency and skill in making a portrait magnificently repulsive, and his caricatures are a vivid example of the school of cartoonists who believe in slashing rather than merely prodding or tickling the object of attack. Charles G. Nelan frequently scores, and throughout the wide extent of the United States one finds keen wits busily assailing the manifold evils of life. Noteworthy among them are: Thos. E. Powers, H. R. Heaton, A. L. Levering, Clare Angell, and R. C. Swayne. Many of the daily papers publish a weekly comic supplement; some even devote a page every day to humour. The quality of most of this is inevitably low, yet enlarged artistic opportunities usually evoke increased achievement, and entice many a brilliant mind that would otherwise have sought some other outlet. Among the increasing crowd of American caricaturists there are already enough important figures to justify a reasonable confidence in the future. (R. Hu.)

Carimata (Dutch, *Karimata*), a group of islands in the East Indian Archipelago, west of Borneo and between 1° 11′ and 1° 46′ S. lat., and 108° 40′ and 109° 28′ E. long. Great Carimata, on which is the village (kampong) of Palembang, rises in its highest point to 2620 feet. The industries are fisheries, forest products, and iron-mining. Population, about 500.

Carinthia (German, *Kärnten*), a duchy and crownland of the Cisleithan part of the Austro-Hungarian monarchy. Population (1880), 348,730; (1890), 361,008, equivalent to 90·12 inhabitants per square mile. Proportion of females to males, 1046 to 1000: 71·6 per cent. were German, and 28·4 Slovenes; the latter mostly settled in the districts adjoining the Slovene province of Carniola. 94·8 per cent. were Roman Catholic, the rest Protestant. Population in 1900, 367,344. In 1896 the marriage-rate was 5·65; the birth-rate, 32·88, or, excluding still-births, 31·78; and the death-rate, 26·38. Of the births, 43·34 per cent. were illegitimate, a declining ratio. Carinthia has the largest proportion in Austria of illegitimacy and of cretins. The crownland returns ten members to the Reichsrath. In

the Diet there are thirty-four Germans and three Slovenes. Education is decidedly backward, although an improvement is now visible, the number of illiterates in 1890, 29·6 per cent., showing an improvement of 10 per cent. on the census of 1880. In 1895 there were four gymnasia, a theological seminary, seven technical institutions (including three agricultural academies and a school of mining), and 374 elementary schools. Less than 14 per cent. of the soil is arable, and the crops are insufficient for the requirements of the population. Cattle-breeding is of greater importance, and all descriptions of live stock show an increase, with the exception of sheep. The mines (lead—the most important in the monarchy—iron, lignite, zinc), and the industries dependent upon them, are the chief resources of the population. Other trades are the manufacture of leather, paper, cloth, and cement, brewing, distilling, &c. In 1897 the value of the minerals was £150,996, and of the furnace products £185,100. But the manufacture of lead, steel, and iron wares, including rails and railway material, agricultural implements, and small-arms, is of greater importance. In 1897 Carinthia had 447 kilometres of railway, 1754 kilometres of roads, and 393 kilometres of waterway, of which two-thirds was only available for floating timber.

Aelschker's *Geschichte Kärntens* (Klagenfurt, 1885); and his *Heimatskunde von K.* (Klagenfurt, 1886); Krones, *Die alte Geschichte Kärntens von der Urzeit bis Kaiser Karl dem Grossen* (Klagenfurt, 1893); and von Radics, *Kärnten, Kultur- und Reisebilder* (Vienna, 1882). (Æ. o'N.)

Carleton Place, a town and port of entry of Lanark county, Ontario, Canada, situated 30 miles S.W. of Ottawa, on the Mississippi river, and at the junction of the main line and Brockville branch of the Canadian Pacific railway. It has abundant water-power privileges, and contains extensive railway-repair shops and woollen mills. Population (1881), 1975; (1891), 4435; (1901), 4059.

Carlisle, a city, municipal borough (extended 1887), parliamentary borough (since 1885 returning only one member), and county town of Cumberland, England, on the Eden, 300 miles N.N.W. of London by rail, and 301 by road. Eight lines of railway converge on Carlisle, making it a very important railway junction. Recent constructions are the Victoria railway viaduct, public baths, the city hall, the market, large public slaughter-houses, and the museum, art gallery, library, &c. The Cumberland Infirmary and the home for incurables have been extended, and large works for locomotives, carriages, and waggons established. The gas-works and the electric-light works are vested in the corporation, whilst the electric tramways (the property of a company) are worked with electric energy supplied by the corporation. Extended area of municipal borough, 2025 acres; population (1881), 36,585; (1891), 39,176; (1901), 45,478. Area of parliamentary borough, 1570 acres; population (1881), 36,585; (1901), 43,687.

Carlisle, a borough of Pennsylvania, U.S.A., and capital of Cumberland county, situated in Cumberland Valley, south of the Blue Ridge, in the southern part of the state, at the intersection of the Cumberland Valley railway with a branch of the Philadelphia and Reading, at an altitude of 473 feet. It is the seat of Dickinson College for boys and Metzger Institute for girls, and of a training school for Indians, of whom about 1000, both boys and girls, are usually in attendance. Population (1880), 6209; (1890), 7620; (1900), 9626.

Carloforte, a town of Italy, Sardinia, province of Cagliari, situated on the E. side of the island of San Pietro, off the S.W. coast of Sardinia. It has grown out of a Genoese colony founded here in 1737 by Charles Emmanuel of Savoy. It carries on tunny fishing and the preparation of salt, and exports these products, as well as zinc and lead from mines on the main island. The coral fishing came to an end in 1898, owing to exhaustion of the banks. Population, about 7000.

Carlos (Charles Maria de los Dolores Juan Isidore Joseph Francis Quirin Antony Michael Gabriel Raphael) (1848-——), prince of Bourbon, known as Don Carlos, was born at Laibach on 30th March 1848, being the eldest surviving son of Don Juan of Bourbon and of the archduchess Maria Beatrix, daughter of Francis IV., duke of Modena. Don Carlos, who styles himself duke of Madrid, and is sometimes called Charles VII. by his partisans, is the fourth pretender who has disputed the rights of the reigning branch of the Spanish Bourbons. He is the grandson of the first pretender, also a Don Carlos and Infante of Spain, brother of Ferdinand VII., who waged war from 1833 to 1840 against Queen Isabella II., the daughter and heiress of that king. The first pretender's eldest son, the count of Montemolin, was taken prisoner by the troops of Queen Isabella, and had to abdicate and renounce his rights in order to regain his liberty, whereupon his younger brother, Don Juan, claimed to be the representative of the rights of the first Don Carlos. Don Juan himself abdicated in favour of his son, Don Carlos, in 1868, when the latter was only twenty. The present pretender married in February 1867, at Frohsdorf, Princess Marguerite, daughter of the duke of Parma and niece of the comte de Chambord, who was born on 1st January 1847, and who bore him a son, Don Jaime, in 1870, and three daughters. Don Carlos boldly asserted his pretensions to the throne of Spain two years after the revolution of 1868 had driven Queen Isabella II. and the other branch of the Bourbons into exile. His manifesto, addressed to his brother Alfonso, namesake of his rival, Alfonso XII., found an echo in the fanatical priesthood and peasantry of many provinces of the Peninsula, but little support among the more enlightened middle classes, especially in the towns. The first rising was started in Catalonia by the brother of the pretender, who himself entered Spain by way of Vera, in the Basque provinces, on 21st May 1872. The troops of King Amadeus under General Moriones, a progressist officer, who was one of Spain's ablest and most popular commanders, surprised and very nearly captured the pretender at Oroquista, sending him a fugitive to France in headlong flight with a few followers. For more than a year he loitered about in the French Pyrenees, the guest of old noble houses who showed him much sympathy, while the French authorities winked at the fact that he was fomenting civil war in Spain, where his guerilla bands, many of them led by priests, committed atrocities, burning, pillaging, shooting prisoners of war, and not unfrequently ill-using even foreign residents and destroying their property. When the Federal Republic was proclaimed on the abdication of King Amadeus, the Carlists had overrun Spain to such an extent that they held all the interior of Navarre, the three Basque provinces, and a great part of Catalonia, Lower Aragon, and Valencia, and had made raids into the provinces of Old Castile and Estremadura. Don Carlos re-entered Spain on 15th July 1873, just before the Carlists took Estella, in Navarre, which became, with Tolosa and Durango in the Basque provinces, his favourite residence. He displayed very lax morals and an apathy which displeased his staff and partisans. Don Carlos was present at some fights around Estella, and was in the neighbourhood of Bilbao during its famous siege of three months in 1874 until its relief by Marshals Serrano and

Concha on 2nd May. He was also present at the battle near Estella on 27th June 1874, in which Marshal Concha was killed and the Liberals were repulsed with loss. Twice he lost golden opportunities of making a rush for the capital—in 1873, during the Federal Republic, and after Concha's death. From the moment that his cousin Alfonso XII. was proclaimed king at Sagunto, at Valencia, in Madrid, and at Logroño, by General Campos, Daban, Jovellar, Primo de Rivera, and Laserna, the star of the pretender was on the wane. Only once, a few weeks after the Alphonsist restoration, the army of Don Carlos checked the Liberal forces in Navarre, and surprised and made prisoners half a brigade, with guns and colours, at Lacar, almost under the eyes of the new king and his headquarters. This was the last Carlist success. The tide of war set in favour of Alfonso XII., whose armies swept the Carlist bands out of Central Spain and Catalonia in 1875, while Marshal Quesada, in the upper Ebro valley, Navarre, and Ulava, prepared by a series of successful operations the final advance of 180,000 men, headed by Quesada and the king, which defeated the Carlists at Estella, Peña Plata, and Elgueta, thus forcing Don Carlos with a few thousand faithful Carlists to retreat and surrender to the French frontier authorities in March 1876.

The pretender went to Pau, and there, singularly enough, issued his proclamations bidding temporary adieu to the nation and to his volunteers from the same chateau where Queen Isabella, also a refugee, had issued hers in 1868. From that date Don Carlos became an exile and a wanderer, travelling much in the Old and New World, and raising some scandal by his mode of life. He fixed his residence for a time in England, then in Paris, from which he was expelled at the request of the Madrid Government, and next in Austria, before he took up his abode at Viarreggio in Italy. Like all pretenders, he never gave in, and his pretensions, haughtily reasserted, often troubled the courts and countries whose hospitality he enjoyed. His great disappointment was the coldness towards him of Pope Leo XIII., and the favour shown by that Pontiff for Alfonso XII. and his godson, Alfonso XIII. Don Carlos had two splendid chances of testing the power of his party in Spain, but failed to profit by them. The first was when he was invited to unfurl his flag on the death of Alfonso XII., when the perplexities and uncertainties of Castilian politics reached a climax during the first year of a long minority under a foreign queen-regent. The second was at the close of the war with the United States and after the loss of the colonies, when the discontent was so widespread that the Carlists were able to assure their prince that many Spaniards looked upon his cause as the one untried solution of the national difficulties. Don Carlos showed his usual lack of decision; he wavered between the advice of those who told him to unfurl his standard with a view to rally all the discontented and disappointed, and of those who recommended him to wait until a great *pronunciamiento*, chiefly military, should be made in his favour—a day-dream founded upon the coquetting of General Weyler and other officers with the Carlist Senators and Deputies in Madrid. Afterwards the pretender continued to ask his partisans to go on organizing their forces for action some day, and to push their propaganda and preparations, which was easy enough in view of the indulgence shown them by all the governments of the regency and the open favour exhibited by many of the priesthood, especially in the rural districts, the religious orders, and the Jesuits, swarming all over the kingdom. After the death of his first wife in 1893, Don Carlos married in the following year Princess Marie Bertha of Rohan. His son by his first wife, Don Jaime, was educated in Austrian and British military schools before he entered the Russian army, in which he holds the rank of a colonel of dragoons.

Carlos I. (1863-——), king of Portugal, the third sovereign of Portugal of the line of Braganza-Coburg, was the son of King Luiz I. and Maria Pia, daughter of King Vittorio Emmanuele of Italy, being born 28th September 1863. When about twenty years of age he spent a considerable time in travelling. He visited England in 1883. On 22nd May 1886 he married Marie Amélie, daughter of Philippe, duc d'Orléans, comte de Paris, and on the death of his father, 19th October 1889, succeeded to the throne of Portugal. In that year the British Government found it necessary to make formal remonstrances against Portuguese encroachments in South Africa, and relations between the two countries were greatly strained for some time. The king's attitude during this critical period was one of conciliation, and his temperate, though firm, speech on opening the Cortes in January 1890 did much to strengthen the party of peace. In 1900-1 also his friendly attitude towards Great Britain was shown by cordial toasts at a banquet to the officers of the British fleet at Lisbon. The king has been a great patron of science and literature; in March 1894 he took a very active part in the celebration of the 500th anniversary of the birth of Prince Henry the Navigator, and a year later he decorated the Portuguese poet João de Deus with much honour at Lisbon. He has taken a great personal interest in deep-sea soundings and marine exploration, and has published an account of some of his own investigations, the results themselves being shown at an oceanographic exhibition opened by him on 12th April 1897.

Carlow, an inland county of Ireland, province of Leinster.

Population.—The area of the judicial county in 1900 was 221,458 acres, of which 71,486 were tillage, 122,649 pasture, 114 fallow, 3240 plantation, 688 turf bog, 2367 marsh, 10,647 barren mountain, and 10,267 water, roads, fences, &c. The new administrative county, under the Local Government (Ireland) Act, 1898, includes the portion of the town of Carlow formerly situated in Queen's County. Population (1881), 46,568; (1891), 41,964; (1901), 37,723, of whom 18,991 were males and 18,732 females, being a decrease of 10·1 per cent., divided as follows among the different religions:—Roman Catholics, 33,381; Protestant Episcopalians, 3950; Presbyterians, 156; Methodists, 198; others, 38. The decrease of population between 1881 and 1891 was 12·1 per cent. The average number of persons to an acre was ·19. Of the total population 35,345 persons inhabited the rural districts, being an average of 119 to each square mile under crops and pasture. The following table gives the degree of education in 1891:—

	Males.	Females.	Total.	Percentage.		
				R. C.	Pr. Epis.	Presb.
Read and write .	13,840	13,514	27,354	71·5	89·4	94·0
Read only . .	1,938	2,341	4,279	12·4	5·2	1·0
Illiterate . . .	2,829	2,709	5,538	16·1	5·4	5·0

In 1881 the percentage of illiterates among Roman Catholics was 21·4. In 1891 there were 6 superior schools, with 396 pupils (344 Roman Catholics and 52 Protestants), and 83 primary schools, with 5791 pupils (5092 Roman Catholics and 699 Protestants). The number of pupils on the rolls of the national schools on 30th September 1899 was 6275, of whom 5530 were Roman Catholics and 745 Protestants.

The following table gives the number of births, deaths, and marriages in various years:—

Year.	Births.	Deaths.	Marriages.
1881	937	754	177
1891	817	772	140
1899	847	698	145

In 1899 the birth-rate per 1000 was 20·2, and the death-rate 16·6; the rate of illegitimacy was 4·3 per cent. of the total births. The total number of emigrants who left the county between 1st

May 1851 and 31st December 1899 was 32,009, of whom 16,425 were males and 15,584 females. The following are the chief towns in the county, with their populations in 1891:—Carlow, 6619; Bagenalstown, 1920; Tullow, 1773.

Administration.—The county returns 1 member to Parliament, the number of registered electors in 1900 being 8132. The rateable value in 1900 was £169,401. By the Local Government (Ireland) Act, 1898, the fiscal and administrative duties of the grand jury and (to a less extent) of other bodies were transferred to a county council, urban and rural district councils were established, and under that Act the county now comprises 1 urban and 3 rural sanitary districts.

Agriculture.—The following tables show the acreage under crops (including meadow and clover), and the amount of live stock, in 1881, 1891, 1895, and 1900. The figures for 1900 are for the new administrative county:—

	Wheat.	Oats.	Barley, etc.	Potatoes.	Turnips.	Other Green Crops.	Meadow and Clover.	Total.
1881	3409	20,209	5404	9856	4972	1880	31,275	76,955
1891	1483	20,174	5157	9532	5192	2130	31,045	74,713
1895	120	21,902	4958	8515	5759	1952	33,501	76,707
1900	405	19,428	5499	7918	5656	2046	30,534	71,486

For 1899 the total value of cereal and other crops was estimated by the Registrar-General at £515,840. The number of acres under pasture in 1881 was 116,694; in 1891, 116,175; and in 1900, 122,649.

	Horses and Mules.	Asses.	Cattle.	Sheep.	Pigs.	Goats.	Poultry.
1881	8649	2556	44,519	60,078	21,411	3380	176,909
1891	9039	2763	46,311	89,123	24,611	3037	198,728
1895	9493	2876	43,787	79,696	22,560	3387	204,526
1900	8867	3358	47,314	97,845	22,436	3044	225,168

The number of milch cows in 1891 was 12,070, and in 1900 11,674. It is estimated that the total value of cattle, sheep, and pigs in 1900 was £827,223. In 1900 the number of holdings not exceeding 1 acre was 1576; between 1 and 5, 625; between 5 and 15, 817; between 15 and 30, 994; between 30 and 50, 834; between 50 and 100, 840; between 100 and 200, 349; between 200 and 500, 108; and above 500, 7—total, 6150. The number of loans issued (the number of tenants being the same as the number of loans) under the Land Purchase Acts 1885, 1891, and 1896, up to 31st March 1900, was 155, amounting to £129,570. The number of loans sanctioned for agricultural improvements under sect. 31 of the Land Act, 1881, between 1882 and 1900, was 114, and the amount issued was £10,541. The total amount issued on loan for all classes of works under the Land Improvement Acts, from the commencement of operations in 1847 to 31st March 1900, was £109,969. (W. H. Po.)

Carlsbad, or Kaiser-Karlsbad (Czech, *Karlovy Vary*), a royal free town and celebrated watering-place in Bohemia. The population in 1890 was 12,033; in 1900 (estimated), 14,640, all German and chiefly Catholic (about 9 per cent. Jewish and 2 per cent. Protestant). In 1896 the total number of visitors rose to 42,448. There has been a corresponding increase in the accommodation, the houses having been increased by 114 in the period 1887-96, 33 of these being public buildings. Carlsbad has an important porcelain and stoneware industry, cutlery, confectionery, &c.

There is an extensive literature on the curative properties of the waters, comprising works by Mannl (*Carlsbad and its Mineral Springs*, Leipzig, 1850), Hochstetter, Semler, Hertzka, Fleckles, Kraus, Sorger, Kafka, Hlawacek, Cartellieri, Stephanides, and Sipöcz.

Carlscrona, the chief naval station of Sweden, on the S. coast, 53 miles S.S.W. from Calmar by rail (line opened in 1899). A bronze statue of Charles XI., the founder of the town, was unveiled in 1897. There are factories for naval equipments, canvas, leather, and rice, and granite quarries. About 550 vessels of 110,000 tons clear the port annually. Principal exports—granite and timber. Imports—coal, cereals and flour, groceries, hides, machinery, etc. Population (1880), 18,300; (1898), 23,507.

Carlshamn, a seaport town of Sweden, on the S. coast, 28 miles by rail W. from Carlscrona. It has a school of navigation, and an export trade in timber, spirits, and fish. The industries embrace distilleries, tanneries, tobacco factories, &c. Population (1880), 6402; (1898), 7074.

Carlsruhe, a town of Germany, capital of grand-duchy of Baden, 33 miles by rail S. by W. of Heidelberg, and 5 miles E. of the Rhine. The fan-like form of the plan of the city, already described in the article in the ninth edition, has been rigidly adhered to in the new suburbs. The city as a whole makes the impression of uniformity and elegance. Amongst the new buildings probably the most noteworthy are the joint museum of the grand-ducal and national collections (natural history, archæology, ethnology, art, and a library of over 150,000 volumes); the palace of the heir-apparent, a late Renaissance building of 1891-96; the imperial bank (1893); the national industrial hall, with an exhibition of machinery, &c.; and the new law courts. The hall of fine arts, which shelters a good picture gallery, was enlarged in 1896. Carlsruhe possesses further the Zähringer museum of curiosities, &c., in the left wing of the castle, an architectural school (1891), industrial art school and museum, cadet school (1892), botanical and electro-technical institutes, industrial art school, art school, trades and commercial schools, and horticultural and agricultural schools. Of its recent public monuments may be mentioned one to Von Scheffel (1892), who was born here in 1826, and died here in 1886; a bronze equestrian statue of the Emperor William I. (1896); and a memorial of the 1870-71 war. Carlsruhe is the headquarters of the 14th German army corps. Since 1870 the industry of the town has grown rapidly, as well as the town itself. Here are large railway workshops. The principal branches of industry are concerned with the making of locomotives, vehicles, implements and machinery, silvered wares, art furniture, gloves, cement, carpets, perfumery, and beer. There is an important arms factory. Maxau, on the Rhine, serves as the river port of Carlsruhe, and is connected with it by a canal finished in 1901. Population (1885), 61,066; (1895), 84,030; (1900), 96,876.

Carlstad, a town of Sweden, capital of province of Vermland, stands at the N. end of Lake Wener, 205 miles W. from Stockholm by rail to Christiania. There are ironworks and match factories, and a mineral spring. Population (1880), 7772; (1898), 10,015.

Carluke, a burgh of barony of central Lanarkshire, Scotland, 19½ miles S.E. of Glasgow by rail. Fruit is largely grown in the district, and a preserve factory and engineering works are among the industrial features. Original Secession and Congregational chapels have been erected. Population (1881), 3867; (1901), 4731. The parish contains four villages, the largest, Law, an important railway junction. Population (1901), 8962.

Carlyle, Thomas (1795-1881), British essayist, historian, and philosopher, born on 4th December 1795 at Ecclefechan, in Annandale, was the eldest of the nine children of James Carlyle by his second wife, Janet Aitken. The father was by trade a mason, and afterwards a small farmer. He had joined a sect of seceders from the Kirk, and had all the characteristics of the typical Scottish Calvinist. He was respected for his integrity and independence, and a stern outside covered warm affections. The family tie between all the Carlyles was unusually strong, and Thomas regarded his father with a reverence which found forcible expression in his *Reminiscences*. He always showed the tenderest

love for his mother, and was the best of brothers. The narrow means of his parents were made sufficient by strict frugality. He was sent to the parish school when seven, and to Annan grammar-school when ten years old. His pugnacity brought him into troubles with his fellows at Annan; but he soon showed an appetite for learning which induced his father to educate him for the ministry. He walked to Edinburgh in November 1809, and entered the University. He cared little for any of the professors, except Sir John Leslie, from whom he learned some mathematics. He acquired a little classical knowledge, but the most valuable influence was that of his contemporaries. A few lads in positions similar to his own began to look up to him as an intellectual leader, and their correspondence with him shows remarkable interest in literary matters. In 1814, Carlyle, still looking forward to the career of a minister, obtained the mathematical mastership at Annan. The salary of £60 or £70 a year enabled him to save a little money. He went to Edinburgh once or twice, to deliver the discourses required from students of divinity. He does not seem, however, to have taken to his profession very earnestly. He was too shy and proud to see many of the Annan people, and found his chief solace in reading such books as he could get. In 1816 he was appointed, through the recommendation of Leslie, to a school at Kirkcaldy, where Edward Irving, Carlyle's senior by three years, was also master of a school. Irving's severity as a teacher had offended some of the parents, who set up Carlyle to be his rival. A previous meeting with Irving, also a native of Annan, had led to a little passage of arms, but Irving now welcomed Carlyle with a generosity which entirely won his heart, and the rivals soon became the closest of friends. The intimacy, affectionately commemorated in the *Reminiscences*, was of great importance to Carlyle's whole career. "But for Irving," he says, "I had never known what the communion of man with man means." Irving had a library, in which Carlyle devoured Gibbon and much French literature, and they made various excursions together. Carlyle did his duties as a schoolmaster punctiliously, but found the life thoroughly uncongenial. No man was less fitted by temperament for the necessary drudgery and worry. A passing admiration for a Miss Gordon is supposed to have suggested the "Blumine" of *Sartor Resartus;* but he made no new friendships, and when Irving left at the end of 1818 Carlyle also resigned his post.

He had by this time resolved to give up the ministry. He has given no details of the intellectual change which alienated him from the Church. He had, however, been led, by whatever process, to abandon the dogmatic system of his forefathers, though he was and always remained in profound sympathy with the spirit of their teaching. A period of severe struggle followed. He studied law for a time, but liked it no better than schoolmastering. He took a pupil or two, and wrote articles for the *Edinburgh Encyclopædia* under the editorship of Brewster. He occasionally visited his family, and their unfailing confidence helped to keep up his courage. Meanwhile he was going through a spiritual crisis. Atheism seemed for a time to be the only alternative to his old creed. It was, however, profoundly repugnant to him. At last, one day in June 1821, after three weeks' total sleeplessness, he went through the crisis afterwards described "quite literally" in *Sartor Resartus*. He cast out the spirit of negation, and henceforth the temper of his misery was changed to one, not of "whining," but of "indignation and grim fire-eyed defiance." That, he says, was his spiritual new-birth, though certainly not into a life of serenity. The conversion was coincident with Carlyle's submission to a new and very potent influence. In 1819 he had begun to study German, with which he soon acquired a very remarkable familiarity. Many of his contemporaries were awakening to the importance of German thought, and Carlyle's knowledge enabled him before long to take a conspicuous part in diffusing the new intellectual light. The chief object of his reverence was Goethe. In many most important respects no two men could be more unlike; but, for the present, Carlyle seems to have seen in Goethe a proof that it was possible to reject outworn dogmas without sinking into materialism. Goethe, by singularly different methods, had emerged from a merely negative position into a lofty and coherent conception of the universe. Meanwhile, Carlyle's various anxieties were beginning to be complicated by physical derangement. A rat, he declared, was gnawing at the pit of his stomach. He was already suffering from the ailments, whatever their precise nature, from which he never escaped. He gave vent to his irritability by lamentations so grotesquely exaggerated as to make it difficult to estimate the real extent of the evil.

THOMAS CARLYLE.
(From a photograph by Elliott and Fry, London.)

Irving's friendship now became serviceable. Carlyle's confession of the radical difference of religious opinion had not alienated his friend, who was settling in London, and used his opportunities for promoting Carlyle's interest. In January 1822, Carlyle, through Irving's recommendation, became tutor to Charles and Arthur Buller, who were to be students at Edinburgh. Carlyle's salary was £200 a year, and this, with the proceeds of some literary work, enabled him at once to help his brother John to study medicine and his brother Alexander to take up a farm. Carlyle spent some time with the elder Bullers, but found a life of dependence upon fashionable people humiliating and unsatisfactory. He employed himself at intervals upon a life of Schiller and a translation of *Wilhelm Meister*. He received £50 for a translation of Legendre's *Geometry;* and an introduction, explaining the theory of proportion, is said by De Morgan to show that he could have gained distinction as an expounder of mathematical principles. He finally gave up his tutorship in July 1824, and for a time tried to find employment in London. The impressions made upon him by London men of letters were most unfavourable. Carlyle felt by this time conscious of having

a message to deliver to mankind, and his comrades, he thought, were making literature a trade instead of a vocation, and prostituting their talents to frivolous journalism. He went once to see Coleridge, who was then delivering his oracular utterances at Highgate, and the only result was the singularly vivid portrait given in a famous chapter in his life of Sterling. Coleridge seemed to him to be ineffectual as a philosopher, and personally to be a melancholy instance of genius running to waste. Carlyle, conscious of great abilities, and impressed by such instances of the deleterious effects of the social atmosphere of London, resolved to settle in his native district. There he could live frugally and achieve some real work. He could, for one thing, be the interpreter of Germany to England. A friendly letter from Goethe, acknowledging the translation of *Wilhelm Meister*, reached him at the end of 1824 and greatly encouraged him. Goethe afterwards spoke warmly of the life of Schiller, and desired it to be translated into German. Letters occasionally passed between them in later years, which were edited by Professor Norton in 1887. Goethe received Carlyle's homage with kind complacency. The gift of a seal to Goethe on his birthday in 1831 "from fifteen English friends," including Scott and Wordsworth, was suggested and carried out by Carlyle. The interest in German, which Carlyle did so much to promote, suggested to him other translations and reviews during the next few years, and he made some preparations for a history of German literature. British curiosity, however, about such matters seems to have been soon satisfied, and the demand for such work slackened.

Carlyle was meanwhile passing through the most important crisis of his personal history. Jane Baillie Welsh, born 1801, was the only child of Dr Welsh of Haddington. She had shown precocious talent, and was sent to the school at Haddington where Irving was a master. After her father's death in 1819 she lived with her mother, and her wit and beauty attracted many admirers. Her old tutor, Irving, was now at Kirkcaldy, where he became engaged to a Miss Martin. He visited Haddington occasionally in the following years, and a strong mutual regard arose between him and Miss Welsh. They contemplated a marriage, and Irving endeavoured to obtain a release from his previous engagement. The Martin family held him to his word, and he took a final leave of Miss Welsh in 1822. Meanwhile he had brought Carlyle from Edinburgh and introduced him to the Welshes. Carlyle was attracted by the brilliant abilities of the young lady, procured books for her, and wrote letters to her as an intellectual guide. The two were to perform a new variation upon the theme of Abelard and Héloïse. It is, however, difficult to speak with confidence of the precise character of their relations. The letters which contain the necessary information have been read by no one except Carlyle's biographer, Froude, and Professor Norton. Professor Norton (in his edition of Carlyle's *Early Letters*, 1886) declares that Froude had distorted the significance of this correspondence in a sense injurious to the writers. He gives significant instances of misconception, and the presumption is certainly not in favour of Froude's accuracy. According to Professor Norton, Miss Welsh's previous affair with Irving had far less importance than Froude ascribes to it; and she soon came to regard her past love as a childish fancy. She recognized Carlyle's vast intellectual superiority, and the respect gradually deepened into genuine love. The process, however, took some time. Her father had bequeathed to her his whole property (£200 to £300 a year). In 1823 she made it over to her mother, but left the whole to Carlyle in the event of her own and her mother's death. She still declared that she did not love him well enough to become his wife. In 1824 she gradually relented so far as to say that she would marry if he could achieve independence. She had been brought up in a station superior to that of the Carlyles, and could not accept the life of hardship which would be necessary in his present circumstances. Carlyle, accustomed to his father's household, was less frightened by the prospect of poverty. He was determined not to abandon his vocation as a man of genius by following the lower though more profitable paths to literary success, and expected that his wife should partake the necessary sacrifice of comfort. The natural result of such discussions followed. The attraction became stronger on both sides, in spite of occasional spasms of doubt. An odd incident precipitated the result. A friend of Irving's, Mrs Basil Montague, wrote to Miss Welsh, to exhort her to suppress her love for Irving, who had married Miss Martin in 1823. Miss Welsh replied by announcing her intention to marry Carlyle; and then told him the whole story, of which he had previously been ignorant. He properly begged her not to yield to the impulse without due consideration. She answered by coming at once to his father's house, where he was staying; and the marriage was finally settled. It took place on 17th October 1826.

Carlyle had now to arrange the mode of life which should enable him to fulfil his aspiration. His wife had made over her income to her mother, but he had saved a small sum upon which to begin housekeeping. A passing suggestion from Mrs Carlyle that they might live with her mother was judiciously abandoned. Carlyle had thought of occupying Craigenputtock, a remote and dreary farm belonging to Mrs Welsh. His wife objected his utter incapacity as a farmer; and they finally took a small house at Comely Bank, Edinburgh, where they could live on a humble scale. The brilliant conversation of both attracted some notice in the literary society of Edinburgh. The most important connexion was with Jeffrey, still editor of the *Edinburgh Review*. Though Jeffrey had no intellectual sympathy with Carlyle, he accepted some articles for the *Review* and became warmly attached to Mrs Carlyle. Carlyle began to be known as leader of a new "mystic" school, and his earnings enabled him to send his brother John to study in Germany. The public appetite, however, for "mysticism" was not keen. In spite of support from Jeffrey and other friends, Carlyle failed in a candidature for a professorship at St. Andrews. His brother, Alexander, had now taken the farm at Craigenputtock, and the Carlyles decided to settle at the separate dwelling-house there, which would bring them nearer to Mrs Welsh. They went there in 1828, and began a hard struggle. Carlyle, indomitably determined to make no concessions for immediate profit, wrote slowly and carefully, and turned out some of his most finished work. He laboured "passionately" at *Sartor Resartus*, and made articles out of fragments originally intended for the history of German literature. The money difficulty soon became more pressing. John, whom he was still helping, was trying unsuccessfully to set up as a doctor in London; and Alexander's farming failed. In spite of such drawbacks, Carlyle in later years looked back upon the life at Craigenputtock as on the whole a comparatively healthy and even happy period, as it was certainly one of most strenuous and courageous endeavour. Though often absorbed in his work and made both gloomy and irritable by his anxieties, he found relief in rides with his wife, and occasionally visiting their relations. Their letters during temporary separations are most affectionate. The bleak climate, however, the solitude, and the necessity of managing a household with a single servant, were excessively trying to a delicate woman, though Mrs Carlyle concealed from her husband

the extent of her sacrifices. The position was gradually becoming untenable. In the autumn of 1831 Carlyle was forced to accept a loan of £50 from Jeffrey and went in search of work to London, whither his wife followed him. He made some engagements with publishers, though no one would take *Sartor Resartus*, and returned to Craigenputtock in the spring of 1832. Jeffrey, stimulated perhaps by his sympathy for Mrs Carlyle, was characteristically generous. Besides pressing loans upon both Thomas and John Carlyle, he offered to settle an annuity of £100 upon Thomas, and finally enabled John to support himself by recommending him to a medical position. Carlyle's proud spirit of independence made him reject Jeffrey's help as long as possible; and even his acknowledgment of the generosity (in the *Reminiscences*) is tinged with something disagreeably like resentment. In 1834 he applied to Jeffrey for a post at the Edinburgh Observatory. Jeffrey naturally declined to appoint a man who, in spite of some mathematical knowledge, had no special qualification, and administered a general lecture upon Carlyle's arrogance and eccentricity which left a permanent sense of injury.

In the beginning of 1833 the Carlyles made another trial of Edinburgh. There Carlyle found materials in the Advocates' Library for the article on the *Diamond Necklace*, which is one of his most perfect writings, and which led him to study the history of the French Revolution. *Sartor Resartus* was at last appearing in *Fraser's Magazine*, though the rate of payment was cut down, and the publisher reported that it was received with "unqualified dissatisfaction." Edinburgh society did not attract him, and he retreated once more to Craigenputtock. After another winter the necessity of some change became obvious. The Carlyles resolved to "burn their ships." They went to London in the summer of 1834, and took a house at 5 (now 24) Cheyne Row, Chelsea, which Carlyle inhabited till his death; the house has since been bought for the public. Irving, who had welcomed him on former occasions, was just dying,—a victim, as Carlyle thought, to fashionable cajoleries. A few young men were beginning to show appreciation. J. S. Mill had made Carlyle's acquaintance in the previous visit to London, and had corresponded with him. Mill had introduced Emerson, who visited Craigenputtock in 1833. Carlyle was charmed with Emerson, and their letters published by Professor Norton show that his regard never cooled. Emerson's interest showed that Carlyle's fame was already spreading in America. Carlyle's connexion with Charles Buller, a zealous utilitarian, introduced him to the circle of "philosophical Radicals." Carlyle called himself in some sense a Radical; and J. S. Mill, though not an intellectual disciple, was a very warm admirer of his friend's genius. Carlyle had some expectation of the editorship of the *London Review*, started by Sir W. Molesworth at this time as an organ of philosophical Radicalism. The combination would clearly have been explosive. Meanwhile Mill, who had collected many books upon the French Revolution, was eager to help Carlyle in the history which he was now beginning. He set to work at once and finished the first volume in five months. The manuscript, while entrusted to Mill for annotation, was burnt by an accident. Mill induced Carlyle to accept in compensation £100, which was urgently needed. Carlyle took up the task again and finished the whole on 12th January 1837. "I can tell the world," he said to his wife, "you have not had for a hundred years any book that comes more direct and flamingly from the heart of a loving man. Do what you like with it, you ——"

The publication, six months later, of the *French Revolution* marks the turning-point of Carlyle's career. Many readers hold it to be the best, as it is certainly the most characteristic, of Carlyle's books. The failure of *Sartor Resartus* to attract average readers is quite intelligible. It contains, indeed, some of the most impressive expositions of his philosophical position, and some of his most beautiful and perfectly written passages. But there is something forced and clumsy, in spite of the flashes of grim humour, in the machinery of the *Clothes Philosophy*. The mannerism which has been attributed to an imitation of Jean Paul appeared to Carlyle himself to be derived rather from the phrases current in his father's house, and in any case gave an appropriate dialect for the expression of his peculiar idiosyncrasy. But it could not be appreciated by readers who would not take the trouble to learn a new language. In the *French Revolution* Carlyle had discovered his real strength. He was always at his best when his imagination was set to work upon a solid framework of fact. The book shows a unique combination: on the one hand is the singularly shrewd insight into character and the vivid realization of the picturesque; on the other is the "mysticism" or poetical philosophy which relieves the events against a background of mystery. The contrast is marked by the humour which seems to combine a cynical view of human folly with a deeply pathetic sense of the sadness and suffering of life. The convictions, whatever their value, came, as he said, "flamingly from the heart." It was, of course, impossible for Carlyle to satisfy modern requirements of matter-of-fact accuracy. He could not in the time have assimilated all the materials even then extant, and later accumulations would necessitate a complete revision. Considered as a "prose epic," or a vivid utterance of the thought of the period, it has a permanent and unique value.

The book was speedily successful. It was reviewed by Mill in the *Westminster* and by Thackeray in the *Times*, and Carlyle, after a heroic struggle, was at last touching land. In each of the years 1837 to 1840 he gave a course of lectures, of which the last only (upon "Hero Worship") was published; they materially helped his finances. By Emerson's management he also received something during the same period from American publishers. At the age of forty-five he had thus become independent. He had also established a position among the chief writers of the day. Young disciples, among whom John Sterling was the most accepted, were gathering round him, and he became an object of social curiosity. Monckton Milnes, who won universal popularity by the most genuine kindliness of nature, became a cordial friend. Another important intimacy was with the Barings, afterwards Lord and Lady Ashburton. Carlyle's conversational powers were extraordinary; though, as he won greater recognition as a prophet, he indulged too freely in didactic monologue. In his prophetic capacity he published two remarkable books: *Chartism* (1829), enlarged from an article which Lockhart, though personally approving, was afraid to take for the *Quarterly*; and *Past and Present* (1843), in which the recently published *Mediæval Chronicle* was taken as a text for the exposure of modern evils. They may be regarded as expositions of the doctrine implicitly set forth in the *French Revolution*. Carlyle was a "Radical" as sharing the sentiments of the class in which he was born. He had been profoundly moved by the widely-spread distresses in his earlier years. When the yeomanry were called out to suppress riots after the Peace, his sympathies were with the people rather than with the authorities. So far he was in harmony with Mill and the "philosophical Radicals." A fundamental divergence of principle, however, existed and was soon indicated by his speedy separation from the party and alienation from Mill himself. The Revolution, according to him, meant the sweeping away of effete beliefs

and institutions, but implied also the necessity of a reconstructive process. *Chartism* begins with a fierce attack upon the *laissez faire* theory, which showed blindness to this necessity. The prevalent political economy, in which that theory was embodied, made a principle of neglecting the very evils which it should be the great function of government to remedy. Carlyle's doctrines, entirely opposed to the ordinary opinions of Whigs and Radicals, found afterwards an expositor in his ardent disciple Ruskin, and have obvious affinities with more recent socialism. At the time he was as one crying in the wilderness to little practical purpose. Liberals were scandalized by his apparent identification of "right" with "might," implied in the demand for a strong government; and though he often declared the true interpretation to be that the right would ultimately become might, his desire for strong government seemed too often to sanction the inverse view. He came into collision with philanthropists, and was supposed to approve of despotism for its own sake.

His religious position was equally unintelligible to the average mind. While unequivocally rejecting the accepted creeds, and so scandalizing even liberal theologians, he was still more hostile to simply sceptical and materialist tendencies. He was, as he called himself, a "mystic"; and his creed was too vague to be put into any formula beyond a condemnation of atheism. One corollary was the famous doctrine of "hero worship" first expounded in his lectures. Any philosophy of history which emphasized the importance of general causes seemed to him to imply a simply mechanical doctrine, and to deny the efficacy of the great spiritual forces. He met it by making biography the essence of history, or attributing all great events to the "heroes," who are the successive embodiments of divine revelations. This belief was implied in his next great work, the *Life and Letters of Oliver Cromwell*, published in 1845. The great Puritan hero was a man after his own heart, and the portrait drawn by so sympathetic a writer is not only intensely vivid, but a very effective rehabilitation of misrepresented character. The "biographical" view of history, however, implies the weakness, not only of unqualified approval of all Cromwell's actions, but of omitting any attempt to estimate the Protector's real relation to the social and political development of the time. The question, what was Cromwell's real and permanent achievement, is not answered nor distinctly considered. The effect may be partly due to the peculiar form of the book as a detached series of documents and comments. The composition introduced Carlyle to the "Dryasdust" rubbish heaps of which he here and ever afterwards bitterly complained. A conscientious desire to unearth the facts, and the effort of extracting from the dullest records the materials for graphic pictures, made the process of production excessively painful. For some years after *Cromwell* Carlyle wrote little. His growing acceptance by publishers, and the inheritance of her property by Mrs Carlyle on her mother's death in 1842, finally removed the stimulus of money pressure. He visited Ireland in 1846 and again in 1849, when he made a long tour in company with Sir C. Gavan Duffy, then a young member of the Nationalist party (see Sir C. G. Duffy's *Conversations with Carlyle*, 1892, for an interesting narrative). Carlyle's strong convictions as to the misery and misgovernment of Ireland recommended him to men who had taken part in the rising of 1848. Although the remedies acceptable to a eulogist of Cromwell could not be to their taste, they admired his moral teaching; and he received their attentions, as Sir C. G. Duffy testifies, with conspicuous courtesy. His aversion from the ordinary Radicalism led to an article upon slavery in 1849, to which Mill replied, and which caused their final alienation. It was followed in 1850 by the *Latterday Pamphlets*, containing "sulphurous" denunciations of the do-nothing principle. They gave general offence, and the disapproval, according to Froude, stopped the sale for years. The *Life* of Sterling (died 1844), which appeared in 1851, was intended to correct the life by Julius Hare, which had given too much prominence to theological questions. The subject roused Carlyle's tenderest mood, and the *Life* is one of the most perfect in the language.

Carlyle meanwhile was suffering domestic troubles, unfortunately not exceptional in their nature, though the exceptional intellect and characters of the persons concerned have given them unusual prominence. Carlyle's constitutional irritability made him intensely sensitive to petty annoyances. He suffered the torments of dyspepsia; he was often sleepless, and the crowing of "demon-fowls" in neighbours' yards drove him wild. Composition meant for him intense absorption in his work; solitude and quiet were essential; and he resented interruptions by grotesque explosions of humorously exaggerated wrath. Mrs Carlyle had to pass many hours alone, and the management of the household and of devices intended to shield him from annoyances was left entirely to her. House-cleanings and struggles with builders during the construction of a "sound-proof room" taxed her energy, while Carlyle was hiding himself with his family in Scotland or staying at English country houses. Nothing could be more affectionate than his behaviour to his wife on serious occasions, such as the death of her mother, and he could be considerate when his attention was called to the facts. But he was often oblivious of the strain upon her energies, and had little command of his temper. An unfortunate aggravation of the difficulty arose from his intimacy with the Ashburtons. Lady Ashburton, a woman of singular social charm and great ability, appreciated the author, but apparently accepted the company of the author's wife rather as a necessity than as an additional charm. Mrs Carlyle was hurt by the fine lady's condescension and her husband's accessibility to aristocratic blandishments. Carlyle, as a wise man, should have yielded to his wife's wishes; unluckily, he was content to point out that her jealousy was unreasonable and, upon that very insufficient ground, to disregard it and to continue his intimacy with the Ashburtons on the old terms. Mrs Carlyle bitterly resented his conduct. She had been willing to renounce any aspirations of her own and to sink herself in his glory, but she naturally expected him to recognize her devotion and to value her society beyond all others. She had just cause of complaint, and a remarkable power, as her letters prove, of seeing things plainly and despising sentimental consolations. She was childless, and had time to brood over her wrongs. She formed a little circle of friends, attached to her rather than to her husband; and to one of them, Mazzini, she confided her troubles in 1846. He gave her admirable advice; and the alienation from her husband, though it continued still to smoulder, led to no further results. A journal written at the same time gives a painful record of her sufferings, and after her death made Carlyle conscious for the first time of their full extent. The death of Lady Ashburton in 1857 removed this cause of jealousy; and Lord Ashburton married a second wife in 1858, who became a warm friend of both Carlyles. The cloud which had separated them was thus at last dispersed. Meanwhile Carlyle had become absorbed in his best and most laborious work. Soon after the completion of the *Cromwell* he had thought of Frederick for his next hero, and had in 1845 contemplated a visit to Germany to collect materials. He did not, however, settle down finally to the work till 1851. He shut himself up in his study to wrestle with the Prussian Dryasdusts, whom

he discovered to be as wearisome as their Puritan predecessors and more voluminous. He went to Scotland to see his mother, to whom he had always shown the tenderest affection, on her deathbed at the end of 1853. He returned to shut himself up in the "sound-proof room." He twice visited Germany (1852 and 1858), to see Frederick's battlefields and obtain materials; and he occasionally went to the Ashburtons and his relations in Scotland. The first two volumes of *Frederick the Great* appeared in 1858, and succeeding volumes in 1862, 1864, and 1865. The success was great from the first, though it did little to clear up Carlyle's gloom. The book is in some respects his masterpiece, and its merits are beyond question. Carlyle had spared no pains in research. The descriptions of the campaigns are admirably vivid, and show his singular eye for scenery. These narratives are said to be used by military students in Germany, and at least convince the non-military student that he can understand the story. The book was declared by Emerson to be the wittiest ever written. Many episodes, describing the society at the Prussian court and the relations of Frederick to Voltaire, are unsurpassable as humorous portraiture. The effort to fuse the masses of raw material into a well-proportioned whole is perhaps not quite successful; and Carlyle had not the full sympathy with Frederick which had given interest to the *Cromwell*. A hero-worshipper with half-concealed doubts as to his hero is in an awkward position. Carlyle's general conception of history made him comparatively blind to aspects of the subject which would, to writers of other schools, have a great importance. The extraordinary power of the book is undeniable, though it does not show the fire which animated the *French Revolution*. A certain depression and weariness of spirit darken the general tone.

During the later labours Mrs Carlyle's health had been breaking. Carlyle, now that happier relations had been restored, did his best to give her the needed comforts; and in spite of his immersion in *Frederick*, showed her all possible attention in later years. She had apparently recovered from an almost hopeless illness, when at the end of 1865 he was elected to the rectorship of the University of Edinburgh. He delivered an address there on 2nd April 1866, unusually mild in tone and received with general applause. He was still detained in Scotland when Mrs Carlyle died suddenly while driving in her carriage. The immediate cause was the shock of an accident to her dog. She had once hurt her mother's feelings by refusing to use some wax candles. She had preserved them ever since, and by her direction they were now lighted in the chamber of death. Carlyle was overpowered by the loss. His life thenceforward became more and more secluded, and he gradually became incapable of work. He went to Mentone in the winter of 1866 and began the *Reminiscences*. He afterwards annotated the letters from his life, published (1883) as *Letters and Memorials*. He was, as Froude says, impressed by the story of Johnson's "penance" at Uttoxeter, and desired to make a posthumous confession of his shortcomings in his relations to his wife. A few later utterances made known his opinions of current affairs. He joined the committee for the defence of Governor Eyre in 1867; he also wrote in 1867 an article upon "shooting Niagara," that is, upon the tendency of the Reform Bill of that year; and in 1870 he wrote a letter defending the German case against France. The worth of his *Frederick* was acknowledged by the Prussian Order of Merit in 1874. In the same year Disraeli offered him the Grand Cross of the Bath and a pension. He declined very courteously, and felt some regret for previous remarks upon the minister. The length of his literary career was now softening old antipathies, and he was the object of general respect. His infirmities enforced a very retired life, but he was constantly visited by Froude, and occasionally by his disciple Ruskin. A small number of other friends paid him constant attention. His conversation was still interesting, especially when it turned upon his recollections, and though his judgments were sometimes severe enough, he never condescended to the scandalous. His views of the future were gloomy. The world seemed to be going from bad to worse, with little heed to his warnings. He would sometimes regret that it was no longer permissible to leave it in the old Roman fashion. He sank gradually, and died on 4th February 1881. A place in Westminster Abbey was offered, but he was buried, according to his own desire, by the side of his parents at Ecclefechan. He left Craigenputtock, which had become his own property, to found bursaries at the University of Edinburgh. He gave his books to Harvard College, Massachusetts.

Carlyle's appearance has been made familiar by many portraits, none of them, according to Froude, satisfactory. The statue by Boehm on the Chelsea Embankment, however, is characteristic; and there is a fine painting by Watts in the National Portrait Gallery. During Carlyle's later years the antagonism roused by his attacks upon popular opinions had subsided; and upon his death general expression was given to the emotions natural upon the loss of a remarkable man of genius. The rapid publication of the *Reminiscences* by Froude produced a sudden revulsion of feeling. Carlyle became the object of general condemnation. Froude's biography, and the *Memorials* of Mrs Carlyle, published soon afterwards, strengthened the hostile feeling. Carlyle had appended to the *Reminiscences* an injunction to his friends not to publish them as they stood, and added that no part could ever be published without the strictest editing. Afterwards, when he had almost forgotten what he had written, he verbally empowered Froude to use his own judgment: Froude accordingly published the book at once, without any editing, and with many inaccuracies. Omissions of a few passages written from memory at a time of profound nervous depression would have altered the whole character of the book. Froude in this and the later publications held that he was giving effect to Carlyle's wish to imitate Johnson's "penance." No one, said Boswell, should persuade him to make his lion into a cat. Froude intended, in the same spirit, to give the shades as well as the lights in the portrait of his hero. His admiration for Carlyle probably led him to assume too early that his readers would approach the story from the same point of view, that is, with an admiration too warm to be repelled by the admissions. Moreover, Froude's characteristic desire for picturesque effect, unchecked by any painstaking accuracy, led to his reading preconceived impressions into his documents. The result was that Carlyle was too often judged by his defects, and regarded as a selfish and eccentric misanthrope with flashes of genius, rather than as a man with many of the highest qualities of mind and character clouded by constitutional infirmities. Yet it would be difficult to speak too strongly of the great qualities which underlay the superficial defects. Through long years of poverty and obscurity Carlyle showed unsurpassed fidelity to his vocation and superiority to the lower temptations which have ruined so many literary careers. His ambition might be interpreted as selfishness, but certainly showed no coldness of heart. His unstinted generosity to his brothers during his worst times is only one proof of the singular strength of his family affections. No one was more devoted to such congenial friends as Irving and Sterling. He is not the only man whom absorption in work and infirmity of temper have made into a provoking husband, though few

wives have had Mrs Carlyle's capacity for expressing the sense of injustice. The knowledge that the deepest devotion underlies misunderstandings is often a very imperfect consolation; but such devotion clearly existed all through, and proves the defect to have been relatively superficial.

The harsh judgments of individuals in the *Reminiscences* had no parallel in his own writings. He scarcely ever mentions a contemporary, and was never involved in a personal controversy. But the harshness certainly reflects a characteristic attitude of mind. Carlyle was throughout a pessimist or a prophet denouncing a backsliding world. His most popular contemporaries seemed to him to be false guides, and charlatans had ousted the heroes. The general condemnation of "shams" and cant had, of course, particular applications, though he left them to be inferred by his readers. Carlyle was the exponent of many of the deepest convictions of his time. Nobody could be more in sympathy with aspirations for a spiritual religion and for a lofty idealism in political and social life. To most minds, however, which cherish such aspirations the gentler optimism of men like Emerson was more congenial. They believed in the progress of the race and the triumph of the nobler elements. Though Carlyle, especially in his earlier years, could deliver an invigorating and encouraging, if not a sanguine doctrine, his utterances were more generally couched in the key of denunciation, and betrayed a growing despondency. Materialism and low moral principles seemed to him to be gaining the upper hand; and the hope that religion might survive the "old clothes" in which it had been draped seemed to grow fainter. The ordinary mind complained that he had no specific remedy to propose for the growing evils of the time; and the more cultivated idealist was alienated by the gloom and the tendency to despair. To a later generation it will probably appear that, whatever the exaggerations and the misconceptions to which he was led, his vehement attacks at least called attention to rather grave limitations and defects in the current beliefs and social tendencies of the time. The mannerisms and grotesque exaggerations of his writings annoyed persons of refinement, and suggest Matthew Arnold's advice to flee "Carlylese" as you would flee the devil. Yet the shrewd common-sense, the biting humour, the power of graphic description, and the imaginative "mysticism" give them a unique attraction for many even who do not fully sympathize with the implied philosophy or with the Puritanical code of ethics. The letters and autobiographical writings, whether they attract or repel sympathy, are at least a series of documents of profound interest for any one who cares to study character, and display an almost unique idiosyncrasy.

The chief authorities for Carlyle's life are his own *Reminiscences*, the letters of JANE WELSH CARLYLE, and the four volumes of FROUDE'S *Biography*. — Prof. NORTON'S edition of the *Reminiscences* and his collection of Carlyle's *Early Letters* correct some of Froude's inaccuracies.—A list of many articles upon Carlyle is given by Mr IRELAND in *Notes and Queries*, sixth series, vol. iv.—Among other authors may be noticed HENRY JAMES, sen., in *Literary Remains*.—Prof. MASSON. *Carlyle, Personally and in his Writings*.—CONWAY. *Thomas Carlyle*.—LARKIN. *The Open Secret of Carlyle's Life*.—Mrs OLIPHANT in *Macmillan's Magazine* for April 1881.—G. S. VENABLES in *Fortnightly Review* for May 1883 and November 1884. (L. S.)

Carmarthen, a municipal borough (extended 1898), contributory parliamentary borough (uniting with Llanelly), and county town of Carmarthenshire, Wales, 32 miles N.W. of Swansea by rail, on the Towy, about 5 miles from the sea. The borough forms a county of itself. Recent erections are a chapel of ease and a Masonic hall; the county and borough infirmary has been extended. Iron-founding, woollen manufacture, tanning, and rope-making are carried on. Population (1881), 10,514; (1901), 9935. There is a parish of Carmarthen.

Carmarthenshire, a maritime county of South Wales, bounded on the N. by Cardigan, on the E. by Brecon and Glamorgan, on the S. by Carmarthen Bay, and on the W. by Pembroke.

Area and Population.—The area of the ancient and the administrative county, as given in the census returns, is 587,816 acres, or 918 square miles. The population in 1881 was 124,864, and in 1891 was 130,566, of whom 62,316 were males and 68,250 females; the number of persons per square mile being 142, and of acres to a person 4·50. In 1901 the population was 135,325. The area of the registration county is 478,717 acres, with a population in 1891 of 118,624. Within this area the percentage of increase between 1881 and 1891 was 6·62. Between 1881 and 1891 the excess of births over deaths was 15,234, and the increase in the resident population was 7369. The following table gives the numbers of marriages, births, and deaths, with the number and percentage of illegitimate births, for 1880, 1890, and 1898:—

Year.	Marriages.	Births.	Deaths.	Illegitimate Births.	
1880	767	3702	2338	190	5·1
1890	767	3647	2143	156	4·3
1898	861	3540	2328	130	3·7

In 1891 the natives of Scotland in the county numbered 232, the natives of Ireland 343, and foreigners 191; while 1751 persons could speak English, 63,345 Welsh, and 36,937 English and Welsh.

Constitution and Government.—The county is divided into two parliamentary divisions, and it also includes the Carmarthen district of parliamentary boroughs, consisting of Carmarthen and Llanelly. There are three municipal boroughs: Carmarthen (9935), Kidwelly (2285), and Llandovery (1809). The urban districts are Llandilo (1934), Llanelly (25,553), and Newcastle Emlyn (855). The county is in the South Wales circuit, and assizes are held at Carmarthen. The borough of Carmarthen has a commission of the peace and a separate court of quarter sessions. The ancient county, which is in the diocese of St. Davids, contains 75 entire ecclesiastical parishes and districts, and parts of one other.

Education.—There is a residential training college for schoolmasters (National Society's) at Carmarthen, and at Llanelly there is a board school for deaf children. The number of elementary schools on 31st August 1899 was 166, of which 100 were board and 66 voluntary schools, the latter including 54 National Church of England Schools, 2 Roman Catholic, and 10 "British and other." The average attendance at board schools was 14,592, and at voluntary schools 6421. The total school board receipts for the year ending 29th September 1899 were over £64,909. The income under the Agricultural Rates Act was over £2849.

Agriculture.—About three-fourths of the total area of the county is under cultivation, and of this about three-fourths is in permanent pasture. There are also over 47,000 acres in mountain pasture, and over 23,000 under woods. More than half the acreage under corn crops is occupied by oats, about one-fourth by barley, and more than one-sixth by wheat. About one-half of the green crop acreage is occupied by turnips and swedes, and more than one-third by potatoes. The chief attention of the farmer is devoted to stock raising and dairy farming. The following table gives the larger main divisions of the cultivated area at intervals of five years from 1880:—

Year.	Total area under Cultivation.	Corn Crops.	Green Crops.	Clover.	Permanent Pasture.	Fallow.
1880	429,000	67,265	10,079	41,592	307,610	2454
1885	441,108	63,258	10,601	37,207	327,819	2223
1890	445,775	60,205	10,806	30,370	342,932	1436
1895	441,325	56,557	10,114	29,855	343,994	744
1900	442,109	52,333	10,191	33,915	344,772	839

The following table gives particulars regarding the principal live stock for the same years:—

Year.	Total Horses.	Total Cattle.	Cows or Heifers in Milk or in Calf.	Sheep.	Pigs.
1880	19,091	106,835	48,771	194,890	25,103
1885	19,419	115,834	51,855	213,091	30,146
1890	20,791	116,793	52,403	243,155	36,558
1895	21,703	115,564	51,734	234,606	39,644
1900	22,172	123,361	51,809	271,869	36,514

Industries and Trade.—According to the report of the chief inspector of factories for 1898 (1900), the number of persons employed in factories and workshops in 1897 was 9728, as compared with 9805 in 1896. Of the 7829 persons employed in non-textile factories, 5068 were employed in the founding and conversion of metals. Of the 1200 persons employed in 1897 in workshops, the majority were employed in the clothing industry. The total number of persons employed in mines and quarries in 1899 was 5362. Good limestone is plentiful in the southern part of the county, no fewer than 110,066 tons being raised in 1899. In the same year 67,926 tons of sandstone were raised. Within recent years little or no ironstone has been dug. The output of fireclay is increasing, as also is that of lead (1933 tons, valued at £7683, in 1899). Coal is the principal mineral, and its production is increasing. The following table gives the tonnage and value of the production in 1890 and 1899 :—

Year.	Tons.	Value.
1890	762,032	£333,389
1899	1,207,205	£421,612

The total value of fish landed at Llanelly in 1899, including shellfish, was £979.

AUTHORITIES.—SPURRELL. *Carmarthen and its Neighbourhood*, Carmarthen, 1860, 2nd ed., 1879.—CURTIS. *The Antiquities of Carmarthenshire*. London, 1880.—*The Carmarthenshire Miscellany, and Notes and Queries for South-West Wales.* See also the various guide-books to South Wales. (T. F. H.)

Carmaux, a town and railway station in the arrondissement of Albi, department of Tarn, France, 10 miles N. of Albi, on a tributary of the Aveyron. The town gives its name to an important coal-basin, with an output in 1899 of 750,790 tons (metric) and employing over 3800 workpeople. The manufacture of glass is an important industry. Population (1881), 5744; (1891), 8087; (1896), 7899, (comm.) 9993; (1901), 10,948.

Carmignano, a town of the province of Florence, Tuscany, Italy, 13 miles N. by W. from Florence, the ancient *Carminianum*. Over 4000 of its people are engaged in making straw hats and straw plait. Population, about 11,000.

Carmona, a town of Spain in the province of Seville, with a railway station on the line from Cordova to Seville. Population (1897), 18,478. On a large tract of land near the Seville road excavations have been made that led to the discovery of a very important example of a Roman necropolis, lying between two Roman roads, enough curiosities being found to fill a local museum founded by the Carmona Archæological Society. In 1886, near the necropolis, an amphitheatre and more tombs were found, chiefly of the early Christian centuries. These remarkable remains are fully described in the work of Señor Rada, with illustrations by Mr Bonsor, published in 1886 under the title of *Necropolis of Carmona*, and in that of Señor Sales y Ferré (1887) styled *Estudios arqueologicos e historicos*.

Carnarvon, Henry Howard Molyneux Herbert, 4th EARL OF (1831-1890), was born on 24th June 1831. He succeeded to the title in 1849, and soon after taking his degree began to play a prominent part in the deliberations of the House of Lords. In 1858 he was Under Secretary for the Colonies, and in 1866 Secretary of State. In this capacity he introduced in 1867 the Bill for the federation of the British North American provinces which set so many political problems at rest; but he had not the privilege of passing it, having, before the measure became law, resigned, owing to his distaste for Mr Disraeli's Reform Bill. Resuming office in 1874, he endeavoured to confer a similar boon on South Africa, but the times were not ripe, and he was singularly unfortunate in his principal agent, Mr Froude. In 1878 he again resigned, out of opposition to Lord Beaconsfield's policy on the Eastern Question; but on his party's return to power in 1885 he became Lord-Lieutenant of Ireland. His short period of office, memorable for a conflict on a question of personal veracity between himself and Mr Parnell as to his negotiations with the latter in respect of Home Rule, was terminated by another premature resignation. He never returned to office, and died on 29th June 1890. As a statesman his career was marred by extreme sensitiveness; but he was beloved as a man of worth and admired as a man of culture. He was high steward of the University of Oxford, and president of the Society of Antiquaries.

Carnarvon, a municipal and parliamentary borough, seaport, market town, and county town of Carnarvonshire, Wales, just within the western entrance of the Menai Strait, 248 miles by rail N.W. of London. The castle has recently been restored by order of the Government. The guildhall dates from 1874. The literary institute, with free library, was erected in 1884. In the market-place is a statue (1888) to Sir Hugh Owen, a distinguished promoter of Welsh education. The Pavilion will seat 8000 persons. Three of the weekly newspapers are in the Welsh language. Vessels entering port in 1888—1667 of 123,439 tons, clearances, 1511 of 116,784 tons; in 1898—total entrances, 2020 of 146,261 tons; total clearances, 1965 of 145,297 tons. The total exports of the produce and manufactures of the United Kingdom in 1898 amounted to the value of £152,468, against £186,386 in 1888. Area of municipal borough, 2214 acres; population (1881), 10,258; (1901), 9760.

Carnarvonshire, a maritime county of North Wales, bounded on the N.W. by Menai Strait, separating it from Anglesey, and by Beaumaris Bay, on the E. by Denbigh (where is also a small detached portion), on the S.E. by Merioneth, on the S. by Cardigan Bay, and on the S.W. by Carnarvon Bay.

Area and Population.—The area of the ancient county is 361,097 acres, or 564 square miles. The population in 1881 was 119,349, and in 1891 was 118,204, of whom 56,496 were males and 61,708 females, the number of persons per square mile being 210, and of acres to a person 3·05. In 1901 the population was 126,835. The area of the administrative county, as given in the census returns of 1891, was 360,138 acres, with a population of 117,233, but in 1895 a small addition was made to the administrative area by the transference to Carnarvon of the part of the parish of Beddgelert in Merioneth. The area of the registration county is 372,135 acres, with a population in 1891 of 125,585. Within this area the increase of population between 1881 and 1891 was only 1·44 per cent., while within the ancient county area there was an actual decrease of 0·9 per cent. Within the registration area the excess of births over deaths was 10,244, and the decrease in resident population was 1785. The following table gives the numbers of marriages, births, and deaths, with the number and percentage of illegitimate births, for 1880, 1890, and 1898 :—

Year.	Marriages.	Births.	Deaths.	Illegitimate Births.	
				No.	Per cent.
1880	808	3756	2481	214	5·7
1890	837	3040	2266	229	7·5
1899	1106	3419	2483	214	6·2

In 1891 there were in the county 421 natives of Scotland, 630 natives of Ireland, and 244 foreigners, while 12,604 persons could speak English, 78,780 Welsh, and 28,330 English and Welsh.

Constitution and Government.—The ancient county is divided into two parliamentary divisions, and it also includes the Carnarvon district of boroughs, consisting of Bangor city, Carnarvon, Conway, Criccieth, Nevin, and Pwllheli. There are four municipal boroughs—Bangor (11,269), Carnarvon (9725), Conway (4636), and Pwllheli (3675). The following are urban districts :—Bethesda (5271), Bettws-y-coed (881), Criccieth (1410), Llandudno (9307), Llanfairfechan (2768), Penmaenmawr (3501), and Ynyscynhaiarn (4883). Carnarvon is in the North Wales circuit, and assizes are held there. The borough of Carnarvon has a separate commission of the peace, but no separate court of quarter sessions. The ancient county—which is chiefly in the diocese of Bangor, with a few parishes in that of St Asaph—contains 61 entire ecclesiastical parishes or districts, and parts of four others.

Education.—Bangor is the seat of the University College of

North Wales, in connexion with which there is a day training college for schoolmasters and schoolmistresses. There are also in the city a residential college (British and Foreign School Society's) for schoolmasters, and another (North Wales Church of England) for schoolmistresses. The total number of elementary schools on 31st August 1899 was 127, of which 62 were board and 65 were voluntary schools, the latter including 57 National Church of England schools, 2 Roman Catholic, and 6 "British and other." The average attendance at board schools was 8953, and at voluntary schools 7611. The total school board receipts for the year ending 29th September 1899 were over £39,044. The income under the Agricultural Rates Act was over £1135.

Agriculture.—Only a little more than half of the total area of the county is under cultivation, and of this area nearly two-thirds is in permanent pasture. There are, moreover, more than 114,000 acres in hill pasture and nearly 13,000 acres under woods. The chief attention of the farmer is devoted to dairy farming and the rearing of sheep. The principal corn crops are oats and barley, the former occupying nearly two-thirds, and the latter nearly one-third of the corn acreage. More than one-half of the acreage under green crops is occupied by potatoes, and about three-eighths by turnips. The following table gives the acreages of the larger main divisions of the cultivated area at intervals of five years from 1880:—

Year.	Total Area under Cultivation.	Corn Crops.	Green Crops.	Clover.	Permanent Pasture.	Fallow.
1880	187,351	20,445	7,949	32,178	125,803	976
1885	187,283	20,250	8,601	33,508	124,763	161
1890	193,840	21,121	10,147	26,255	136,064	208
1895	191,969	19,181	8,780	29,136	134,607	192
1900	182,395	16,878	8,066	41,282	115,880	209

The following table gives particulars regarding the principal live-stock for the same years:—

Year.	Total Horses.	Total Cattle.	Cows or Heifers in Milk or in Calf.	Sheep.	Pigs.
1880	8241	51,168	21,765	213,458	16,899
1885	8271	53,623	21,861	204,733	20,023
1890	8724	58,094	22,961	233,332	26,747
1895	8674	54,320	22,342	235,707	24,080
1900	9435	57,357	23,659	269,692	19,028

Industries and Trade.—According to the annual report for 1898 of the chief inspector of factories (1900), the total number of persons employed in factories and workshops in 1897 was 3302, as compared with 3231 in 1896. Of these, 1259 were employed in workshops (the majority in clothing industries), and 1891 in non-textile factories. The total number of persons employed in mines and quarries in 1899 was 13,344. The slate quarries are of great importance, the two largest workings being the Penrhyn quarry near Bangor and the Dinorwic quarry near Carnarvon. In 1899 418,821 tons of limestone were raised, and 413,109 tons of "igneous rocks other than granite." The output of both copper and zinc has very greatly decreased; that of lead is extremely variable—198 tons in 1885, 1116 tons valued at £10,101 in 1890, and 608 tons in 1899. The following table gives particulars regarding the slate production in 1890 and 1899:—

Year.	Tons.	Value.
1890	265,157	£539,085
1899	309,426	£944,796

At Pwllheli, Carnarvon, and Bangor (including Llanfairfechan, Aber, Beaumaris, and Menai), 18,246 cwt. of fish, valued at £24,833, were landed in 1899, the total value, including shellfish, being £29,372.

AUTHORITIES.—RAMSAY. *Geological Structure of Merioneth and Carnarvonshire.* London, 1858.—HARKER. *Bala Volcanic Series of Carnarvonshire Rocks.* Cambridge, 1889.—JONES. *Old Carnarvon.* Carnarvon, 1889.—See also guide-books for North Wales. (T. F. H.)

Carnegie, Andrew (1837- ——), American manufacturer and philanthropist, was born in Dunfermline, Scotland, 25th November 1837. In 1848 his family removed to America, and settled in Pittsburg, Pa. At an early age the boy was put to work, first in charge of a small stationary engine, later as telegraph messenger, operator, or clerk, and for a while was superintendent of a division of the Pennsylvania Railroad. He laid the foundation of his fortune in the introduction of sleeping cars and in the purchase of oil-wells. With others he established a rolling-mill, out of which grew the various companies for the manufacture of iron and steel, known collectively as the Carnegie companies, probably the largest and most complete works of the kind in the world. In 1901 these were amalgamated with others in a great Steel Trust, Mr Carnegie retiring with a fortune estimated at nearly £100,000,000. He has given immense sums for charitable objects, but chiefly for education and the building of libraries, one of his largest gifts being that to New York city. In 1901 he gave about £2,000,000 to the universities of Scotland, and established a trust to administer the fund, one half of the income to be devoted to the payment of the fees of Scottish students, and the other half to buildings, apparatus, professorships, research, &c. In 1902 he gave $10,000,000 to found the Carnegie Institution in Washington, U.S.A., to "encourage investigation, research, and discovery." He is author of *Triumphant Democracy*, *An American Four-in-Hand in Britain*, and other books.

Carnegie, a borough of Allegheny county, Pennsylvania, U.S.A., a few miles S.W. of Pittsburg. It is devoted to iron smelting and manufacture, and has been built up entirely in recent years. Population (1900), 7330.

Carnières, a town of Belgium, in the province of Hainaut, 15 miles E. of Mons, with a station on the railway from Mons to Charleroi. It has quarries of building stone. Population (communal) (1880), 5787; (1901), 7328.

Carniola (German, *Krain*), a duchy and crownland in the Cisleithan half of the Austro-Hungarian monarchy. Population (1869), 463,273; (1880) 481,243; (1890) including garrison of 2264 men, 498,958 (equivalent to 129·36 inhabitants per square mile); (1900) 508,348. Proportion of females to males, 1096 to 1000; 94 per cent. Slovene, 5·66 German, the rest Serbo-Croatians and Italians; 99 per cent. Roman Catholic, 1 per cent. Protestant. In 1896 the marriage-rate was 7; the birth-rate, 36·43, or, excluding still-births, 35·69; and the death-rate, 30·11 per thousand. Of the births 6·9 per cent. were illegitimate. Carniola sends 11 members to the Reichsrath. The Diet is composed of 26 Slovenes and 11 Germans. There are 5 gymnasia, 330 elementary schools, and about 30 other educational establishments. The proportion of illiterates in 1890, 33·5 per cent., shows an improvement of 12 per cent. on 1880. The Slovene members of the Reichsrath, partly on political grounds, vigorously promote the educational requirements of their nationality. The fall of the Windischgrätz coalition ministry in 1895 was due to the grant of such an educational concession to the Slovenes in the Cilli Gymnasium. Of the 24 periodicals and newspapers published, 18 are in the Slovene and 6 in the German language. Although three-fourths of the population are engaged in agriculture and forestry, only 14 per cent. of the land is arable, and the crops (wheat, rye, barley, maize, millet, and buckwheat) do not suffice for the needs of the province. Game and fish are plentiful. The timber trade is of considerable importance. The silk-worm is bred in the warmer districts adjoining Görz. Mercury, a monopoly of this province, is the most important mining product (882,384 metre centners in 1897); lignite, iron ore, and manganese being also produced, together with small quantities of lead and zinc ore, of a total value of £121,800. The product of the furnaces—mercury, silver, iron, lead, and zinc—amounted in value to £164,200. The textile, metal, leather, and other industries are of less importance. In 1897 Carniola had 422 kilometres of railways, 5516 kilometres of roads, and 139 kilometres of waterway, of which 55 kilometres are

only available for floating timber. There were 156 post and 71 telegraph offices, with 792 kilometres of line and 2509 kilometres of wire. The Slovenes regard the Croatians as their nearest relatives and exemplars among the Slav peoples. The languages are closely related, more particularly the dialects spoken in the adjoining districts of the two countries. The so-called "Young Slovenes," still affected by the temporary unification of "Illyria," as also by the aggravation of the nationality struggle, aspire to the formation of a "Greater Croatia," uniting at least the whole Catholic section of the South Slav race. The more moderate representatives of the national sentiment content themselves with advocating the unification and autonomy of the Southern Slavs in the Cisleithan half of the monarchy. German influence in the province is now very slight and is still declining. Energetic efforts are being made to cultivate literature, science, and the drama in the Slovene language. The Dramatic Association has brought out over a hundred original and translated pieces, many of which have been produced in the subsidized Slovene theatre at Laibach. The National Literary Association, which numbers over 46,000 members, distributes a quarter of a million volumes annually, while its encouragement promotes and maintains a national periodical press, which calls forth a succession of talented young writers. The anti-German and anti-Italian feeling is very strong, and has found expression in violent demonstrations of fraternity with the Czechs and in an abortive effort to make the Russian language a subject of instruction in the public schools, preliminary to elevating it to the rank of the Panslavist medium of intercommunication.

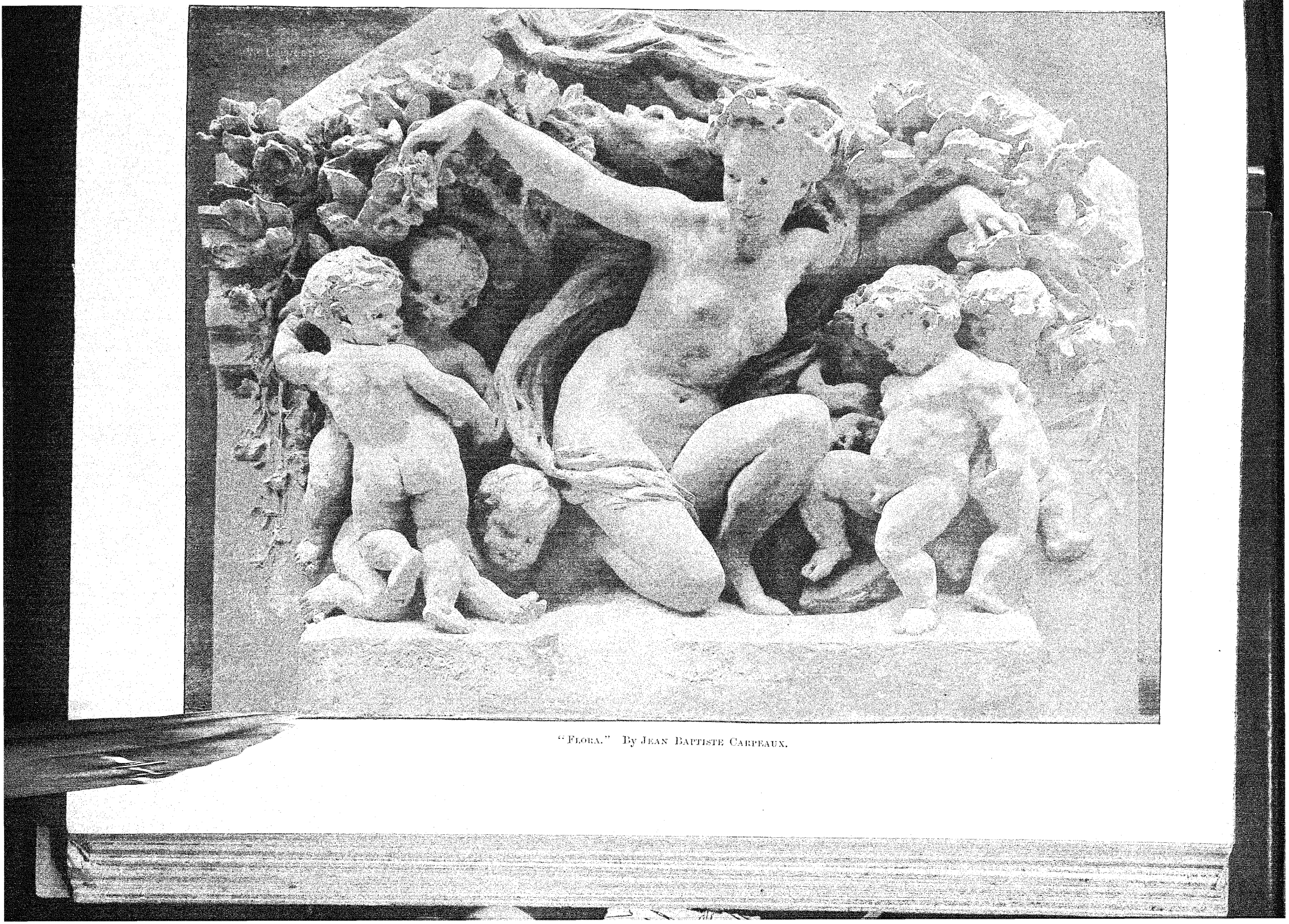
Hoff, *Hist.-Statist.-Topogr. Gemälde von Krain* (Laibach, 1808); and Dimitz's historical works on the province, published at Laibach, 1874-86. (Æ. O'N.)

Carnot, Marie François Sadi (1837-1894), fourth President of the French Republic, was born at Limoges on 11th August 1837. He was grandson of the famous "organizer of victory" in the first Republic, and son of Hippolyte Carnot, Minister of Public Instruction under the Provisional Government of 1848. He was educated as a civil engineer, and after having highly distinguished himself at the École Polytechnique and the École des Ponts et Chaussées, obtained an appointment in the public service. His hereditary republicanism recommended him to the Government of National Defence, by which he was entrusted in 1870 with the task of organizing resistance in the departments of the Eure, Calvados, and Seine Inférieure, and made prefect of the last named in January 1871. In the following month he was elected to the National Assembly by the department Côte d'Or. He took no prominent part in politics until August 1878, when he was appointed secretary to the Minister of Public Works. In September 1880 he became minister, and again in April 1885, passing almost immediately to the Ministry of Finance, which he held under both the Ferry and the Freycinet administrations until December 1886. When the Wilson scandals occasioned the downfall of M. Grévy in December 1887, M. Carnot's high character for integrity marked him out as a candidate for the Presidency, and he obtained the support of M. Clémenceau and of all those who objected to the candidatures of men who had been more active in the political arena, so that he was elected by 616 votes out of 827. He assumed office at a critical period, when the Republic was all but openly attacked by General Boulanger. President Carnot's ostensible part during this agitation was mainly confined to augmenting his popularity by well-timed appearances on public occasions, which gained credit for the Presidency and the Republic. When, early in 1889, Boulanger was finally driven into exile by the energy of the Minister of the Interior, M. Constans, it fell to President Carnot's lot to appear as the head of the State on two occasions of especial interest, the celebration of the centenary of 1789, and the opening of the Paris Exhibition of that year. The perfect success of both was regarded, not unreasonably, as a popular ratification of the Republic, and though continually harassed by the formation and dissolution of ephemeral ministries, by Socialist outbreaks, and the beginnings of anti-Semitism, M. Carnot had but one serious crisis to surmount, the Panama scandals of 1892, which, if they greatly damaged the prestige of the State, increased the respect felt for its head, against whose integrity none could breathe a word. M. Carnot seemed to be arriving at the zenith of popularity, when on 24th June 1894, after delivering at a public banquet at Lyons a speech in which he appeared to imply that he nevertheless should not seek re-election, he was stabbed by an Italian anarchist named Caserio, and expired almost immediately. The horror and grief excited by this tragedy were boundless, and the President was honoured with a splendid funeral in the Panthéon, Paris. It was felt that he had been a worthy hereditary representative of the best traditions of the first Republic, and had exemplified the type of man of which the third Republic stood especially in need. If his abilities, though respectable, were not of the first order, the more credit was due to the weight of character which had so well supplied the place of genius. (R. G.)

Carnoustie, a police burgh and summer resort of S.E. Forfarshire, Scotland, on the German Ocean, $10\frac{3}{8}$ miles E.N.E. of Dundee by rail. There are various minor industries. Bathing and golfing are good. Modern erections are an Episcopal church, municipal buildings, and a Union Club. Population (1881), 3321; (1901), 5204.

Carouge. See Geneva.

Carpathian, or Karpathian Mountains.—Since 1875 the Carpathian Mountain Club, as well as individual scientific investigators, have done a good deal to add to our knowledge of this mountain system, especially from the geological standpoint. Where fully developed, the Carpathian chain consists of four zones. (1) An outer undulating foreland of soft Tertiary (Miocene) rocks, whose folds are inclined to the north and east, and overlie the ancient Russian platform. It is rich in deposits of salt (Wieleczka), mineral wax (Boryslav), and petroleum (Drohobycz), the last occurring also in the next zone. (2) A continuous sandstone zone, extending from the March to the extreme south-east, to which the name Carpathian is usually applied in the narrower sense. It corresponds to the chain of the Pre-Alps, and consists of short parallel ranges of no great height, formed mainly of Carpathian sandstone, a flysch of Cretaceous and Tertiary age. The rivers zigzag in alternate longitudinal and transverse valleys, occasionally cutting their beds in softer schistose strata. Ridges of limestone (Klippen) are prominent in the north. This zone resembles the Swiss Jura in its simple folded structure, but not in composition. (3) A crystalline zone of granites and schists intimately folded with Palæozoic and Mesozoic rocks, and rich in minerals. It is absent in the Central Carpathians. (4) A young volcanic zone, also rich in minerals, is present on the much-faulted inner side of the chain, except in the west of Transylvania. Orographically the system is divisible into—(i) The West Carpathians, a complex, roughly circular mass, about 150 miles in diameter, lying between the March and the Poprad. (ii) The simple parallel ranges of the Central or Wooded Carpathians, 60 to 70 miles broad,



"Flora." By Jean Baptiste Carpeaux.

running south-eastwards from the Poprad for 170 miles to the Körösmezö pass, between the upper Pruth and Tisza. (iii) The eastern triangular mass of the Transylvanian plateau (1575 feet), enclosed by the Eastern Carpathians (3540 feet) for 220 miles in the east, by the Transylvanian Alps (3800 feet) and Banat hills (1675 feet) for a similar distance in the south, and by the Bihar mountains (1740 feet) in the west. The granitic Great Tátra rises to 8737 feet in Gerlachfalva (Gerlsdorfer or Franz Jozef peak), and is the hydrographic centre of the West Carpathians. From it the Dunayec and Poprad flow northwards to the Vistula, across the Klippen and Sandstone ranges, and divide the Western from the Eastern Beskids. Longitudinal furrows separate the Great Tátra, Little Tátra, the Ore, and Mátra mountains. Westwards they are drained by the Vág, Gran, and Ipoly, all curving round to the Danube; and eastwards by the fault valley of the Hernad. The Fátra, Nytra, and Little Carpathians form a connecting link between the crystalline zones of Carpathians and Alps. The trachytic Hungarian Ore mountains form the south-western quadrant of the West Carpathians, and the Mátra and Hegyalya ranges the southern and eastern arcs. The trachytic Vihorlat range rises along the inner margin of the Wooded Carpathians, which here form the main divide. The Eastern Carpathians open in wide valleys to the south-east and south. They are crossed by the Bistritza from the crystalline zone, which reappears on their concave side, and is separated in the south from the trachytic Hargita mountains by a longitudinal valley, in which the Maros flows northwards and the Aluta southwards. Near the Tömös pass, south of the Brassó or Kronstadt basin, the sandstone range abruptly ends, and the crystalline schists of the Transylvanian Alps run westwards to the Banat mountains, where the fold axes curve to south-west and south. The Aluta breaks through them at the Roteturm pass (1155 feet) between the highest summits, Negoi (8320 feet) and Mandra (8270 feet). The Maros crosses the Transylvanian plateau and skirts the south of the Bihar mountains, which have a crystalline nucleus—possibly representing the inner portion of the West Carpathian crystalline region—surrounded by Carpathian sandstones and trachytic and other young rocks containing many minerals (Transylvanian Ore Mountains). (A. J. He.)

Carpeaux, Jean Baptiste (1827-1875), French sculptor, was born at Valenciennes, France, on 14th May 1827. He was the son of a mason, and passed his early life in extreme poverty. In 1842 he came to Paris, and after working for two years in a drawing-school, was admitted to the École des Beaux-Arts on 9th September 1854. The Grand Prix de Rome was awarded to his statue of "Hector bearing in his arms his son Astyanax." His first work exhibited at the Salon, in 1853, did not show the spirit of an innovator, and was very unlike the work of his master Rude. At Rome he was fascinated by Donatello, and yet more influenced by Michael Angelo, to whom he owes his feeling for vehement and passionate action. He sent from Rome a bust, "La Palombella," 1856; and a "Neapolitan Fisherman," 1858. This work was again exhibited in the Salon of 1859, and took a second-class medal; but it was not executed in marble till 1863. In his last year in Rome he sent home a dramatic group, "Ugolino and his Sons," and exhibited at the same time a "Bust of Princess Mathilde." This gained him a second-class medal and the favour of the Imperial family. In 1864 he executed the "Girl with a Shell," the companion figure to the young fisherman; and although in 1865 he did not exhibit at the Salon, busts of "Mme. A. E. André," of "Giraud" the painter, and of "Mlle. Benedetti" showed that he was not idle. He was working at the same time on the decorations of the Pavillon de Flore, of which the pediment alone was seen at the Salon, though the bas-relief below is an even better example of his style. After producing a statue of the Prince Imperial, Carpeaux was made Chevalier of the Legion of Honour in 1866. Two years later he received an important commission to execute one of the four groups for the façade of the new Opera House. His group, representing "Dancing," 1869, was greeted with indignant protests; it is nevertheless a sound work, full of movement, with no fault but that of exceeding the limitations prescribed. In 1869 he exhibited a "Bust of M. Garnier," and followed this up with two pieces intended for his native city: a statue of Watteau, and a bas-relief, "Valenciennes repelling Invasion." During the Commune he came to England and made a "Bust of Gounod" in 1871. His last important work was a fountain for the Luxembourg Gardens, representing the "Four Quarters of the World" as four female figures. Carpeaux, though exhausted by illness, continued designing indefatigably, till he died at the Château de Bécon, near Courbevoie, on 12th October 1875, after being promoted to the higher grade of the Legion of Honour. Many of his best drawings have been presented by Prince Stirbey to the city of Valenciennes.

See also Chesneau. *Le Statuaire Carpeaux.* Paris, 1880.—Paul Foucart. *Catalogue du Musée Carpeaux.* Paris, 1882.

Carpenter, Mary (1807-1877), English educational and social reformer, was born 3rd April 1807 at Exeter, where her father, Dr Lant Carpenter, was Unitarian minister. In 1817 the family removed to Bristol, where Dr Carpenter was called to the ministry of Lewin's Mead Meeting. As a child Mary Carpenter was unusually earnest, with a deep religious vein and a remarkable thoroughness in everything she undertook. She was educated in her father's school for boys, learning Latin, Greek, and mathematics, and other subjects at that time not generally taught to girls. She early showed an aptitude for teaching, taking a class in the Sunday-school, and afterwards helping her father with his pupils. When Dr Carpenter gave up his school in 1829, his daughters opened a school for girls under Mrs Carpenter's superintendence. In 1833 the Raja Rammohun Roy visited Bristol, and inspired Miss Carpenter with a warm interest in India; and Dr Joseph Tuckerman of Boston about the same time aroused her sympathies for the condition of destitute children. One day when she was walking with him through one of the worst Bristol slums, a wretched-looking boy rushed out of a dark entry and ran wildly past them. "That child," said her companion, "should be followed to his home and seen after." These words gave the first stimulus to what became her life-work. The first step was to help to organize, in 1835, a "Working and Visiting Society." It was a sort of district-visiting scheme, which in those days seemed a startling new departure. Miss Carpenter was its secretary for twenty years. In 1843 her interest in negro emancipation was aroused by a visit from Dr Howe. Her interest in general educational work was also growing. A Bill introduced in this year "to make provision for the better education of children in manufacturing districts," as a first instalment of a scheme of national education, failed to pass, largely owing to Nonconformist opposition, and private effort became doubly necessary. So-called "Ragged Schools" sprang up in many places, and Miss Carpenter conceived the plan of starting one in Lewin's Mead. To this was added a night-school for adults. In spite of many difficulties this was rendered a success, chiefly owing to Miss Carpenter's unwearied enthusiasm and remarkable organ-

izing power. In 1848 the closing of their own private school gave Miss Carpenter more leisure for philanthropic and literary work. She published a memoir of Dr Tuckerman and a series of articles on ragged schools which appeared in the *Inquirer*, and were afterwards collected in book form. This was followed in 1851 by *Reformatory Schools for the Children of the Perishing and Dangerous Classes, and for Juvenile Offenders.* She sketched out three classes of schools as urgently needed—(1) Good free day-schools. (2) Feeding industrial schools. (3) Reformatory schools. This book drew public attention to her work, and from that time onwards she was drawn into personal intercourse with leading thinkers and workers. She was consulted in the drafting of educational Bills, and invited to give evidence before House of Commons committees. To test the practical value of her theories, she herself started a reformatory school at Bristol, and in 1852 she published *Juvenile Delinquents, their Condition and Treatment*, which largely helped on the passing of the Juvenile Offenders Act in 1854. Now that the principle of reformatory schools was established, Miss Carpenter returned to her plea for free day-schools, contending that the ragged schools were entitled to pecuniary aid from the annual parliamentary grant. At the Oxford meeting of the British Association (1860) she read a paper on this subject, and, mainly owing to her instigation, a conference on ragged schools in relation to Government grants for education was held at Birmingham, 1861. In 1866 Miss Carpenter was at last able to carry out a long-cherished plan of visiting India, where she found herself an honoured guest. She visited Calcutta, Madras, and Bombay, inaugurated the Bengal Social Science Association, and drew up a memorial to the Governor-General dealing with female education, reformatory schools, and the state of the gaols. This visit was followed by others in 1868 and 1869. Her attempt to found a female normal school was unsuccessful at the time, owing to the inadequate previous education of the women, but afterwards such colleges were founded by Government. A start, however, was made with a model Hindu girls' school, and here she had the co-operation of native gentlemen. Her last visit to India took place in 1875, two years before her death, when she had the satisfaction of seeing many of her schemes successfully established. At the meeting of the Prison Congress in 1872 she read a paper on "Women's Work in the Reformation of Women Convicts." Her work now began to attract attention abroad. Princess Alice summoned her to Darmstadt to help to organize a Women's Congress. Thence she went to Neufchâtel to study the prison system of Dr Guillaume, and in 1873 to America, where she was enthusiastically received. Miss Carpenter watched with interest the increased activity of women during the busy 'seventies. She warmly supported the movement for their higher education, and herself signed the memorial to the University of London in favour of admitting them to medical degrees. She died at Bristol on 14th June 1877, having lived to see the accomplishment of nearly all the reforms for which she had worked and hoped. (A. Z.)

Carpenter, William Benjamin (1813-1885), English physiologist and naturalist, was born at Exeter on 29th October 1813. He was the eldest son of Dr Lant Carpenter, the celebrated Unitarian minister, and brother of the well-known philanthropist, Mary Carpenter. His bent, like that of Huxley and Herbert Spencer, was towards engineering, but, as with Huxley in his early years, medicine was his destiny. After study under the family doctor, with whom he visited the West Indies, Carpenter attended medical classes at University College, London, and then went to Edinburgh, where he took the degree of M.D. in 1839. The subject of his graduation thesis, "The Physiological Inferences to be Deduced from the Structure of the Nervous System of Invertebrated Animals," indicates a line of research which had fruition in his *Principles of General and Comparative Physiology*. His work in comparative neurology was recognized in 1844 by his election as a Fellow of the Royal Society, and that body awarded him a Royal medal in 1861. His appointment as Fullerian Professor of Physiology in the Royal Institution in 1845 enabled him to exhibit his powers as a teacher and lecturer, his gift of ready speech and luminous interpretation placing him in the front rank of exponents, at a time when the popularization of science was in its infancy. His manifold labours as investigator, author, editor, demonstrator, and lecturer knew no cessation through life; but in assessing the value of his work, prominence should be given to his researches in marine zoology, notably in the lower organisms, as Foraminifera and Crinoids, among the latter being the exquisite feather-star (*Comatula rosacea*), the peculiar form of the nervous system of which he discovered. These researches gave an impetus to deep-sea exploration, an outcome of which was in 1868 the *Lightning*, and, later, the more famous *Challenger*, expedition. He took a keen and laborious interest in the evidence adduced by Canadian geologists as to the organic nature of the structure known as *Eozoon Canadense*, discovered in the Laurentian strata, and at the time of his death had nearly finished a monograph on the subject, defending the now discredited theory of the animal origin of that deposit. He was an adept in the use of the microscope, and his popular treatise on that instrument has stimulated a host of observers to the use of the "added sense" with which it has endowed man. In 1856 Carpenter became Registrar of the University of London, and held the office for twenty-three years; for his services to education generally he was made a C.B. Biologist as he was, Carpenter nevertheless made reservations as to the extension of the doctrine of evolution to man's intellectual and spiritual nature. In his *Principles of Mental Physiology* he asserted both the freedom of the will and the existence of the "Ego," and one of his last public engagements was the reading of a paper in support of miracles. He died in London, from injuries occasioned by the accidental upsetting of a spirit-lamp, on 19th November 1885. (E. CL.)

Carpets.—The artistic revival of recent years in Great Britain has had a considerable influence upon the design and colouring of carpets. The pioneer in this, as in so many other decorative reforms, was William Morris. His treatment of the Kidderminster fabric was a revelation of its possibilities, but he was perhaps scarcely so successful in his "Hammersmith" carpets, on account of the coarseness of the fabric, while he was also hampered by his self-imposed rules for colouring, by no means always in accordance with principles derived from the best work of the East. Other leading decorative artists have until lately held aloof from carpet-designing, probably deterred by its difficulties and by want of technical knowledge. Instruction on this subject had not been given at art schools, so that designs produced by students who lacked separate training under manufacturers have usually been unpractical and useless. Full information as to technical conditions is now available, and has to some extent been utilized. Several eminent decorative artists have entered the field, but while they avoid the faults of many trade productions, and while their work has much distinction and character,

it cannot on the whole be said that they have solved the problem of floor decoration. They have been confronted with the enormous difficulty of getting variety and character, while complying strictly with the axiom that a carpet should look equally well from all sides. Constantly ignoring this rule, they have simply used for carpets designs which were originally intended for walls or hangings, without any attempt to adapt them to the special requirements of a floor. The striking designs of Mr Walter Crane are free from this defect. Of many trade designs it must still be said that the more perfect the manufacturing process becomes, the more they appear to lend themselves to what is bad. At the same time many are in excellent taste, and in the all-important matter of colour great advances have been made, due almost entirely to the manufacturers, who have supplied what no school of art yet provides, namely, systematic training in colour, founded on the study of the best examples.

On the Continent of Europe the influence of *l'art nouveau* (the new style of art) has been strongly felt. In France some rather striking designs have been produced, which show a flat treatment of free-growing natural forms, but they have the fault of upward growth and, usually, of thin and washy colour. In Germany designers have gone to the wildest extremes. Everything has been sacrificed to novelty, the results being carpets which have no other quality, and which have been well described as monstrosities in design and nightmares in colour. The chief improvement in the manufacture of carpets has been the application to the power-loom of the moquette system of weaving, which, originally invented in France, was perfected in the United States, and introduced into England about the year 1877. Its essential principle, common to several types of loom, and to several fabrics called by different trade-names, such as "Royal" and "Imperial" Axminster, is as follows:—A set of long "spools" or bobbins is prepared, one for each transverse row of small squares in the design. On these spools coloured woollen threads are wound side by side, corresponding in colour and position to the design squares. The spools being fixed in series in the loom, are brought successively into position; rows of tufts (or "moquettes") are one by one cut off from the projecting ends of the threads, and inserted by suitable mechanism in a framework of simple warp and weft, thus forming a pile surface reproducing the original design. Hitherto this method of weaving has been commercially applied to narrow widths only; there are considerable mechanical and other difficulties in the way of its application to very wide looms. Another important manufacturing development has been the application of the power-loom to the weaving of seamless carpets, which have to some extent taken the place of narrow widths intended for seaming. The seamless method has been applied to Brussels and tapestry looms, but the greatest development in this direction has taken place in the patent Axminster or chenille process, and in a modification of the Kidderminster fabric known as "Roman" carpet. The products of these two processes are well known under the trade-names of "Parquet Carpets" and "Art Squares."

The importation of carpets from the East has very largely increased, and European and American influence has been brought to bear upon their design and colouring. Where the best ancient examples have been used as models, little or no harm has been done, but where attempts have been made to introduce light delicate colour schemes wholly foreign to Oriental traditions, the results have sometimes been disastrous. The manufacture of hand-knotted carpets on the Oriental plan is still carried on in various parts of England, and has been introduced into the north-west of Ireland; but the relatively high price of labour must always prevent this industry from attaining great proportions in the United Kingdom, as compared with Germany and Austria, where it is extensively carried on. Japan has entered this field, but its products have been poor in quality and disappointingly inartistic, the best being weak copies of Persian rugs. Japanese manufacturers seem to have steadfastly set their faces in this direction, instead of developing along their own native artistic lines. The demands of the market probably account for this.

Various attempts have been made to produce the knotted fabric by power-loom. Some have been fairly successful, but none has as yet attained sufficient importance to call for more extended notice. The manufacture of carpets is very extensively carried on in America, its chief feature being the enormous extent to which the moquette system of weaving has been developed. (A. MI.)

Carrara, an Italian town in Tuscany, province of Massa and Carrara, 5 miles from the Mediterranean coast and 34 miles by rail N.N.W. from Pisa. In the province of Carrara there are altogether 1264 quarries, of which 311 were worked at Carrara, 54 at Massa, and 106 at Versilia in 1898; the number of workmen employed in the quarries, sawmills, and polishing works being 10,155, of whom 6522 were at Carrara, 1100 at Massa, and 2533 at Versilia in the same year. In the years 1886-97 inclusive the annual output averaged 178,500 tons, of which 154,000 tons were exported (161,260 tons in 1898). The quarries are served by a mountain railway of 10 miles in length, opened in 1890, which descends from 1500 feet down to the sea. The art of carving and sculpturing is taught in the academy of fine arts and the school of design (1860). Population of town, including Avenza, its port (1881), 23,072; (1901), 26,325; of province (1881), 169,469; (1901), 195,840.

Carriages.—Before enumerating the developments which have taken place in the manufacture of carriages since 1875, we shall notice the period of transition, dating back some forty years earlier. At that time the means of travelling by road and horse-power, in the case of public coaches, had reached in England its utmost limits of speed and convenience, and the travelling-carriages of the nobility and the wealthy were equipped with the completest and most elaborate contrivances to secure personal comfort and safety. More particularly was this the case as regards Continental tours, which had become indispensable to all who had at their command the means for this costly educational and pleasurable experience. Concurrently with this development the style and character of Court equipages had also reached a consummate degree of splendour and artistic excellence. Not only was this the case in points of decoration, in which livery colour and heraldic devices were effectively employed, but also in the beauty of outline and skilful structural adaptation, in which respect carriages of that period made greater demands upon the capacity of the builder and the skill of the workman than do those of the present day. For this attainment the art of coachmaking was indebted to a very few leading men, whose genius has left its impress upon the art, and is still jealously cherished by those who in early life had experience of their achievements. The early portion of Queen Victoria's reign was an age of much emulation; the best-equipped carriages of that period, distinctive of noble families and foreign embassies, with their graceful outline and superb appointments, and harnessed to a splendid breed of horses—all harmoniously

blended, perfect in symmetry and adaptation — gave to the London season, more especially on Drawing-room days, and at other times in Hyde Park, an attractiveness unequalled in any other capital. After the death of the Prince Consort, the pageantry of that period very much declined and, except as an appendage of royalty, full-dress carriages have since been comparatively few, though there are hopes of a revival in this direction. Meanwhile, owing to the rapid development of railways and the wide extension of commerce, the demand for carriages greatly increased. The larger types gave place to others of a lighter build and more general utility, in which in some cases an infusion of American ideas made its appearance. In accordance with the universal rule of supply meeting the demand, Mr Stenson, an ironmaster of Northampton, was successful in producing a mild forging steel, which proved for some years, until the manufacture ceased, very conducive to the object of securing lightness with strength. In the early 'seventies the eminent mechanician, Sir Joseph Whitworth, in the course of his scientific studies in the perfecting of artillery, succeeded in manufacturing a steel of great purity, perfectly homogeneous and possessing marvellous tenacity and strength, known as "fluid compressed steel." Incidentally carriage-building was able to participate in the results of this discovery. Two firms well known to Sir Joseph were asked to test its merits as a material applicable to this industry. In this test much difficulty was experienced, the nature of the steel not being favourable to welding, of which so much is required in the making of coach ironwork; but after much perseverance by skilful hands this was at length accomplished, and for some years there existed not a little rivalry in the use of this material, more especially in the case of carriages on the C and under-spring principle, which for lightness, elegance, and luxurious riding left nothing to be desired. Many of these carriages may be referred to to-day as rare examples of constructive skill. Unfortunately, the original cost of the material, still more of the labour to be expended upon it, and the difficulty of educating men into the art of working it, were effectual barriers to its general adoption. The idea, however, had taken hold, and attention was given by other firms to the manufacture of the steel now in general use, admitting of easier application, with approximate, if not equal, results.

From C and under-spring carriages there arose another application of springs which was very prominently before the public during this period, by means of which it was professed that two drawbacks recognized in the C and under-spring carriages were obviated, which were caused by the perch or bar which passes under the body holding the front and hind parts in rigid connexion, and yet making use of a form of spring to which

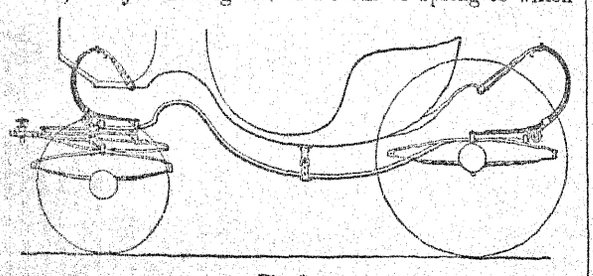


Fig. 1.

the same terms may be applied. These objections are the weight of the perch, and the limitation which it causes to the facility of turning, which in narrow roads and crowded thoroughfares is an inconvenience. The objection to weight is, however, minimized by the introduction of steel, and as the more advanced builders almost always construct the perch with a *forked* arch in front, allowing the wheels to pass under, the difficulty of a limited lock is in a great measure overcome (Fig. 1). It must be noted, however (and this cannot be too emphatically stated) that the so-called C springs above

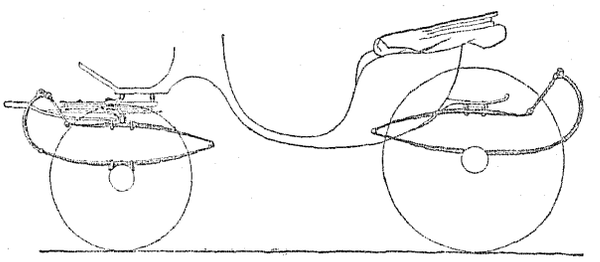


Fig. 2.

referred to are not at all the same in action as the C spring proper; they are but an elongation of the ordinary elliptic spring in the form of the letter C (Fig. 2), without adding anything to, but rather lessening their elasticity, and entirely ignoring the principle of *suspension* by leather braces over the C spring proper, by which alone the advantage of superior ease is to be obtained.

Another improvement which stamps the period under review is the introduction of indiarubber for the tyres of wheels. To produce a carriage as nearly as possible free from noise and rattle has always been the aim of high-class coachmaking. A structure composed of wood, iron, and glass, with axle-trees, doors, windows, lamps, and other parts, in use upon the road in all weathers, must from time to time require some attention with this object. To meet this difficulty, the introduction of indiarubber has been received by carriage-users as a great boon. It was about the year 1852 that Mr Reading, who at that time was known as a builder of invalid carriages, conceived the idea of encircling wheels with that material, but his method only admitted of its use on vehicles travelling slowly over good roads. This was improved upon at a later date by Mr Uriah Scott, who, taking advantage of the tempering capacity of indiarubber by the chemical action of sulphur, produced an inner rim of such density as to hold bolts, by which it could be secured through the felloe, forming a base for the outer covering of soft pliable rubber. This system was attended with satisfactory results, and was in favour for some years with persons whose health needed such provision. Another method, originated by Mr Mulliner of Liverpool in the early 'seventies, was to screw on iron flanges to the outer and inner sides of the felloes, having a kind of lip to press into the indiarubber filling the intervening space; but the cost of this—£36 per set—rendered its adoption prohibitive. Meanwhile another invention by Mr Uriah Scott, afterwards improved upon by an American patentee, came into use; this was known as the "rubber-cushioned axle," cylindrical rings being introduced between the axle-box and hub of the wheel, thus insulating the body of the carriage from the concussion of the road. This, however, necessitated the cutting away of so much of the timber of the hub as to impair its durability, and had therefore, after a few years' experience, to be abandoned in favour of an invention by a Parisian builder, who introduced indiarubber bearings between the spring and axle-tree. This was thoroughly practicable, and met with general acceptance, and it is still used in conjunction with iron and steel tyres. In 1890 the pneumatic tyre was first applied to road carriages, but not until 1893 were strenuous means taken in the hope of popularizing this invention. Its bulky appearance was a great draw-

back, contrasting strongly with the qualities which distinguish a graceful equipage; yet the practical advantages were such that, in the absence of other objections, this became a secondary consideration. The sanguine anticipations of the inventor have not, however, been realized in England, owing to fears as to the difficulty of keeping the tyres fully inflated under the weight of a carriage carrying four or more persons, and their liability to puncture and explosion. In Paris and its neighbourhood and many parts of France, pneumatic tyres are to be seen in frequent use both on public and private conveyances. In another form the indiarubber tyre has become of almost universal application. Owing to an ingenious invention of Mr Carment, what appeared to be an insuperable difficulty in rolling a grooved tyre was overcome (Fig. 3). This so simplified the application as to bring the cost within practicable limits. The grooved tyre is now made in several sections, in some of which the inward projection for securing the rubber is dispensed with, this being kept in position by wires running through the whole length, and electrically welded at the point of contact. Whatever be the method chosen for securing the tyre, the best tyres, both for durability and ease, are those in which the rubber provided is most resilient in its nature.

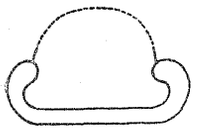


Fig. 3.

In the ninth edition of this work reference is made to automatic arrangements for the lifting and lowering of the hoods of Victorias and other such carriages, and the opening and closing of Landaus. There are now many contrivances with this object, of which the most to be preferred are the simplest in their arrangements. The quarter-light or five-glass Landau is a carriage which has been greatly improved during this period. The complicated adjustments of pillars, windows, and roof have been replaced by one simple parallel movement. The first public exhibition of a finished carriage on this principle was by an English firm at the Paris Exhibition of 1876 (Fig. 4).

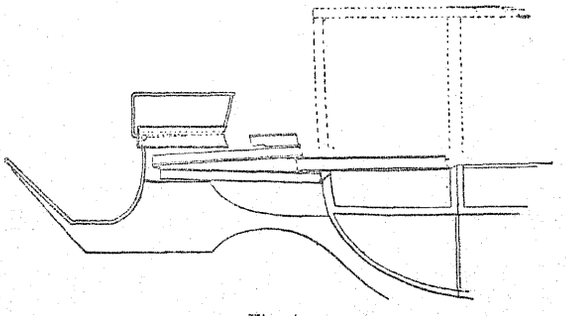


Fig. 4.

In the matter of style certain types of carriages have passed through marked changes during this period. Extreme lightness was at one time considered by many the one desideratum both as to appearance and actual weight, in providing which ease of movement and comfortable seating of the occupants became secondary considerations—though to these extremes builders of repute were always opposed. Still, when at the International Exhibition of Paris, 1889, it was seen that the Parisian builders had suddenly gone in the opposite direction, the world of fashion in carriages was taken by surprise. From being built upon easy, flowing, graceful lines, it was seen, with some revulsion of feeling, that these were to be displaced by the deep, full-bodied Victoria, Brougham, and Landau. Only by slow degrees did this characteristic find acceptance with English connoisseurs, and then only in a modified form, though eventually in a greater or less degree it is now the prevailing style.

While the better types of English carriages are still pre-eminent in their constructive qualities, and represent the well-known characteristics of individual firms, some emulation may be excited by the elegant taste and careful workmanship which French builders display in points of finish, both internally and externally. Of the various types of carriages now in vogue, the Victoria, in its many varieties of form, is the most popular, accompanied, as of necessity, by the double Victoria, Sociable, Brougham, Landaulet, and Landau. Four-in-hand coaches for private use, as well as the "road" coaches, are built on a smaller scale than formerly; 6 feet 8 inches may now be taken as the standard height of the roof from the ground. Owing to the encouragement given by the Four-in-hand and Coaching Clubs, the ascendancy of this style of driving is still preserved to Great Britain; and in association with it the Char-à-banc, Mail Phaeton, Wagonette, and Four-wheel Dog-cart retain their popularity. Of two-wheeled vehicles the Polo-cart and Ralli-cart are most in favour, to which may be added the Governess-car, which is found convenient for many purposes not implied by its name. For a few years an effort was made, but with very indifferent success, to bring into fashion the Tandem-cart, which may again be considered almost obsolete in England, though not so in the United States, where the taste for this style of driving obtains. For street purposes the Hansom-cab, named after the inventor, an architect in Birmingham, and greatly improved by Messrs Forder and others, remains unrivalled. Since 1875 the public omnibuses of London have been much improved in comfort and ventilation, the easy staircase and convenient seats making the roof attractive to persons of both sexes.

America has long held a prominent position in connexion with the carriage industry. In all the chief cities manufactories on a colossal scale are to be found, producing thousands of vehicles annually and equipped with the most perfect labour-saving machinery; and as vehicles of any particular pattern—many of small value—are required, not singly, but in large numbers, much economy is exercised in their manufacture. It is remarkable that, as a contrast to the popular Buggy, Wagon, and Rockaway of the States, which are to be found in infinite variety, carriage establishments of the wealthy are not considered complete unless furnished with some of a European character, selected from the most eminent firms of London or Paris, in addition to others of their own manufacture. In Paris preference is given to an excess of bulk, with elaborate scroll ornamentation and diminutive windows, forming indeed, by reason of its exaggeration, a distinctive class. In respect of workmanship and finish, carriages by the best-known American builders leave nothing to be desired.

The International Exhibition of Paris, 1900, brought together examples from various Continental countries, in some of which a preference for curvilinear outline was displayed, but the best examples followed very closely the well-known English styles. In the French section it was interesting to find a revival of the once all-prevailing Chariot, Barouche, and Britzska, suspended on C and under-springs, with perch, but with ideas of lightness somewhat out of proportion to their general character.

The Sedan-chair, so fashionable a century ago (Fig. 5), was also represented by some beautifully decorated examples of that period. It is a portable chair or covered vehicle, with side-windows and entrance through hinged doorway at the front. It is borne on poles by two men. It took its name from the town of Sedan in France, where it was first used, and was introduced into England by

Sir S. Duncombe in 1634. It is still to be seen in use at the public baths at Ischl in Austria, and also in the city of Bath, England, where a revival of interest in this mode of transit in connexion with the medical baths has

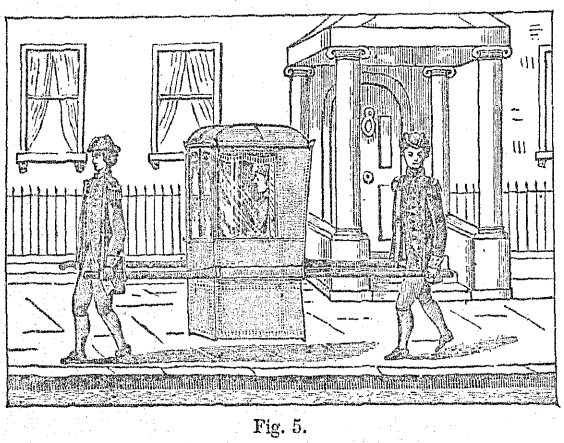


Fig. 5.

taken place of late years. The Sedan can be taken into the bedroom, and the invalid is conveyed without exposure to the outer air into the mineral-water bath, and, after bathing, carried home again. The poles are so arranged that the chair may be carried up and down stairs and still preserve its horizontal position.

The Bath-chair, with a folding head, which can be used open or closed, with a glass front, mounted on three or four wheels, can be drawn or pushed by hand (Fig. 6). If required to be drawn by a donkey or small pony,

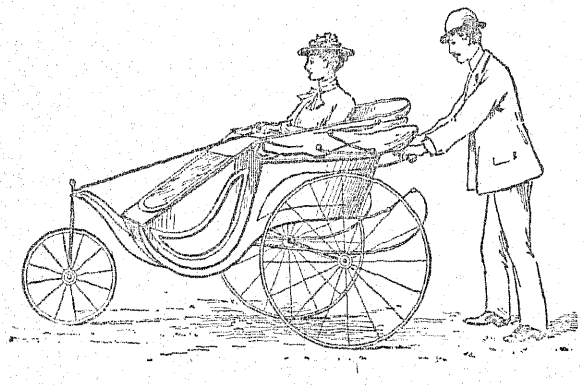


Fig. 6.

it is then mounted on four wheels, with the usual turning arrangement. James Heath, of Bath, was the inventor. He flourished rather before the middle of the 18th century, and, though he may not have foreseen it, he has contributed very greatly to the health and comfort of invalids. (J. A. M'N.)

Carrickfergus, a maritime town and urban sanitary district, in the county of Antrim, Ireland, on Belfast Lough and the Belfast and Northern Counties railway, 9½ miles N.E. of Belfast. It ceased to be a parliamentary borough in 1885, and in 1898 the separate county of the town of Carrickfergus was abolished. The new harbour admits vessels of 500 tons, and is connected by rail with the Northern Counties system. Population, 8923.

Carrière, Moritz (1817-1895), German philosopher and historian, was born at Griedel in the Grand Duchy of Hesse Darmstadt on 5th March 1817. After studying at the universities of Giessen, Göttingen, and Berlin, he spent a few years in Italy in the study of the fine arts, and established himself in 1842 in his old university town of Giessen as a docent of philosophy, becoming an extraordinary professor there a few years later. In 1853 he was appointed professor at the University of Munich, lecturing mainly on æsthetics. An avowed enemy of Ultramontanism, he contributed by his writings in no small degree to make the idea of German unity more palatable to the South Germans. Carrière identified himself with the school of Fichte as one who held the theistic view of the world which aimed at reconciling the contradictions between deism and pantheism. Among his works may be mentioned: *Der Kölner Dom als freie Deutsche Kirche*, *Die philosophische Welt-Anschauung der Reformationszeit*, and *Die sittliche Weltordnung*. He died in Munich on 19th January 1895.

Carrington, Richard Christopher (1826-1875), English astronomer, son of a brewer at Brentford, was born in London on 26th May 1826. Though intended for the Church, his studies and tastes inclined him to astronomy, and with a view to gaining experience in the routine of an observatory he accepted the post of observer in the University of Durham. Finding, however, that there was little chance of obtaining instruments suitable for the work which he wished to undertake, he resigned that appointment and established an observatory of his own (1854) at Redhill. Here he devoted three years to a survey of the zone of the heavens within 9 degrees of the North Pole, the results of which are contained in his *Redhill Catalogue of 3735 Stars*. His investigation of the motion of sun-spots, in which he determined the elements of the sun's rotation, especially his important discovery of a systematic drift of the photosphere, in virtue of which the time of rotation of a spot varies according to the particular solar latitude at which it breaks out, is the work with which his name will be most closely associated. He died on 27th November 1875. (A. A. R.*)

Carrodus, John Tiplady (1836-1895), English violinist, was born on 20th January 1836 at Keighley, in Yorkshire. He made his first appearance as a violinist in his native town at the age of nine, and had the advantage of studying with Molique at Stuttgart, where he made such progress that on his return to England in 1853 Costa got him engagements in the leading orchestras. He was a member of the Covent Garden Opera orchestra from 1855, and succeeded Sainton as leader there in 1869. He died "in harness," for his death took place at Hampstead on 13th July 1895, within a very few hours of the close of a performance. For many years he had led the Philharmonic orchestra and those of the great provincial festivals. He published several pieces for violin solo, and was a very successful teacher.

Carson, a city of Nevada, U.S.A., capital of Ormsby county, and the capital of the state, situated in 39° 10′ N. lat. and 119° 46′ W. long., in the western part of the state, at an altitude of 4720 feet, in Eagle valley, near the south base of Washoe mountains. It is on the Virginia and Truckee railway. It was founded in 1858, about the time of the discovery of the Comstock Lode, and its fortunes have been closely associated with the mines of that great ore deposit. Population (1880), 4229; (1890), 3950; (1900), 2285.

Cartagena, a seaport, dockyard, and arsenal on the Mediterranean coast of Spain, in the province of Murcia. Cartagena is one of the three great naval departments, the other two being San Fernando, near Cadiz, and Ferrol. Each department is under an admiral, whose title is captain-general in local rank. The population of Cartagena was (1887) 84,170, and (1897)

86,424. Not only have the land and coast defences been improved, but considerable sums have been expended on the port works, quays, and wharves. These changes and the completion of the through railway lines have contributed to an increase in both local commerce and population, as the latter was only 26,000 in 1870. The commercial importance of Cartagena was diminished at the beginning of 1898, when PORMAN, or Portman, a mining village about 11 miles to the eastward, situated on a well-sheltered bay, was declared by royal order an independent port. Vessels go to Porman to land coke and coal, and to load iron ore and lead. This fact explains why the number of British vessels visiting Cartagena slightly declined in 1899, the figures being 307 entered with 298,314 tons, and 310 cleared with 301,610 tons. The number of ships of other nationalities in the same year were 152 entered with 109,412 tons, and 153 cleared with 111,200 tons. The Spanish vessels trading direct over sea, cleared and entered, were 79 steamers of 100,303 tons in all, and 5 sailing vessels of 1398 tons. The export trade owes its importance chiefly to the ores from the surrounding districts. The exports of iron and manganiferous iron ores amounted in 1898 to 430,750 tons, those of silver lead to 56,571 tons, of soft lead to 8422 tons, and of zinc to 44,546 tons, while copper ore, copper mat, and pyrites were also exported. England imported from Cartagena in that year 8034 tons of esparto grass, while 6863 tons of fruit, cereals, barley, and oats were sent to England, France, and Belgium. The imports into Cartagena were chiefly coal, 56,516 tons from England, and coke, 18,662 tons from England, 1657 tons from Germany, and 2000 tons from North Spain. Timber came from the United States and Russia, and 1501 tons of cod-fish from Canada and Norway.

Cartagena, a port of Colombia, on the north coast of South America, capital of the department of Bolivar, situated on a low island of the Caribbean Sea, at the entrance of Cartagena Bay. In 1898 the wharf was lengthened by 120 feet, and a wharf was also made for the construction of steamboats. Cartagena is connected with the Magdalena river, both by a canal and by rail to Calamar, 60 miles distant. It retains its pre-eminence for its educational establishments. Of the churches, that of San Juan de Dios is celebrated for its altar of Italian marble. The city, which within recent years has greatly increased in prosperity, is lighted by electricity, and possesses a service of telephones and tramways. A large market—the first in the city—was erected by the municipality in 1897-98. The value of the exports now averages about £380,000 annually. During the civil war of 1885 the city underwent a siege. On the anniversary of its independence, 11th November 1897, a statue of Bolivar was unveiled, the cost being about £4000. The population is estimated at 16,000.

Cartago, a city of Costa Rica, Central America, capital of the province of the same name, situated on the railway line from Limon, about 90 miles W.S.W. of that port, and 11 miles E.S.E. of San José. Among the public buildings are a college and a hospital. At Bella Vista, a short distance from the city, are hot mineral springs, much frequented by invalids. In 1892 the population was only 3491; but the railway to Limon has already done much to revive the city's prosperity, which will be further aided by the line from San José to a proposed new port at the mouth of the Gulf of Nicoya.

Cartaxo, a town of the district of Santarem, Portugal, situated 4 miles from the right bank of the Tagus, and 7 miles S.W. from Santarem. It produces corn and good wine, and fish from the Tagus. The parish yielded 1,143,250 gallons of wine, valued at £65,350, in 1892. Population, about 7000.

Carthage, capital of Jasper county, Missouri, U.S.A., situated in 37° 11′ N. lat. and 94° 18′ W. long., on the south bank of Spring river, in the south-western part of the state, at an altitude of 973 feet. It is entered by two railways, the Missouri Pacific and the St Louis and San Francisco. It is in the rich lead and zinc region of south-west Missouri and south-east Kansas. Population (1890), 7981; (1900), 9416, including 273 foreign-born and 539 negroes.

Cartoon, a term now applied to the principal political drawings in the humorous or satirical papers of the day. At an earlier period satirical prints were styled "caricatures," and were issued separately; Gillray, Rowlandson, the three Cruikshanks, Heath, and others were popular favourites in this class of design. Even the insignificant little cuts by Robert Seymour in *Figaro in London*, the *diableries* in *The Fly*, and the vulgar and rancorous political skits in the flood of scurrilous little papers of the time, were dignified by the same term (see CARICATURE, *Ency. Brit.*, ninth ed.) The long series of *Political Sketches* by "H. B." (John Doyle) were the first examples of unexaggerated statement, and fair and decorous satire. With the advent of *Punch* and its various rivals (*The Peep-Show*, *The Great Gun*, *Diogenes*, and the like), the general tone was elevated. *Punch* at first adopted the word "pencilling" to describe the "big cut," which dealt variously with political and social topics. But when in 1843 there was held in Westminster Hall the great exhibition of cartoons from which selection was to be made of designs for the decoration in fresco of the new Houses of Parliament, *Punch* jocularly professed to range himself alongside the great artists of the day; so that the "mad designe" of the reign of Charles I. became the "cartoon" of that of Queen Victoria. John Leech's drawing in No. 105 of that journal was the first caricature to be called a cartoon: it was entitled "Substance and Shadow: the Poor ask for Bread, and the Philanthropy of the State accords—an Exhibition." Later, *Punch* dropped the word for a while, but the public took it up. Yet the *Encyclopædic Dictionary* entirely ignores the word in its application to modern satirical prints, and the monumental *Oxford Dictionary* curiously attributes the first use of it to Miss Braddon in 1863.

In England the cartoon, no longer a weapon of venomous attack, has come to be regarded as a humorous or sarcastic comment upon the weekly topic uppermost in the nation's mind, a witty or saturnine illustration of views already formed, rather than as an instrument for the manufacture of public opinion. It has almost wholly lost its rancour; it has totally lost its ferocity—the evolutionary result of peace and contentment, for satire in its more violent and more spontaneous form is but the outcome of the dissatisfaction or the rage of the multitude. The cartoon, it is agreed, must be suggestive; it must present a clear idea lucidly and, if possible, laughably worked out; and however reserved or restrained it may be, or even, when occasion demands (as in the case of Sir John Tenniel and some of his imitators), however epic in intuition, it must always figure, so to say, as a leading article transformed into a picture in the solvent, more or less mordant, of graphic fun or feeling. Matt Morgan transgressed on at least one occasion, and paid the penalty by loss of popularity. That the cartoon has greater influence for good or evil than is usually recognized has more than once been proved, and international amenities have several times been disturbed when the

satirical papers have hurt the susceptibilities of foreign nations. Among examples may be quoted the "Fashoda" cartoon in *Punch*, which caused considerable irritation in France, and the insulting drawings by Willette and Léandre in 1899-1900 in Paris, which outraged British feelings by their bad taste, indecency, and lack of chivalry.

The names of *Punch's* cartoonists, Sir John Tenniel, John Leech, Richard Doyle, Charles Keene, Linley Sambourne, among others, are household words in all English-speaking countries. Artists of ability have likewise worked in the service of *Fun*, including Paul Gray, A. B. Houghton, Matt Morgan, Fred Barnard, J. F. Sullivan, and Gordon Thomson—the last named having invented and drawn the weekly cartoon from 1870 to 1892 with only the break of a single week. Other cartoonists of the past are Watts Phillips, William M'Connell, William Brunton, and Alfred Bryan, while those of the present, besides those already mentioned, are Harry Furniss, John Proctor, William Bowcher, A. Stafford, William Parkinson, G. R. Halkett, and F. C. Gould. In France, where political passion runs high, the cartoon continues to flourish as a political engine worked with extraordinary ability and energy. The considerable number of satirical journals, supported by a population extremely alive to the ridiculous and easily moved by party feeling, gives occupation to many clever caricaturists, who employ technical methods such as lithography and colour for the reproduction of their cartoons to an extent unknown in England. Prominent among them are Caran d'Ache (E. Poiré), Pépin (E. Gillaumin), Forain, Willette, Léandre, Couturier, and Hermann-Paul. In the other countries of Europe the cartoon does not seem to be quite so popular, or to have been so vigorously exploited as in France and England, although much talent is occasionally displayed; indeed, it is not uncommon to see the picture to which, in *Punch* for example, is assigned the place of honour, relegated to a corner of the back page. In the United States many artists of striking ability have arisen, but only two names—those of Thomas Nast and J. Keppler—may be said to have gained European celebrity. (See CARICATURE and ILLUSTRATION.)

AUTHORITIES.—JAMES PARTON. *Caricature and other Comic Art.* New York, 1878.—GRAHAM EVERITT. *English Caricaturists and Graphic Humorists of the 19th Century.* London, 1886.—M. H. SPIELMANN. *The History of "Punch."* London, 1895.—J. GRAND-CARTERET. *Les Mœurs et la Caricature en France.* Paris, 1885. *Les Mœurs et la Caricature en Allemagne,* &c. Paris, 1885.—ADOLPH BRISSON. *Nos Humoristes.* Paris, 1900.—And various volumes by J. Grand-Carteret upon special subjects, such as the Franco-Russian alliance, the Dreyfus case, and the like.

(M. H. S.)

Cary, Alice (1820-1871), and **Phœbe** (1824-1871), American poets, born near Cincinnati, Ohio, respectively on 20th April 1820, and 4th September 1824. Their education was largely self-acquired, and their work in literature was always done in unbroken companionship. In 1852 they removed to New York, and occupied a prominent position in the literary circles of that city at the time when their friend Rufus Wilmot Griswold, Poe's literary executor, was the *quasi*-dictator of American verse, and when Horace Greeley, editor of the *Tribune*, who also aided them, was making that journal the organ of the reformers in politics and the sentimentalists in letters. The prose of Alice, who was the more voluminous writer of the two, consisted of sketches and novels, now entirely forgotten; of her verse the best volume is the progressive collection of lyrics entitled *The Lover's Diary* (1867). Phœbe, whose writings were first collected in a volume entitled *Poems by Alice and Phœbe Cary* (1850), is now best known by the hymn beginning "One sweetly solemn thought." Alice died in New York, 12th February 1871, and Phœbe in Newport, Rhode Island, 31st July of the same year.

Casablanca. See DAR EL BAIDA.

Casale Monferrato, a town and episcopal see of Piedmont, Italy, province of Alessandria, 20 miles N. by W. from Alessandria by rail, and on the river Po. In 1888 the river was spanned by a handsome iron bridge. The town possesses a school of design, carries on the raising of silk cocoons, and has clothing and cement factories, ironworks, and printing. Population, about 17,000.

Cascina, a commune of the province of Pisa, Tuscany, Italy, 8 miles E. by S. from Pisa on the railway to Florence. It is still surrounded with walls, and carries on cotton-weaving and furniture-making. Under its walls the troops of Pisa were defeated by Galeotto Malatesta and the Florentines in 1364. Population, about 24,000.

Caserta, a town and episcopal see of Campania, Italy, capital of province of Caserta, 20 miles N.N.E. from Naples by rail. It has a cathedral, a technical institute, and an agricultural school; and cotton, silk, and woollen mills, macaroni factories, and pottery works. In 1898 an ancient necropolis was discovered here. Good wine is made in the vicinity. Population of town (1881), 30,550; (1901), 32,729; of province (1881), 714,131; (1901), 783,495.

Casimir-Perier, Jean Paul Pierre (1847-——), fifth President of the French Republic, was born in Paris on 8th November 1847, being the grandson of the famous Premier of Louis Philippe. He entered public life as secretary to his father, who was Minister of the Interior under the presidency of M. Thiers. He was elected to the Chamber in 1874, and distinguished himself as an active supporter of the Republic until 1883, when he resigned his seat upon the enactment of a law disqualifying the members of French royal and imperial families from employment in the public service. After this demonstration, due to his old family connexion with the House of Orleans, he re-entered the Chamber, and, continually increasing in influence and authority, was elected President of the Republic after the assassination of President Carnot in July 1894. The highest hopes were entertained of the government of one who rivalled his predecessor in integrity, and was thought to surpass him in firmness, and great was the disappointment when, after a stormy administration of six months, during which he had in some measure alienated the Moderate party without gaining the support of the more advanced Republicans, President Casimir-Perier resigned his office. The cause assigned by himself—inability to withstand the insults continually directed against him by opponents—was evidently insufficient; but it was generally believed that the real motive was impatience at finding himself a mere cipher in the hands of his ministers. Whatever the reason, the effect was to deprive France of the services of one of the foremost of her citizens, for, except for a brief appearance during the Dreyfus court-martial of 1899, which led to the circulation of many singular rumours, M. Casimir-Perier ceased to take any part in public affairs.

Caspian Sea (the ancient *Mare Caspium* or *Hyrcanium;* Russian, *Kaspiyskoye More*, formerly *Hvalynskoye More;* Persian, *Daria-i-Khyzyr*, or *Gurzem;* Tatar, *Ak-Denghiz; Sikim*, also *Jurjan* of the old Eastern geographers), an inland sea between Europe and Asia, situated between 36° 40′ to 47° 20′ N. and 46° 50′ to 55° 10′ E. It has an area of 169,380 square miles. Its surface is 86 feet below the level of the ocean (96·7 feet,

according to the Aral-Caspian levelling).[1] Its shores mostly belong to Russia, with the exception of the southern coast, which belongs to Persia. Its general description and map were given in the ninth edition of this work.

Hydrography.—The hydrography of the Caspian was carefully investigated in 1856-72 by Captain (afterwards Vice-Admiral) Ivashintseff, and by several later expeditions directed by O. Grimm, N. Andrusoff, I. Spindler, &c., whilst the subjects of its shores, its former extension, and its geological history have been studied by Russian geologists. Its basin is naturally divided into three portions. Of these the northern, extending from west to east, and forming the great gulf Mortvyi Kultuk, is the shallowest, and hardly reaches a maximum depth of 20 fathoms. It is being gradually silted up by the deposits of the Volga, the Ural, and the Terek. A depression, half of which has a depth of more than 50 fathoms, and reaches the maximum depth of 421 fathoms, occupies the middle portion of the sea. It may be considered as a continuation of the synclinal depression of the Sea of Azov and North Caucasia (Manych), and is separated from the southern and deepest portion of the Caspian by a submarine ridge, which is a continuation of the main Caucasus range, and connects it with the Kopet Dagh. The depth of the Caspian over this ridge varies from 30 to 150 fathoms. Finally, the southern portion, which lies at the foot of the high Elburz border-ridge of the Persian plateau, and which may be regarded as a continuation of the Kura valley, has a depth of more than 500 fathoms in its middle (with a maximum of 516 fathoms).

Salinity.—The salinity of the Caspian is but $\frac{3}{7}$ of that of the ocean, and in the surface layers it is only 0·0075 in the northern portion and 0·015 in the middle. It is also smaller along the western coast than along the eastern, and the proportion of sulphides is greater than it is in the ocean.

Geology.—The isolation of the Caspian from the ocean must have taken place, in the opinion of Russian geologists, at a relatively recent geological period. During the early Tertiary age it belonged to the great sea which covered all South Russia, and was in open communication with the ocean. Only during the Miocene period, the so-called Sarmathian Sea of the geologists, which spread from the middle Danube through Rumania, South Russia, and along both slopes of the main Caucasus ridge to the Caspian region, began to be isolated and partially to lose its salinity. Before the beginning of the Pliocene time it was broken into three separate parts, one of which was the Aral-Caspian basin. The deposits of that period are described as the Pontic, and their fossils point to a further decrease of salinity. Towards the end of the Pliocene period, and undoubtedly so during the Post-Pliocene, the fauna of that basin took the aspect which it has now in the Caspian. Its remains, known as Aral-Caspian deposits, are widely spread round the Caspian, which then stood at a level of about 100 feet above the present, according to Sjögren, but probably even more than that. During the Ice age the Caspian covered the Steppes which now spread on its northern shore, probably joined the Black Sea (also isolated from the ocean), through the Manych depression, and sent northwards a narrow gulf, up the present Volga valley as far as the 56th degree of latitude (Aral-Caspian deposits are found on the lower Kuma). Eastwards it penetrated into the Transcaspian territory, between the Great and the Little Balkhan mountains, up the Uzboi—which a few years ago was supposed to represent an old bed of the Amu-Daria, but which in reality is a dried-up strait of the Aral-Caspian basin, the bottom of which is strewn with marine Post-Pliocene deposits. Joining what is now Lake Aral, it received both the Amu and the Syr. When the great ice-cap, which covered two-thirds of European Russia, had thawed, and the subsequent general desiccation of the northern hemisphere (still continued) set in, the Caspian began to diminish, its level to go down, while its connexions, both with the Black Sea and Lake Aral, were broken.

Fauna.—The fauna of the Caspian, well studied by Eichwald, Kowalewski, Grimm, Dybowski, Kessler, and Sars, gives support to the above views. It is a mixture of fresh-water and marine forms; thus we find in it the marine herring and such fishes (*Cyprinus*, *Perca*, *Silurus*) as are, together with the fluviatile lobster, characteristic of fresh water. The Rhizopoda, *Rotalia* and *Textillaria*, one sponge (*Amorphina*), the *Amphicteis* worm, the mollusc *Cardium edule*, and various *Cardidæ*, and some Amphipods (*Cumacea* and *Mysidæ*), are purely marine; but they are either such forms as easily support variations in salinity, or are especially characteristic of brackish waters. Of genera which are specially Caspian, the following are known: one sponge (*Metschnikowia*), the Cardides (*Adacna* and *Didacna*), three Gastropods, some Mysids, two Amphipods, and the fish *Clupeonella*, while at least four other genera belong, besides to the Caspian, only to such *limans* or creeks of the Black Sea as have lost their salinity. As to species which belong only to the Caspian fauna, we find them among the Protozoa, the Sponges (three), the Vermes (Oligochætes, species of *Amphicteis*), the Molluscs (twenty-five species), numerous Amphipods and Mysids, the Fishes (species of *Gobius*, *Benthophilus*, *Cobitis*, &c.), and even the Mammals (*Phoca caspia*). It has been shown, moreover, that most of those specifically Caspian species have had their ancestors in the Pontic fauna, and have diverged from the ancestral type since the Caspian became isolated. The irruption of the Mediterranean Sea into the Black Sea, in consequence of the piercing of the Dardanelles, has destroyed many of the species which were retained in the Caspian, as well as in some lagoons (detached fragments) of the Black Sea. One representative of the Caspian fauna (*Glyptonotus entomon*) does not appear either in the Black Sea or the Mediterranean, but belongs to the northern seas, while several Caspian forms (*Phoca caspia*), some Mysidæ (*Gammarus*, *Amphicteis*, &c.) have a northern character. This led to the supposition that the Caspian stood at some recent epoch in direct communication with the Arctic Sea. However, no traces of such a connexion having as yet been discovered, the conjecture was abandoned.

Level.—The level of the Caspian is now taken at 86 feet below that of the ocean; but it has undergone several oscillations in modern times. Thus it appears from the researches of Filippoff that, during the years 1851 to 1888, it thrice stood at a maximum—in 1885, in 1868-69 (highest level), and in 1882—while the minima fell upon the years 1853 (lowest) and 1873—the total range of these oscillations being 3 feet 6¼ inches. Besides these changes, there are also the seasonal ones (lowest level in January, highest in summer). The winds also show a certain periodicity, and they result in currents.

Climate.—The northern portion of the Caspian, which experiences severe frosts, and is too shallow to store in large amounts of heat in the summer, freezes for three or four months along the shores, but in the middle portion ice appears only when it is brought by northern winds.

Fisheries.—There is no other inland sea in the world so rich in fish as the Caspian is at the mouths of its great rivers, the Volga, the Ural, the Terek, and the Kura. It was estimated, in 1882 and 1892, that every year no less than from 264,000 to 297,000 tons of various fish are caught in the North Caspian and the lower Volga, while Dr O. Grimm's more correct estimate for 1896 gives 393,000 tons. Seal-hunting is also an important item.

Navigation.—Navigation on the Caspian is maintained by 213 steamers and 540 sailing vessels, representing an aggregate of nearly 220,000 tons (39 per cent. of the whole Russian commercial fleet), which transport every year about 200,000 passengers and about 3,200,000 tons of goods. The trade is partly with Persia and partly coasting, immense quantities of naphtha and other produce being exported from Caspian ports to Russia, while Russian goods are imported to Caucasia and the Transcaspian territory for Turkestan and Bokhara. A considerable amount of goods, chiefly raw cotton, has been added to the traffic since the completion of the Transcaspian railway. The Caspian ports are entered every year by an average of 20,000 vessels (6000 at Astrakhan), mainly engaged in coasting trade. The chief Russian ports are: Astrakhan, Petrovsk, Derbent (recently improved), Baku, and Lenkoran on the west coast; Krasnovodsk (head of Transcaspian railway) and Mikhailovsk on the east coast; and Resht on Persian territory.

A detachment of the Russian navy, consisting of seven gunboats, known as the "Caspian flotilla," is kept on this sea. Its naval station is at Ashur-ada, on an island close to the Persian coast.

The Gulf of KARA-BOGHAZ, or KARA-BUGAZ (also *Aji-daria* or *Kuli-daria*), on the east coast of the Caspian Sea, is a vast expanse of water which is separated from the Caspian by a narrow sand-bar pierced only by a narrow strait, about 1¼ miles long and from 115 to 170 yards wide—the Kara-bugaz strait. A current flows through it into the gulf at a rate of 1½ to 3¾ miles per hour.

The area of this gulf being about 7500 square marine miles (100 English miles from W. to E. and 87 English miles from N. to S.), its evaporation is very great. It has been proposed to dam the strait in order to raise the level of the Caspian and to increase its salinity. The suggestion has also been made that a wire net stretched across the strait would prevent fishes from entering the gulf, where they get lost. Expeditions sent in 1895 and 1896 to study these questions discovered that the

[1] By the triangulation of 1840 its level was found to be 84 feet below the level of the Black Sea. The Caucasus triangulation of 1860-70 gave 89 feet. It remains an open question whether such a considerable difference can be explained by mere errors. But a longer series of observations of the changes of level due to accidental causes (winds, rains) is required before any positive conclusions may be made.

bottom of the gulf is covered for an area of about 1300 square miles with a layer of Epsom salt, which represents a quite unique formation in nature of a stock of about 1,000,000,000 tons of that salt. Owing to the slight depth of the gulf, this could be easily extracted.

AUTHORITIES.—Besides the works mentioned in the ninth edition, see IVASHINTSEFF, *Hydrographic Exploration of the Caspian Sea*, St Petersburg, 1866 (Russian), 2 vols., with a hydrographical atlas; N. PUSHCHIN, *Caspian Sea*, 1877; FILIPPOFF, *Marine Geography of the Caspian Basin*, 1877; *Memoirs* (Trudy) *of the Aral-Caspian Expedition of 1876-77*, 2 vols., edited by the St Petersburg Society of Naturalists; N. ANDRUSOV, "A Sketch of the Development of the Caspian Sea and its Inhabitants" (*Zapiski of the Russ. Geogr. Soc.*; *General Geogr.*, vol. xxiv.); (all Russian); EICHWALD, *Fauna Caspio-caucasica*. (P. A. K.)

Cassano, a town of the province of Milan, Lombardy, Italy, 16 miles E. by N. from Milan by rail to Brescia, and on the river Adda, here crossed by a long stone bridge. It is famous for the defeat of Prince Eugene, commanding the Austrians, by the French under Vendôme in 1705, and for the defeat of Moreau by the Austro-Russian army under Suvoroff in 1799. Its manufactures include linen, silk, pottery, and ropes. Population, about 5250.

Cassel, a town of Prussia, capital of the province of Hesse-Nassau, 124 miles by rail N.N.E. from Frankfort-on-Main, on the river Fulda. A building was erected in 1871-77 to accommodate the picture gallery as well as collections of porcelain and pottery and industrial art. There are also the Bose Museum, the museums of natural history and ethnography, an industrial exhibition hall, and an industrial art school. A Lutheran church (Gothic) was erected in 1892-97, a post office (Renaissance) in 1881, and new administrative offices and law courts in 1876-80. The public library contains considerably over 150,000 volumes. The most noticeable of the public monuments recently set up are those to the Emperor William I. (1898), to the musician Spohr (1883), and the lion fountain (1881). The towers of St Martin's church were rebuilt in 1889-92. Cassel is the headquarters of the 11th German army corps. There are here a military school, a medical college, an academy of the plastic arts, and a trades school. The industries embrace the making of railway carriages, machinery, scientific instruments, porcelain, tobacco and cigars, lithography, jute-spinning, iron-founding, brewing, and gardening. Population (1885), 64,083; (1900), 106,001.

Cassino, a town of Campania, Italy, in the province of Caserta, 42 miles N.W. from Capua by railway. It took the place of the ancient *Casinum*; but all through the Middle Ages, and later, it was known as San Germano, but in 1871 returned to its original name of Cassino. The place possesses some remains of antiquity, as an amphitheatre and an antique funeral monument, now converted into the Church of the Crucifixion. At Casinum was the villa of M. Terentius Varro, made notorious by the orgies of Mark Antony (Cic. *Phil.* ii. 40). Population, about 13,500.

Castelar y Ripoll, Emilio (1832-1899), Spanish statesman, was born at Cadiz on 8th September 1832. At the age of seven he lost his father, who had taken an active part in the progressist agitations during the reign of Ferdinand VII., and had passed several years as an exile in England. He attended a grammar-school at Sax. In 1848 he began to study law in Madrid, but soon elected to compete for admittance at the school of philosophy and letters, where he took the degree of doctor in 1853. He was an obscure republican student when the Spanish revolutionary movement of 1854 took place and the young liberals and democrats of that epoch decided to hold a meeting in the largest theatre of the capital. On that occasion Castelar delivered his maiden speech, which at once placed him in the van of the advanced politicians of the reign of Queen Isabella. From that moment he took an active part in politics, radical journalism, literary and historical pursuits. Castelar was compromised in the first rising of June 1866, which was concerted by Marshal Prim, and crushed, after much bloodshed, in the streets by Marshals O'Donnell and Serrano. A court-martial condemned him *in contumaciam* to death by "garote vil," and he had to hide in the house of a friend until he escaped to France. There he lived two years until the successful revolution of 1868 allowed him to return and enter the Cortes for the first time—as deputy for Zaragossa. At the same time he resumed the professorship of history at the Madrid university. Castelar soon became famous by his rhetorical speeches in the Constituent Cortes of 1869, where he led the republican minority in advocating a federal republic as the logical outcome of the recent revolution. He thus gave much trouble to men like Serrano, Topete, and Prim, who had never harboured the idea of drifting into advanced democracy, and who had each his own scheme for re-establishing the monarchy with certain constitutional restrictions. Hence arose Castelar's constant and vigorous criticisms of the successive plans mooted to place a Hohenzollern, a Portuguese, the duke of Montpensier, Espartero, and finally Amadeus of Savoy on the throne. He attacked with relentless vigour the shortlived monarchy of Amadeus, and contributed to its downfall.

The abdication of Amadeus led to the proclamation of the federal republic. The senate and congress, very largely composed of monarchists, permitted themselves to be dragged along into democracy by the republican minority headed by Salmeron, Figueras, Pi y Margall, and Castelar. The shortlived federal republic from 11th February 1873 to 3rd January 1874 was the culminating point of the career of Castelar, and his conduct during those eleven months has been much praised by the wiser portion of his fellow-countrymen, though it alienated from him the sympathies of the majority of his quondam friends in the republican ranks.

Before the revolution of 1868, Castelar had begun to dissent from the doctrines of the more advanced republicans, and particularly as to the means to be employed for their success. He abhorred bloodshed, he disliked mob rule, he did not approve of military *pronunciamientos*. His ideal would have been a parliamentary republic on the American lines, with some traits of the Swiss constitution to keep in touch with the regionalist and provincialist inclinations of many parts of the peninsula. He would have placed at the head of his commonwealth a president and Cortes freely elected by the people, ruling the country in a liberal spirit and with due respect for conservative principles, religious traditions, and national unity. Such a statesman was sure to clash with the doctrinaires, like Salmeron, who wanted to imitate French methods; with Pi y Margall, who wanted a federal republic after purely Spanish ideas of decentralization; and above all with the intransigent and gloomy fanatics who became the leaders of the cantonal insurrections at Cadiz, Seville, Valencia, Malaga, and Cartagena in 1873.

At first Castelar did his best to work with the other republican members of the first government of the federal republic. He accepted the post of minister for foreign affairs. He even went so far as to side with his colleagues, when serious difficulties arose between the new government and the president of the Cortes, Señor Martos, who was backed by a very imposing commission composed of the most

influential conservative members of the last parliament of the Savoyard king, which had suspended its sittings shortly after proclaiming the federal republic. A sharp struggle was carried on for weeks between the executive and this commission, at first presided over by Martos, and, when he resigned, by Salmeron. In the background Marshal Serrano and many politicians and military men steadily advocated a *coup d'état* in order to avert the triumph of the republicans. The adversaries of the executive were prompted by the captain-general of Madrid, Pavia, who promised the co-operation of the garrison of the capital. The president, Salmeron, and Marshal Serrano himself lacked decision at the last moment, and lost time and many opportunities by which the republican ministers profited. The federal republicans became masters of the situation in the last fortnight of April 1873, and turned the tables on their adversaries by making a pacific bloodless *pronunciamiento*.

The battalions of the militia that had assembled in the bull-ring near Marshal Serrano's house to assist the anti-democratic movement were disarmed, and their leaders, the politicians and generals, were allowed to escape to France or Portugal. The Cortes were dissolved, and the federal and constituent Cortes of the republic convened, but they only sat during the summer of 1873, long enough to show their absolute incapacity, and to convince the executive that the safest policy was to suspend the session for several months.

This was the darkest period of the annals of the Spanish revolution of 1873-74. Matters got to such a climax of disorder, disturbance, and confusion, from the highest to the lowest strata of Spanish society, that the president of the executive, Figueras, deserted his post and fled the country. Pi y Margall and Salmeron, in successive attempts to govern, found no support in the really important and influential elements of Spanish society. Salmeron had even to appeal to such well-known reactionary generals as Pavia, Sanchez Bregna, and Moriones, to assume the command of the armies in the south and in the north of Spain. Fortunately these officers responded to the call of the executive. In less than five weeks a few thousand men properly handled sufficed to quell the cantonal risings in Cordoba, Sevilla, Cadiz, and Malaga, and the whole of the south might have been soon pacified, if the federal republican ministers had not once more given way to the pressure of the majority of the Cortes, composed of "Intransigentes" and radical republicans. The president Salmeron, after showing much indecision, resigned, but not until he had recalled the general in command in Andalusia, Pavia. This resignation was not an unfortunate event for the country, as the federal Cortes not only made Castelar chief of the executive, though his partisans were in a minority in the Parliament, but they gave him much liberty to act, as they decided to suspend the sittings of the house until 2nd January 1874. This was the turning-point of the Spanish revolution, as from that day the tide set in towards the successive developments that led to the restoration of the Bourbons.

On becoming the ruler of Spain at the beginning of September 1873, Castelar at once devoted his attention to the reorganization of the army, whose numbers had dwindled down to about 70,000 men. This force, though aided by considerable bodies of local militia and volunteers in the northern and western provinces, was insufficient to cope with the 60,000 Carlists in arms, and with the still formidable nucleus of cantonalists around Alcoy and Cartagena. To supply the deficiencies Castelar called out more than 100,000 conscripts, who joined the colours in less than six weeks. He selected his generals without respect of politics, sending Moriones to the Basque provinces and Navarre at the head of 20,000 men, Martinez Campos to Catalonia with several thousand, and Lopez Dominguez, the nephew of Marshal Serrano, to begin the land blockade of the last stronghold of the cantonal insurgents, Cartagena, where the crews of Spain's only fleet had joined the revolt.

Castelar next turned his attention to the Church. He renewed direct relations with the Vatican, and at last induced Pope Pius IX. to approve his selection of two dignitaries to occupy vacant sees as well as his nominee for the vacant archbishopric of Valencia, a prelate who afterwards became archbishop of Toledo, and remained to the end a close friend of Castelar. He put a stop to all persecutions of the Church and religious orders, and enforced respect of Church property. He attempted to restore some order in the treasury and administration of finance, with a view to obtain ways and means to cover the expense of the three civil wars, Carlist, cantonal, and Cuban. The Cuban insurgents gave him much trouble and anxiety, the famous *Virginius* incident nearly leading to a rupture between Spain and the United States. Castelar sent out to Cuba all the reinforcements he could spare, and a new governor-general, Jovellar, whom he peremptorily instructed to crush the mutinous spirit of the Cuban militia, and not allow them to drag Spain into a conflict with the United States. Acting upon the instructions of Castelar, Jovellar gave up the filibuster vessels, and those of the crew and passengers who had not been summarily shot by General Burriel. Castelar always prided himself on having terminated this incident without too much damage to the prestige of Spain.

At the end of 1873 Castelar had reason to be satisfied with the results of his efforts, with the military operations in the peninsula, with the assistance he was getting from the middle classes and even from many of the political elements of the Spanish revolution that were not republican. On the other hand, on the eve of the meeting of the federal Cortes, he could indulge in no illusions as to what he had to expect from the bulk of the republicans, who openly dissented from his conservative and conciliatory policy, and announced that they would reverse it on the very day the Cortes met. Warnings came in plenty, and no less a personage than the man he had made captain-general of Madrid, General Pavia, suggested that, if a conflict arose between Castelar and the majority of the Cortes, not only the garrison of Madrid and its chief, but all the armies in the field and their generals, were disposed to stand by the president. Castelar knew too well what such offers meant in the classic land of *pronunciamientos*, and he refused so flatly that Pavia did not renew his advice. The sequel is soon told. The Cortes met on 2nd January 1874. The intransigent majority refused to listen to a last eloquent appeal that Castelar made to their patriotism and common sense, and they passed a vote of censure. Castelar resigned. The Cortes went on wrangling for a day and night until, at daybreak on 3rd January 1874, General Pavia forcibly ejected the deputies, closed and dissolved the Cortes, and called up Marshal Serrano to form a provisional government.

Castelar kept apart from active politics during the twelve months that Serrano acted as president of the republic. Another *pronunciamiento* finally put an end to it in the last week of December 1874, when Generals Campos at Sagunto, Jovellar at Valencia, Primo de Rivera at Madrid, and Laserna at Logroño, proclaimed Alphonso XII. king of Spain. Castelar then went into voluntary exile for fifteen months, at the end of which he was elected deputy for Barcelona. He sat in all subsequent parliaments, and just a month before his death he was elected as representative of Murcia. During that period

he became even more estranged from the majority of the republicans. Bitter experience had shown him that their federal doctrines and revolutionary methods could lead to nothing in harmony with the aspirations of the majority of Spaniards. He elected, to use his own words, to defend and to seek the realization of the substance of the programme of the Spanish revolution of 1868 by evolution, and legal, pacific means. Hence the contrast between his attitude from 1876 to 1886, during the reign of Alphonso XII., when he stood in the front rank of the Opposition to defend the reforms of that revolution against Señor Canovas, and his attitude from 1886 to 1891. In this latter period Castelar acted as a sort of independent auxiliary of Sagasta and of the Liberal party. As soon as Castelar saw universal suffrage re-established he solemnly declared in the Cortes that his task was accomplished, his political mission at an end, and that he proposed to devote the remainder of his life to those literary, historical, philosophical, and economic studies which he had never neglected even in the busiest days of his political career. Indeed, it was his extraordinary activity and power of assimilation in such directions that allowed him to keep his fellow-countrymen so well informed of what was going on in the outer world. His literary and journalistic labours occupied much of his time, and were his chief means of subsistence. He left unfinished a history of Europe in the 19th century. The most conspicuous of his earlier works were:—*A History of Civilization in the First Five Centuries of Christianity*, *Recollections of Italy*, *Life of Lord Byron*, *The History of the Republican Movement in Europe*, *The Redemption of Slaves*, *The Religious Revolution*, *Historical Essays on the Middle Ages*, *The Eastern Question*, *Fra Filippo Lippi*, *History of the Discovery of America*, and some historical novels. Castelar died near Murcia on 25th May 1899, at the age of 66. His funeral at Madrid was an imposing demonstration of the sympathy and respect of all classes and parties. (A. E. H.)

Castelfranco, a town of the province of Bologna, Emilia, Italy, 16 miles N.W. from Bologna on the railway to Modena. It has several churches with pictures by artists of the Bolognese school, and carries on spinning of textiles and match-making. It is identified with the ancient *Forum Gallorum*, where Hirtius defeated Antonius in 43 B.C. Population, about 12,500.

Castelfranco Veneto, a town of the province of Treviso, Venetia, Italy, 16 miles W. from Treviso on the railway to Verona. It is famous as the birthplace of the painter Giorgione, *i.e.*, Barbarelli (1476-1511), and for the altar-piece by him in the principal church. The people are engaged in the silk industries. Here the French defeated the Austrians under Prince Rohan in 1805. Population, about 7500.

Castellammare, a town of Campania, Italy, in the province of Naples, on the E. shore of the Gulf of Naples, 18 miles by rail S.E. from Naples. The royal arsenals and a royal dockyard are the principal industrial works; but there are also ironworks, cotton-mills, and a small-arms factory. The royal palace has been converted into a hotel. The imports varied between £271,000 and £1,100,000 in the eleven years ending 1899, and the exports (65 per cent. macaroni) increased from £82,400 in 1888 to £335,900 in 1899. The port is cleared by about 280 vessels of 250,000 tons annually. In 1899 the Italian Government voted £56,000 for the extension of the pier and the improvement of the harbour. Population, about 31,500.

Castello Branco, a city and episcopal see of Portugal, capital and district of same name, 120 miles N.E. from Lisbon. In the upper town there is an ancient castle, now used as a lyceum. Population, 6728. The district of Castello Branco consists chiefly of the valleys of the Ponsul, Ocreza, and Aravil (right-hand affluents of the Tagus), although about 50 per cent. of the surface is uncultivated. Area, 2556 square miles. Population, 205,211, giving 80 inhabitants to the square mile.

Castellon de la Plana, a maritime province in the E. of Spain, with an area of 2446 square miles, divided into 9 administrative districts and 140 parishes; population (1887), 292,437; (1897), 304,477. The surface is mostly mountainous, and flat only near the coast. The principal rivers are the Mijares, Palencia, Bergantes, and Cenia. The climate is cold and variable in the hilly districts, temperate in winter, and very warm in summer in the lowlands. Eighty miles of railways are already worked, and new lines are being constructed. The local industries are increasing, and are mainly connected with iron and copper works, salt-fish factories, paper, porcelain, woollen, cotton, silk, esparto, brandy, and oils. Wine, oranges, and oil are exported to foreign countries and other parts of Spain. About 100 vessels annually enter the ports of the province for foreign trade, and 1800 coasting vessels. The fishing fleet is composed of 300 boats. Only 3 mines—1 zinc, 1 iron, 1 lead—are worked. The live stock includes 3803 horses, 18,572 mules, 8221 asses, 1515 cattle, 164,273 sheep, 53,373 goats, 20,473 pigs. 115,800 acres are devoted to the culture of wheat, 2066 to that of oats, 15,600 to barley, 15,042 to rye, 4707 to maize, 15,660 to chick-peas, 128,405 to vines, 72,335 to olive groves.

Castellon de la Plana, the capital of the above province, situated 4 miles from the sea and 40 N.N.E of Valencia. Its population was 25,195 in 1887, and 30,584 in 1897. Its port, called El Grao, is on the coast some miles from the town, and is entered by about 200 vessels every year. It is a comparatively modern town, of which the industries—manufactures of leather, porcelain, silk, brandy, cork, and linen—are developing. The environs are fertile and well irrigated by water drawn from the river Mijares.

Castel San Pietro, a town of the province of Bologna, Emilia, Italy, 7 miles S.E. from Bologna. It has saline and ferruginous mineral springs (64·4°-73·4° Fahr.) and baths. Population, about 12,500.

Castelvetrano, a town of the province of Trapani, Sicily, Italy, 46 miles S.E. from Trapani by rail. There is a small museum containing relics from Selinus, including terra-cottas and a bronze statuette of Apollo. The town has brickworks, olive-oil presses, and macaroni factories. Population, about 20,500. Seven miles to the south-west at Campobello are the quarries whence the ancients extracted the stone for the temples, &c., of Selinus.

Castle Douglas, a burgh of barony, police burgh, and railway junction of Kirkcudbrightshire, Scotland, on Carlingwark Loch, 19½ miles S.W. of Dumfries. Its auction marts for sheep and cattle sales are now the largest in the south-east of Scotland; at an autumn sale as many as 15,000 sheep and 1400 cattle are disposed of in one day. It has a foundry, an agricultural implement work, and a tannery; a town hall with reading-room and library, and a Diamond Jubilee cottage hospital. Water and drainage schemes have been carried out. There are five branch banks. The churches are Established, three United Free, Episcopal and Roman Catholic. The public school had an average attendance of 487 in 1898-99; and a Roman Catholic school of 49. Population (1881), 2565; (1891), 2851; (1901), 3018.

Castleford, a township in the Osgoldcross parliamentary division of Yorkshire, England, on the Aire, 10 miles S.E. of Leeds by rail. Old Watling Street ran through the parish, and Roman remains have been found in the neighbourhood. There are Established, Roman Catholic, and numerous Nonconformist churches; also a market-hall. Large glass-bottle and earthenware-jar works, chemical works, and neighbouring collieries employ the inhabitants. Area of township (an urban district), 564 acres; population (1881), 10,530; (1901), 17,380.

Castlemaine, a town of Victoria, Australia, in the county of Talbot, 78 miles by rail N.N.W. from Melbourne. There are important gold-mines in the district, which is also a fine agricultural one. Slate and flagstone are quarried. The gold-diggings were amongst the first discovered in the colony. Population (1881), 5787; (1901), 5704.

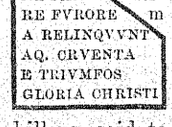
Castrogiovanni, a fortified town of Sicily, Italy, province of Caltanissetta, from which it is 8 miles distant by rail. It has a public library, with fine incunabula, a museum, and sulphur mines, mineral springs, olive-oil mills, and macaroni factories. Population, about 22,700.

Castro Urdiales, a seaport of Spain, in the province of Santander. This town has increased in size, population, and importance very rapidly since 1879, owing to the development of mining interests in its environs. The total amount of iron ore shipped rose from 277,200 tons in 1894 to 413,369 in 1898. The total exports of tinned sardines in 1898 were valued at £21,300, all prepared in the town. Castro is now connected with Bilbao by the coast line between the capital of Biscay and Santander. The movement of British shipping at the port in 1898 was as follows: 102 vessels in ballast with a tonnage of 133,105 entered, and 60 vessels with 101,587 tons of cargoes, valued at £40,634, cleared for Great Britain. Population (1897), 12,268.

Castrovillari, a fortified town of the province of Cosenza, Calabria, Italy, 44 miles N. from Cosenza. It is situated in a wide fertile valley around the foot of an old Norman castle. The people press out olive oil and make casks. Population, about 11,500.

Catacombs of Rome—*Discoveries since* 1870. In 1873 was discovered, near the cemetery of St Domitilla, the semi-subterranean basilica of SS. Nereus and Achilleus, 100 feet by 60 feet. This is now covered with a roof, and the fallen columns have been raised up. The lower part of a pillar, which once supported a baldachino over the altar, still preserves the name ACILLEVS, and beneath it a bas-relief of the martyr, with his hands bound, receiving his death-blow from the executioner. The base of a similar column has only feet in the same attitude, and probably bore the name NEREVS. In a grave in the apse was found a large fragment of an inscription, composed by Pope Damasus, but set up by his successor Siricius, which, from the note-book of a Salzburg pilgrim of the 8th century, can be completed thus:—

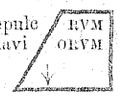
Militiæ nomen dederant sævum ... ue gerebant
Officium pariter spectantes juss ... anni
Præceptis pulsante metu servi ... ati
Mira fides rerum subito posue ... m
Conversi fugiunt ducis impia castr
Projiciunt clypeos faleras tel
Confessi gaudent Christi portar
Credite per Damasum possit quid



Nereus (see Rom. xvi. 15) and Achilleus, said to have been baptized by St Peter, refused to do the bidding of Domitian as prætorians, and entering the service of Flavia Domitilla, suffered martyrdom with their mistress, Petronilla, of the Aurelian family closely connected with the Flavii, and the spiritual daughter of St Peter, was buried in a sarcophagus, with the inscription:—

AVRELIAE·PETRONILLAE·FIL·DVLCISSIMAE

This is now in St Peter's, but was probably originally behind the apse of this basilica, for there is a fresco of her in an arcosolium, with a matron named Veneranda. The original entrance to the cemetery leads directly into a spacious corridor with no *loculi*, but recesses for sarcophagi, and decorations of the classical style of the 2nd century. From this a wide staircase leads directly down to a chamber, discovered in March 1881, of a very early date. Within an arcosolium is a tablet set up by "Aurelius Ampliatus and his son Gordian, to Aurelia Bonifatia, his incomparable wife, a woman of true chastity, who lived 25 years, 2 months, 4 days, and 2 hours." The letters are of the 2nd century; but above the arcosolium was found a stone with great letters, 5 or 6 inches high: "AMPLIATI, the tomb of Ampliatus." Now Ampliatus is a servile name: how comes it to be set up with such distinction in the sepulchre of the Flavii? Romans xvi. 8 supplies the answer: "Salute Ampliatus, most beloved to me in the Lord." De Rossi thinks the identification well grounded (*Bullettino*, 1881, p. 74). Epitaphs of members of the Flavian family have been found here, and others stating that they are put up "EX INDULGENTIA FLAVIAE DOMITILLAE VESPASIANI NEPTIS." So that De Rossi did not hesitate to complete an inscription on a broken stone thus:—



De Rossi began his excavations in the cemetery of St Prisalla in 1851, but for thirty years nothing but what had been described by Bosio came to light. In 1880 he unearthed a portion near the *Capella Greca*, and found galleries that had not been touched since they were filled in during the Diocletian persecution. The *loculi* were intact and the epitaphs still in their places, so that "they form a kind of museum, in which the development, the *formulæ*, and the symbolic figures of Christian epigraphy, from its origin to the end of the 3rd or 4th century, can be notified, and contemplated, not in artificial specimens as in the Lateran, but in the genuine and living reality of their original condition" (*Bullett.*, 1884, p. 68). Many of the names mentioned in St Paul's Epistles are found here: Phœbe, Prisca, Aquilius, Felix Ampliatus, Epenetus, Olympias, Onesimus, Philemon, Asyncritus, Lucius, Julia, Caius, Timotheus, Tychicus, Crescens, Urbanus, Hermogenes, Tryphæna and Trypho(sa) on the same stone. Petrus, a very rare name in the Catacombs, is found here several times, both in Greek and Latin. The neighbouring *Cœmeterium Ostrianum* was anciently known as "*Fons S. Petri*," "*ubi Petrus baptizavit*," "*ubi Petrus prius sedit.*" This cemetery derives its name from Priscilla, mother of Pudens, who is said to have given hospitality to St Peter the Apostle. We are reminded of St Paul, and of his friends Aquila and Prisca, by a monument erected by a freedman of an emperor, both of whose names have perished, but the freedman was PRAEPOSITVS TABERNACVLORVM—chief tentmaker. In 1888 a corridor was discovered which had at one time been isolated from the rest of the cemetery. It had no *loculi*, but recesses in the wall to receive sarcophagi. At the end of the corridor there was a large chamber, 23 feet by 13 feet, once lined with marble and the ceiling covered with mosaic, a few fragments of which

still remain. The only tomb here was a sarcophagus, of which the broken front bears the letters which show it to have been the epitaph of one of the Acilian family:—

ACILIO GLABRIONI FILIO

In the vicinity are fragments of the epitaphs of Manius Acilius and Priscilla, of Quintus Acilius and Caia Acilia in Greek, another Greek inscription "Acilius Rufinus mayest thou live in God." After careful examination of the nine Acilii, who were consuls, De Rossi concludes that this was the resting-place of that Acilius Glabrio, consul with Trajan, A.D. 91, who in the year of his consulate was compelled by Domitian to fight with beasts in the arena, and then banished, and put to death in 95. The question of his Christianity seems settled by the discovery of the sepulchre of these Christian Acilii. From this crypt a staircase led up to the basilica in which Pope Sylvester was buried, and the whole plan of which was laid bare by De Rossi. The tomb of St Sylvester could be identified, and that of Pope Siricius "at his feet," as the pilgrim noted (*Bullett.*, 1890, pp. 106-119).

Just before De Rossi's death, Mgr. Wilpert discovered in the *Capella Greca* a painting of the "*Fractio Panis*" or Eucharistic Feast, which he cleansed from the dust with which it had been covered. The picture of the Blessed Virgin and Child, which De Rossi ascribed to the 2nd, if not to the 1st century, has received an unexpected proof of its antiquity. In 1890 the floor of the gallery in which it stands was excavated, and another floor was found to be 6 feet below its supposed level. The *loculi* in this lower portion were intact, with inscriptions of the 2nd century still in their places, proving that the niche in which that picture was painted must have been considerably older than the lowering of the floor. A flight of iron steps enables the visitor now to examine this venerable specimen of early Christian art.

Since the death of De Rossi, one of his pupils, M. Stevenson, since dead, discovered in 1896 a small subterranean basilica in the Catacomb of St Peter and Marcellinus on the Via Labicana, with pious acclamations on the plaster similar to those in the Papal crypt in St Callixtus. Near the well-known subterranean chapel in the *Cœmeterium Ostrianum* was discovered by Mgr. Crosterosa, in 1877, another chapel, in which Signor Armellini found traces of St Emerentiana, foster-sister of St Agnes. Near this a whole region of galleries has been brought to light, with *loculi* intact. Glass has been placed before them, so that their contents can be examined on the spot.

AUTHORITIES.—DE ROSSI, *Roma Sotterranea*, Tom. iii.; *Bullettino di Archeologia Cristiana*, 1877-92; *Bullettino Nuova*, 1895-1900. Rome.—LANCIANI. *Pagan and Christian Rome*. Macmillan and Co., London.—MARUCCHI. *Les Catacombes Romaines*, Desclées et Cie., Rome, Paris.—Mgr. WILPERT. *Fractio Panis*. Rome.—De Rossi's fourth volume contains a full account of the Cemetery of St Domitilla. The works of Lanciani and Marucchi should be studied by those unable to consult De Rossi's great work. (✠ W. R. B.)

Catamarca, a province in the west of the Argentine Republic. It is bounded on the N. by Salta and Tucuman, on the W. by Chile, on the E. by Santiago del Estero and Cordoba, on the S. by La Rioja. The official area at the census of 1895 was 47,531 square miles. The population in 1869 was 79,962; in 1895 it was 90,161. The province is divided into fifteen departments. In 1895 there were 6834 farms, and 39,051 acres planted in cereals. The capital, CATAMARCA, had a population in 1895 of 7397.

Catania, a city of Italy, in the province of Catania, on the eastern coast of Sicily, near the foot of Mount Etna. Both population and trade underwent a remarkable increase between 1865 and 1880, during which period Catania was the only large Sicilian city with a harbour directly connected by railway with the centres of sulphur production. Architecturally it is the most modern and regularly built Sicilian town, since it has several times been rebuilt in consequence of earthquakes. In 1885 the university was raised from second to first-class status, and faculties of philosophy and letters, and natural science and mathematics were added to those of jurisprudence and medicine and surgery, which it already possessed. The *Consorzio Universitario*, founded by the local and provincial authorities for the improvement of the university, established, with the aid of private munificence, a geographical museum, and has obtained for the university the so-called "Rocks of the Cyclops" for geological studies, and has also begun an archæological museum. These efforts have been so successful that in 1899 the university counted 42 official and 40 free professors (*liberi docenti*), while there were 968 students, as compared with 535 in 1890. In 1898, 6406 vessels of 2,466,787 tons entered and cleared, loading and unloading 433,150 tons of goods. Little change in the volume of the trade has taken place of recent years. The vicinity of Etna, and the beauty of the city and its surroundings, attract large numbers of foreign visitors every year. Catania is also within easy reach of Syracuse and its Greek remains, and also of the extremely interesting archæological site of Taormina. Population, of town (1881) 100,417, (1901) 149,694; of province (1881) 563,457, (1901) 711,923. (G. Mo.)

Catanzaro, a town and episcopal see of Calabria, Italy, capital of the province of Catanzaro, 5 miles from the Ionian Sea, and 110 miles by rail N.E. from Reggio. University classes are held in law, medicine, and pharmacy. There is a coasting trade in wine, olive oil, and cereals, the port being cleared by 105 vessels of 58,530 tons in 1897. Population (1881), 24,094; (1901), 31,887.

Catholic Apostolic Church, The.—This community (the title "Irvingites" is repudiated) has not changed recently in general constitution or doctrine. The community does not publish statistics. Its growth during late years is said to have been more marked in Germany and elsewhere than in Great Britain. The sketch of the constitution given in the ninth edition of the *Encyclopædia Britannica*, prescribing the 12 "prophets," 12 "evangelists," 12 "pastors," and the 24 priests for each church, is an ideal outline which has never been fulfilled. There has never been a "central episcopacy" of 48. The "Apostles" alone have always held the supreme authority, though for some years there have been "coadjutors" appointed to assist the one surviving "Apostle," and to exercise the functions of the "Apostolate." The last "Apostle" died on 3rd February 1901. No readjustment of the constitution had been made up to the autumn of that year.

Catskill, a village of New York, U.S.A., capital of Greene county, situated in 42° 13′ N. lat. and 73° 52′ W. long., on the western bank of Hudson river, in the eastern part of the state. It is entered by the West Shore railway. The site is hilly and the street plan irregular. Several steamboat lines connect Catskill with New York, Albany, and other river points. Population (1880), 4320; (1890), 4920; (1900), 5484 (657 foreign-born, and 304 negroes).

Cattaro, the chief town of the government district of the same name in Dalmatia, Austria. In 1890 the population of the town was 3329, and of the commune 5435, mainly Slav, with a considerable German minority. It has a garrison of 1035 men. There is a steamboat service to Trieste, and a road to Cettigne. Cattaro was the

principal Austrian *point d'appui* in the insurrections which broke out in 1869 and 1881-82, in the barren mountainous district of the Krivoscie, which lies between the Bocche di Cattaro, Herzegovina, and Montenegro. The system of fortifications comprising Cattaro and the small town of Castelnuova at the mouth of the gulf, now extends to the heights of the Krivoscie, which are crowned with small forts.

Cattegat. See NORTH SEA and BALTIC SEA.

Cattle. See AGRICULTURE.

Cauca, a department of the republic of Colombia, bounded on the N.W. by Panama, on the N. by the Caribbean Sea, on the E. by the departments of Bolivar, Antioquia, Tolima, and Cundinamarca, Venezuela, and Brazil; on the S. by Brazil and Ecuador; and on the W. by the Pacific Ocean. Area, 257,463 square miles, including a number of islands along the Pacific and Atlantic coasts, covering an area of some 77 square miles. The capital, Popayán, has 10,000 inhabitants. Other principal towns are Calí (16,000), Buenaventura, Pasto, Cartago, Buga, Barbacoas.

Caucasus, a name indiscriminately applied to (*a*) the great chain of mountains which runs N.W. to S.E. from the Black Sea to the Caspian, and which ought alone to retain this name (Caucasus, Caucasus Range, Great Caucasus); (*b*) the whole series of mountains, highlands, and plateaux which is found in the Ponto-Caspian isthmus—the name of *Little Caucasus*, or *Anti-Caucasus*, being loosely applied to both the escarpment of Transcaucasia which faces the Caucasus Range and to the highlands of Transcaucasia altogether; and (*c*) the subdivision of the Russian Empire known as *Kavkazskiy Krai* (Caucasus Region), or *Caucasia*, or *General-Governorship*, and formerly *Lieutenancy, of the Caucasus*. In the last-named application it is that section of the Russian dominions in Asia which occupies the isthmus between the Black Sea and the Caspian, as well as portions of the plateaux of Asia Minor and Armenia. Its northern boundary is the Kuma-Manych depression, which is a succession of narrow, half-desiccated, and only temporarily filled lakes and river-beds connecting the Manych, a tributary of the Don, with the Kuma, a tributary of the Caspian. It is supposed to be a relic of the former post-Pliocene connexion between the Black Sea and the Caspian, and is accepted by most geographers as a natural frontier between Europe and Asia, while others take for the boundary the sinuous line of the main water-parting of the Caucasus Range. The southern frontier of Caucasia is a line which has been shifted several times during the last century, and now, separating Caucasia from Asia Minor and Persia, runs from a spot situated on the Black Sea 17 miles S. of Batum in a south-westerly and easterly direction to the Ararat, and thence along the Araxes river to within 30 miles from its junction with the Kurá, where the boundary turns once more to the S.E., reaching the Caspian Sea at Astara (lat. 37° 45′ N.). This large territory, covering 180,843 sq. miles and having in 1897, 9,248,695 inhabitants (51 per sq. m.), may be subdivided into four natural zones: (i.) the plains in the N. of the Great Caucasus Range, or North Caucasia; (ii.) the Caucasus Range and the highlands of Daghestan; (iii.) the valley of the Rion and the Kurá, between the main ridge and the escarpments of the Anti-Caucasus; and (iv.) the highlands of Transcaucasia.

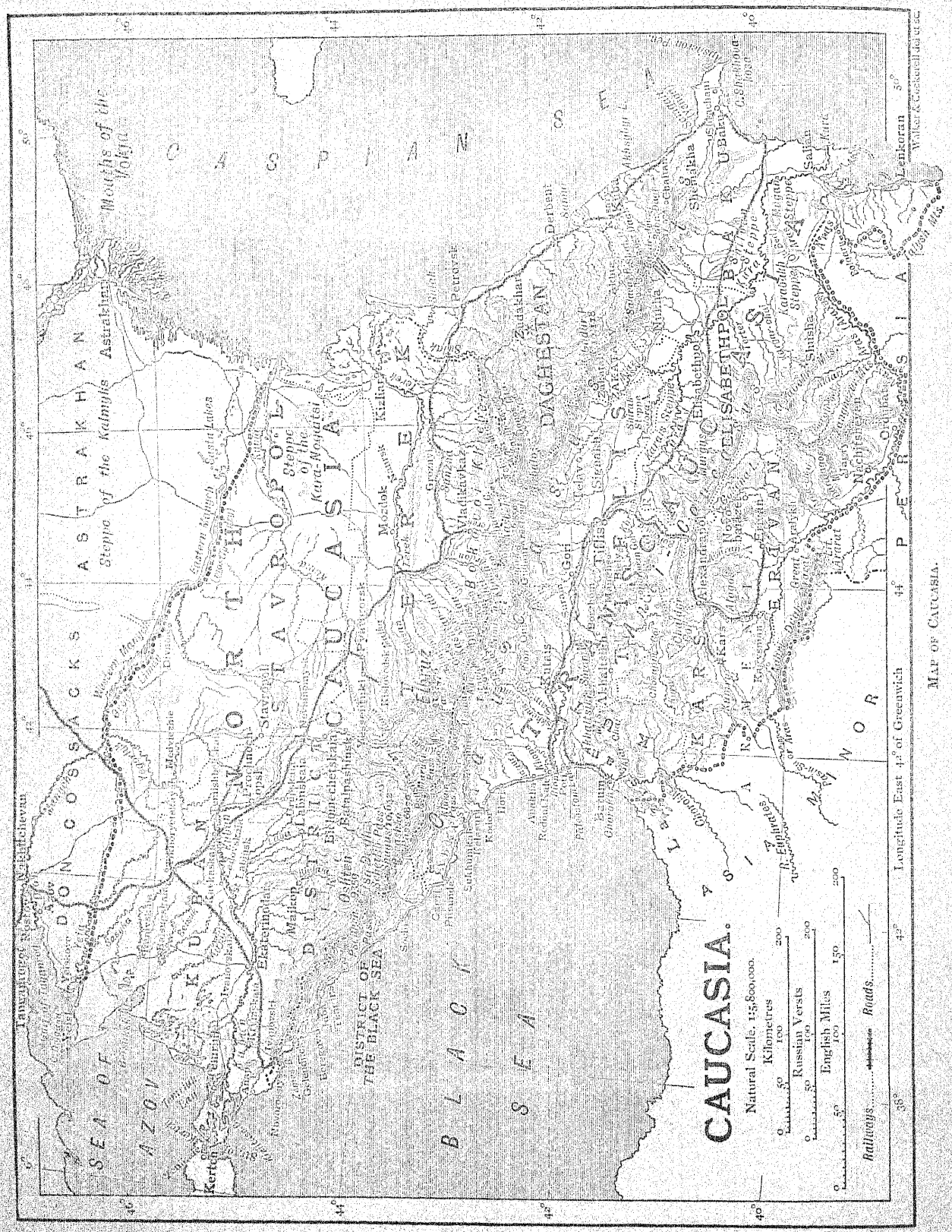
I. The *Plains of North Caucasia*, which include most of the provinces of Kubañ, Stavropol, and Terek, gently slope from the foot of the Caucasus Range towards the Kuma-Manych depression, the Sea of Azov, and the Caspian. They consist of horizontal Tertiary strata, and only in their centre portion do they reach altitudes of from 2000 to 2500 ft., as in the "Stavropol plateau," which spreads northwards, separating the tributaries of the Kubañ from those of the Terek and the Kuma. Thick forests clothe them towards the foot-hills of the Caucasus, while in the W. they merge into the prairies of South Russia, or end in marshy grounds clothed with rushes in the wide delta of the Kubañ; in the N. and E. they become stony and sandy dry steppes as one approaches the Manych and the coasts of the Caspian.

The climate is continental, *i.e.*, very hot in the summer and cold in the winter, and very dry, the yearly rainfall being only from 30 to 10 inches. The average temperatures at Stavropol (alt. 1919 ft.) are: year 47° Fahr., January 24°, July 70°, yearly rainfall 29·8 inches. But the soil of these prairies is very fertile, and they have now a Russian population of nearly 2,800,000, composed of Cossacks and peasant immigrants, chiefly settled on the main rivers and grouped in wealthy, populous villages. They carry on agriculture—wheat-growing on a large scale, with the aid of modern machinery, North Caucasia becoming an important grain-exporting country,—and also cattle and horse breeding; vine culture is widely spread on the low levels, and a variety of domestic trades is rapidly spreading in the villages. The higher portions of these plains, deeply ravined by the upper tributaries of the above-mentioned rivers, are inhabited by a variety of Caucasian branches: the Kabardians and the Cherkess in the W., the Ossets in the middle, and a variety of branches from Daghestan described under the general name of Chechens, while nomadic Nogai Tatars and some Turkomans occupy the steppes.

II. The *Caucasus Range*, running N.W. to S.E. from the Strait of Kerch to the Caspian Sea, on a length of 940 miles (700 miles in a straight line), varying in width from 30 to 130 miles, and covering a surface of 12,000 sq. miles, appears to be of a more and more complicated structure in proportion as more accurate surveys are made. A new survey on the scale of 1½ inches to the mile was in 1901 being made with great accuracy (especially in Central Caucasus) in lieu of the previous 3½ miles to the inch scale.

A. In its *western* portion, from the Sea of Azov to the Elbruz, which runs parallel to, and at a short distance from, the N.E. coast of the Black Sea, it appears rather as a succession of parallel ridges, disposed *en échelon*, sending out on their southern slopes numerous spurs of great steepness, which reach the very coast of the Black Sea. On its northern slope the main range is accompanied by another ridge of mountains, the Bokovoi Khreber, or "side range," which is composed of uplifted stratified rocks gently sloping northwards and having their escarpments turned towards the main range. The rivers which rise on the slopes of the latter flow first in longitudinal valleys and then pierce the thickly forest-clad side range in a series of most picturesque gorges and valleys. The amount of rain received by this region, which is only 20 inches at the Sea of Azov, reaches 40 inches along the Caucasus Range as far as the 46th degree of E. long., and from 60 to 80 inches in the Black Sea coast region (80 inches at Sochi). Consequently the south-western slopes of the Caucasus are covered with a luxuriant, almost sub-tropical, vegetation. Unfortunately, in the narrow coast regions moisture and heat result in the prevalence of very severe malarial fevers, presenting a real obstacle to immigration. The altitude of the snow-line in Western Caucasus is about 9000 ft. on the Fisht or Oshten group, and to the east of it the crest of the main ridge is crowned with perpetual snow and numerous hanging glaciers, while larger glaciers creep down the main valleys. The southern slope, however, is extremely steep and often presents almost vertical walls, 2000 to 3000 ft. high, rendering the passes extremely difficult. As a rule the passes lie at a great height, and apart from those lower ones which are known at the north-western extremity of the range, they are few, namely, Pseashko, from Pitsunda to the head-waters of the Laba (6870 ft.); Marukh (11,000 ft.); Klukor (9075 ft.), along which a bridle-path is now made to connect Sukhum with Batalpashinsk; and Nakhar (9617 ft.), also leading to the upper Kubañ. The main peaks of that part of the range are—Fisht or Oshten (9359 feet), Shugus (10,642), and Psysh (12,427). The former inhabitants of this region—Kabardians and a few Adyghe (or Cherkess, Circassians)—are partly settled now on the northern foot-hills, while Abhazians occupy the south-western slope. The great bulk, however, of the native population have been compelled by the force of

arms to abandon their mountain villages, and rather than settle on the northern plains, as they were offered, preferred to be driven out of the country and emigrated to Turkey, constituting now the *bashi-bazouks*. As to the Russians, they have but a few small



MAP OF CAUCASIA.

towns along the coast, namely, Novorossiysk (16,208 inhabitants), Sukhum-kale (1869), and Sochi, the first named of which is connected by a branch railway with the great line of North Caucasia, and becomes a great corn-exporting seaport. Immense beds of coal have been discovered at Ochemchiri.

B. *Middle Caucasus*, from the sources of the Kubañ to those of the Ardon, *i.e.*, from Mt. Elbruz to the Adai-khokh, is the highest portion of the range. Immense snow-clad ridges of mountains shoot off from the main range on its southern slope, at small angles with its main axis, forming large longitudinal valleys (Legchum, Racha,

and so on), inhabited by various branches of the Georgian stem. On the northern slope the side range (Bokovoi Khrebet) runs parallel to the main one, often exceeding it in altitude, but it is cut through by many rivers, which, as in the W. Caucasus, also flow for some distance in longitudinal valleys between the two ridges, and then pierce it, to find an issue to the northern plains. Many spurs also shoot off the main range, and it is usually on these spurs that the highest peaks—some of them of volcanic origin, as Elbruz and Kazbek—stand, covered with snow, and sending down mighty glaciers. The highest peaks of the Caucasus are met with in this division, there being no fewer than 20 peaks higher than Mont Blanc. The chief are in close succession: Elbruz, or Minghi-tau (18,470 ft.), Ushba (15,445), Tikhtenghen, Gistola, Tetnuld (15,914), Adysh (16,291), Great Shkhara (17,049) and Little, Koshtan-tau (16,881), Janghi-tau (16,564), Dykh-tau (17,054), Pasis-mta, Adai-khokh (15,244), Tepli (14,510), Himarai-khokh (15,673), and Kazbek (16,546). None of the passes in this portion of the Caucasus is below 12,000 ft., and only to the E. of Kazbek the Mamisson Pass, from Kutais to Vladikavkaz, known as the "Military Ossetian Road," lies at an altitude of 9390 ft. Mighty snow-clad ridges—Svanetian, Legchum, Rachinsky—shoot also to the W. and W.S.W. on the southern slope of the main chain, forming elevated longitudinal valleys.

As a rule, the snow-line lies at heights of from 11,000 to 12,000 ft., and although it remains a fact that the Caucasus, taking into account its dimensions and altitude, has fewer glaciers in proportion than the Alps, the excursions of Western European and Russian Alpinists, and especially the newest detailed survey, have disclosed in this part of the Caucasus, between the main range and the secondary ones, wide areas covered with perpetual snow and feeding mighty glaciers, not second in size to those of the Alps. It is estimated that there are in this region no fewer than 183 first-class and 679 second-class glaciers,—the number of the latter in the whole chain probably being between 900 and 1000. However, the Caucasian glaciers do not creep so low as those of the Alps. The best known of them are: Bizinghi (Shkhara and Dykh-tau), 11 miles long, reaching at its lower end the altitude of 6539 ft.; Dykh-su, in the same locality, 7 m. long (6649 ft.); Karagom, 6½ m. long, flowing from the Adai-khokh and reaching the 5702 ft. level (lowest in Caucasia); Tsanner, creeping from the Tetnuld, 7 m. long (6835 ft.); Devdorak, from the Kazbek, 2½ m. long (? 7531 ft.). Numerous traces of glaciation on a very large scale are found in all the valleys.

Farther eastwards the main range becomes much lower, and the highest peaks are grouped in the side range. They are: Tsmiakom-khokh (13,567), Zilga-khokh (12,645 ft.), Zikari (12,563), Choukhi (12,107), and Borbalo (10,807) in the main range. The rivers of the northern slope—the Ardon and the Terek—after short courses in longitudinal valleys, pierce the side range in most wild gorges. The whole chain narrows, however, in the meridian of Vladikavkaz, and it is crossed there by the well-known Cross Pass (Krestovaya; also named Gudur and Kobi Pass), along which goes the military road to Georgia, following the famous Darial gorge, which is pierced by the Terek across the side range.

C. It appears very probable that to the east of this gorge the Caucasus is crossed by other lines of upheaval which have a direction from S.W. to N.E. and may be considered as continuations of the Suram or Meskes Mountains and the Pontic Ridge. At any rate, from the Kazbek eastwards the Caucasus changes its character. It has to the N. of the main range a wide Alpine land, Daghestan, composed of several ridges—Andi, Bozdagh, and others—all running towards E.N.E., with many treeless and dry plateaux between them, so that Daghestan may be considered by the orographer as a fragment of the Transcaucasian plateaux, separated from the main body by the broad valley of the Kura, while the geologist sees in it a series of folds of Jurassic and Cretaceous deposits. As to the main range, it continues in the same south-easterly direction, but its granite axis disappears and Palæozoic slates spread on both the southern and the northern slopes. The crest of the main ridge becomes lower and has less protruding peaks. Glaciers are scarce upon it, but attain a great development on the ridges lying to the north of the main one. The chief passes across the latter are Kodor (9300 ft.) and Satskheni, both leading from Tiflis to Daghestan. The chief peaks of the main ridge do not reach altitudes of 12,000 ft., and are, besides Borbalo, Antsal (11,742), and Shavi-kilde (11,314); while in the Andi ridge are Tebulos-mta (14,781), Donos-mta (13,736), Kachu (14,027), and Balakuri in the Bozdagh ridge.

D. From the 47th degree of longitude (head of Samur) to the Baba-dagh Peak the main range rises once more in altitude, reaching 13,764 ft. in Thfan-dagh, 14,772 in Bazar-dyuz or Kichen-dagh, and 13,951 ft. in Shah-dagh, while the Gudur Pass lies at an altitude of 10,118 ft. and the Salavat Pass (military road of Akhte) at 9283 ft. In this portion of the Caucasus are the last glaciers. Beyond the Baba-dagh (11,934) no summit rises above 9000 ft.; the Alty-agach Pass is at an altitude of only 4354 ft.; the crest is devoid of perpetual snow. Finally, the great ridge is lost in hills as it approaches the Caspian, to be continued, however, under the sea as a submarine swelling, and to reappear in the Transcaspian territory under the name of Kopet-dagh.

The high valleys of the Caucasus are populated by Cherkess (Adyghe) in the W., Svanetians, Ossets, Pshaves, and Khevzurs in the middle, and a variety of stems, of which the Lezghians and the Cherkess are the most numerous, in Daghestan. Every available patch in the mountain valleys is used for culture, the soil having often to be carried on the shoulders to a great height, and the villages (*auls*) are built house above house upon the steep mountain slopes. Unfortunately, the Cherkess having been driven out of the country, their abodes in Western Caucasus remain unoccupied, while the various Georgian stems of the middle Caucasus, pressed by want of land available for culture, have had much to suffer from the feudal servitude under which they remained till 1863.

III. The *Broad Valley* which runs N.W. to S.E. between the Great Caucasus and the escarpments of the Anti-Caucasus is the most fertile and the most populated portion of Caucasus. It broadly corresponds with the provinces of Kutais, Tiflis, Elisabethpol, and Baku, and has a population of over 3,000,000. It is watered in the W. by the Rion, affluent of the Black Sea, and its tributaries, and in the E. by the Kura, affluent of the Caspian (with its two tributaries, Yora, Alazan), and the lower Araxes. The Suram or Meskes Mountains, 3000 to 5000 feet high, separate the two drainage areas. This Broad Valley was peopled in a remote antiquity with Greek colonists, was later the seat of powerful Georgian kingdoms, and has been for centuries the stronghold of Caucasia against invasions from the east and south. It is thickly peopled, chiefly with Georgian stems (Gurians, Imeretians, Mingrelians, Svanes) in the valley of the Rion, and Georgians mixed with Armenians in the valley of the Kura, while the steppes spreading along the lower course of the latter river are occupied by various Turko-Tatars. In the agricultural region the land is so well cultivated that it attains a fabulously high selling value, increased now by the manganese and copper mines of the Rion and the extremely rich naphtha wells of Baku. The drainage area of the Rion (province of Kutais), as well as the Sukhum-kale coast region and the basin of the lower Chorokh (Batum district), is covered with spurs of the Caucasus, the Meskes Mountains and the Wakhan ridge, with a broad triangular delta of the Rion between them. Its climate is extremely hot, and the amounts of rain are very considerable, so as to reach a yearly average amount of 80 in. at Batum, from 80 to 60 in. round Poti, and from 60 to 40 in. elsewhere. Farther east, in the valley of the Kura, the climate is, however, much drier and more continental, the averages for Tiflis being: year 55°, January 32°·5, July 77°, rainfall 20 in.; and for Baku, year 59°, January 39°, July 80°, rainfall 10 in. The chief towns of Caucasia are situated in this valley, namely, Batum (28,512 inhabitants) and Poti (7666), the two chief ports on the Black Sea: Kutais (34,492), on the Rion; Tiflis (160,645); and Baku (112,253).

IV. The *Highlands of Transcaucasia* present three distinct regions: the plateaux of Asia Minor and of Armenia, and the Lenkoran region on the Caspian. The first-named plateau, intersected by the Pontic Ridge (from 10,000 to 12,152 ft. high), the Arjar and the Arsian ridges (10,000 to 11,000 ft.), and watered by the Chorokh, is chiefly inhabited by Mussulman Georgians (Lazes), who grow rice, millet, wheat, and all sorts of fruit. The Armenian plateau, separated by the deep valley of the Araxes from its continuation in Turkish Armenia, has mostly altitudes of from 5000 to 6000 feet. It consists of granites covered with Azoic, Devonian, Carboniferous,

Tertiary, and Glacial deposits, and is deeply ravined by rivers. Mountain ranges, which have their bases on the surface of the plateau, and reach altitudes of from 8000 to 9500 ft., and occasionally more, intersect it in various directions; while huge Trachitic masses, such as the Alaghöz (13,436 ft.) and the Ararat (17,212 ft.), rise above its undulating and ravined surface. The climate is severe on the plateau and very hot in the deeper valleys. Thus, even at Erivan (40° 15′ N.), at an altitude of 3230 ft., the averages are as low as these: year 51° Fahr., January 16°, July 75°; and at higher altitudes the winters are still more severe. The yearly amount of rain is only from 9 to 24 inches. The population consists of Armenians, Tatars, Turks, Kurds, Turkomans, and Russians, who do not number, however, more than 15,000. Cattle-breeding and some agriculture are carried on on the plateau, while cotton, rice, and all sorts of fruit are grown in the deeper valleys. As to the Lenkoran district, which lies on the slopes of the Azerbaijan plateau, its climate is extremely warm and moist. The temperature of the coldest month is 37° at Lenkoran, and the yearly amount of rain exceeds 40 inches.

Population. The *population* of Caucasia has been rapidly increasing, and it reached, in 1897, 9,248,695 (4,891,054 men and 4,357,641 women), of whom 996,248 lived in towns. Of this population, 3,786,784 lived in the three North Caucasian provinces and 5,461,911 in Transcaucasia (including Daghestan). The population belongs to a great variety of stems, but it has been proved by modern ethnological research, especially by Baron Uslar, Schiefner, and Zagursky, that the former opinion as to the existence of 150 or 300 different nationalities was exaggerated. Many of the languages that are spoken in different parts of the Caucasus have proved to be but local dialects of a few distinct languages. According to the classification established by Baron Uslar and Zagursky, the different nationalities of Caucasia may be classed as they are given in the table on this page.

Most of the Russians and the Georgians, with the exception of the Moslem Lazes, belong to the Greek Orthodox Church (4,076,173 according to estimates for 1886-97); but considerable numbers of the former are Nonconformists of different denominations (121,824, but probably much more). The Armenians, with the exception of a small number of Catholics (34,008), are Gregorians (979,566). The mountaineers, as also the Turks and the Tatars, are nearly all Sunnite Mussulmans (2,021,334), and the Persians Shiite Mussulmans (884,131), while the Mongols are Buddhists (20,311), and the Kurds are Yezids (14,979).

The movement of population in 1897 was, 350,457 births (3·9 per cent.), and 226,295 deaths (2·5 per cent.), showing thus an increase of 1·4 per cent. (124,162).

Agriculture is the main occupation of the settled inhabitants, and cattle-breeding among the nomads. The total crops for 1897 were: 9,322,000 quarters of wheat and other cereals in Northern Caucasia, and 11,910,000 quarters in Transcaucasia, it being estimated that in an average year Caucasia has an available surplus of 3,000,000 tons of cereals. The yearly crop of raw cotton (chiefly Armenian), grown mostly in Eastern Transcaucasia, is estimated at 10,000 tons, and of tobacco at 36,000,000 lbs. Various sorts of grass (rye-grass, lucerne, &c.) are widely cultivated in Transcaucasia, and nearly 60 cwts. of madder are obtained. The culture of melons and water-melons, as also of the sunflower (for oil), is widely spread; and it is estimated that nearly 54,000 acres are under vineyards in North Caucasia and 278,000 acres in Transcaucasia, giving an aggregate of 30,000,000 gallons of wine. Gardening is brought to a high degree of perfection, and the silkworm is bred so as to obtain every year over 100,000 cwts. of cocoons and to give occupation to about twenty steam silk unwinding mills and great numbers of small native ones. The gathering of the liquorice root (about 600,000 cwt.), of laurel leaves, &c., is worthy of notice. The culture of the tea-tree has been introduced.

The prairies and steppes of both Northern Caucasia and Transcaucasia are stocked with live stock, and Caucasia has 1,017,460 horses, 121,360 donkeys and mules, 5,883,000 horned cattle, 14,100,000 sheep, 360,000 swine, and 24,400 camels.

In their domestic trades many of the inhabitants of Caucasia, including the mountaineers, attain a very high degree of perfection, and their produce is mostly characterized by a high artistic taste. Carpets, woollen cloth, various goods made out of the finest goat wool, and the *burkas*, or Circassian fur cloaks, are among the chief items. Next come various goods made out of wood and metals (small arms in Daghestan, chiselled silver work at Akhaltsykh, &c.), of leather (saddlery, decorated girdles, &c.), and also the making of various sorts of oil, and so on.

1896.	North Caucasia.	Transcaucasia.
A. White Race.		
I. Indo-Europeans.		
Slavonians: Russians	2,795,122	122,257
Poles	10,598	3,735
Germans	25,267	9,356
Romans (French, Moldavians)	...	1,224
Greeks	...	55,507
Iranians: Persians	2,381	10,687
Tates, Talyshins	...	175,193
Ossets	90,000	76,445
Kurds	...	100,043
Armenians	31,525	239,131
Hindus (Tsiganes)	...	725
II. Semites.		
Jews	7,812	34,386
Aisors (Chaldeans)	...	2,372
III. Caucasians.		
1. Kartvelians or Iberes:		
(*a*) Georgians:		
Georgians proper	4,473	381,208
Tushins, Pshaves, Khevzurs, and Mtiulians	...	23,663
Imeretians	...	423,201
Gurians	...	76,095
Ajars, Enghilois	...	68,343
(*b*) Mingrelians	...	213,030
(*c*) Lazes	...	1,781
(*d*) Svanetians	...	14,035
2. Western Mountaineers: Abhazes	...	60,445
Kabardians, &c.	183,516	3,971
3. Eastern Mountaineers:		
Chechens	282,504	917
Lezghian branches:		
Avars and Andians group	...	194,918
Dargo group	...	123,756
Kyurin ,,	...	173,328
Undetermined kinship with the above groups	...	96,731
Udines	...	7,301
B. Mongolian Race.		
I. Turkish Stem.		
Azerbaijan Tatars	...	1,139,659
Turks	...	70,226
Turkomans	...	8,893
Karapapakhs (Black Bonnets)	...	24,134
Nogais	45,000	2,556
Trukhmens (Turkomans?)	...	19,000
Kumyks	31,519	60,838
II. Mongols.		
Kalmycks	10,000	...
III. Finnish Stems.		
Esthonians, Mordovians	...	1,382
Total	3,519,717	4,020,472
Total, Caucasus	7,540,189	

The mining industry is rapidly growing in importance. Copper ore is extracted in the governments of Tiflis, Elisabethpol, Kutais, and Erivan (85,000 tons of ore, 2700 tons of copper in 1897); silver ore in Terek, Kubañ, and Kutais (8500 tons); iron ore in Elisabethpol to a small extent; and manganese ore in Kutais (230,000 tons); also some cobalt, sulphur, and quicksilver. The extraction of coal in Kubañ and Kutais is still in its infancy (22,000 tons). Naphtha, on the contrary, is obtained in very large and ever-growing quantities (6,854,000 tons in Baku, 295,000 tons in Terek, 2320 tons in Kubañ, and 450 tons in Tiflis and Daghestan). About 241,000 tons of rock salt in Erivan and Kars, and from 10,000 to 18,000 tons of lake salt, are extracted every year.

The industries are represented by 26,811 factories and workshops,

giving occupation to 91,289 persons and yielding a yearly production valued at £6,882,800.

The schools in Caucasia were in 1897: fourteen gymnasia and progymnasia for boys (6196 pupils) and twenty for girls (7247), 10 *Realschulen* (3176), five schools for teachers (389), four town (732), five mountaineers' (638), three marine (181), fourteen professional schools (987), and 150 private schools (7272 pupils). For primary education there were 1380 schools (88,182 pupils), all under the Ministry of Public Education. There were, besides, nineteen secondary and 1308 primary schools kept by Cossacks and under other departments, and having an aggregate of 42,671 boys and 13,520 girls. In the Mussulman and Jewish schools there were 2235 and 1360 pupils respectively.

Caucasia has two main lines of railways, both running N.W. to S.E., in the N. and in the S. of the Caucasus range. The former, starting at Rostov on the Don, runs to Vladikavkaz (402 miles), and thence to Petrovsk on the Caspian Sea (180 miles), whence it has been continued along the sea-coast, *viâ* Derbent, to Baku (234 miles). One branch connects the Tikhoryetskaya station of this line with Novorossiysk on the Black Sea (168 miles), and is continued north-eastwards to Tsaritsyn on the Volga (333 miles); two others connect the watering-towns Kislovodsk and Pyatigorsk with the main line. A third branch to Kizlyar is being built. The Transcaucasian line, connected with the first-named at its far eastern end only, *i.e.*, at Baku, begins at Batum and Poti on the Black Sea and runs, through the Suram tunnel, to Tiflis and past Elisabethpol to Baku (400 miles from Batum). It has small branches to Kutais, to Tkvibuli coal-mines, to Chiaturi and Darkweti, to Stavropol, with the main line at Kavkazskaya station (96 miles), and to Borzhom, while a line of great strategic importance has been built from Tiflis to Kars (185 miles).

The Transcaucasian line and Tiflis can thus only be reached by rail on a very circuitous line *viâ* Baku. The usual way of communication is by post-horses from Vladikavkaz to Tiflis, *viâ* the Darial gorge. A road has been made from Vladikavkaz to Kutais *viâ* the Mamisson Pass. The other passes across the Caucasus (see above) are mere bridle-paths.

The chief ports of Caucasia are Batum, Poti, Novorossiysk and Sukhum on the Black Sea, Baku and Petrovsk on the Caspian. The exports from the Black Sea ports reach about 60,000,000 roubles (£6,000,000), and consist chiefly of naphtha, manganese ore, linseed, raw silk and wool, liquorice root, corn, salt, and timber. The chief imports, about £1,000,000 worth, are tin and cheap timber (for naphtha boxes), iron, steel, tin, lead, chemicals, glass, china, and machinery. The maritime trade with Persia averages yearly £850,000 worth for the exports (naphtha, cottons, metals) and £760,000 for the imports (rice, carpets, dried fruit), to which items those of the inland trade with Persia (about £400,000 of imports and £100,000 of exports) have to be added. The internal trade of Caucasia with Russia is very considerable both by land and by sea. The ports of Caucasia were visited in 1892 by 1165 foreign ships and 4073 engaged in cabotage.

For the administrative subdivisions of Caucasia, see RUSSIA.

AUTHORITIES.—The literature of the Caucasus is immense. The best general description in a West European language is, according to Stebnitsky and Masalsky, that of ELISÉE RECLUS in *Geographie Universelle* (English version by KEANE), to which Gen. STEBNITSKY has made most careful annotations in the Caucasian *Zapiski*. There may also be mentioned now, by way of supplementing the list of works quoted in the ninth edition: FRESHFIELD and others. *The Exploration of the Caucasus.* 2 vols. London and New York, 1896.—V. SELLA and D. VALLINO. *Nel Caucaso Centrale.* Turin, 1890.—ABICH. *Geologische Forschungen.*—G. RADDE. *Vier Vorträge.* 1874.—E. CHANTRE. *Recherches Anthropologiques dans le Caucase.* 1885-87.—R. ERCKERT. *Der Caucasus und seine Völker.* 1885.—Articles "Caucasus," &c., in SEMENOFF'S *Geographical Dictionary* (*Slovar*), and in *Russkiy Encyclopedicheskiy Slovar* (1894), by V. MOSALSKY, MILLER, &c.; *Zhivopisnaya Rossiya*, vol. ix.; also by LITVIOROFF, PROTSENKO, V. KRIVENKO, NADEZHDIN, EGIAZAROFF (institutions), O. MILLER and M. KOVALEVSKY (ancient law).—The *Zapiski* and the *Izvestia* of the Caucasian and the Russian Geographical Societies and *Sbornik Materialov* are mines of information, while the *Kavkazskiy Kalendar*, published every year at Tiflis, contains, besides recent statistics and maps, full bibliographical indexes (also lately in the St. Petersburg *Izvestia*).—The local publications of the separate provinces, and the reviews *Zemlevyedenie* (Moscow), *Etnograficheskoye Obozryenie*, &c., may also be consulted.—The best maps (general, orographical, relief, ethnographical, &c.) are those issued from the Military Topographical Depot of the General Staff.

(P. A. K.)

Caudebec-lès-Elbeuf, a French town, in the arrondissement of Rouen, department of Seine Inférieure, 12 miles S. by W. of Rouen, on railway to Louviers. It is practically a suburb of Elbeuf, and has important manufactures of cloth and wool-spinning. Population (1881), 11,290; (1901), 6981.

Caudry, a town and railway station of France, in the department of Nord, arrondissement of Cambrai, 39 miles in direct line S.S.E. of Lille. It has important manufactures of tulle and lace: others are muslin, guipure, chicory, and sugar. Population (1881), 4956; (1901), 9934.

Caulfield, a borough (created 13th April 1901) of Victoria, Australia, in the county of Bourke, 7½ miles E. of Melbourne, with which it is connected by rail. It has a fine racecourse, the headquarters of the Victorian Amateur Turf Club. Population (1891), 8005; (1901), 9607.

Cautin, a province of southern Chile, situated between 38° 25′ and 39° 35′ S. lat., 71° 00′ and 73° 25′ W. long. Its area is 3120 square miles. The population in 1895 was 78,221. It is divided into two departments, Temuco and Imperial. In 1898 there were 1837 births, 456 marriages, and 1510 deaths. Temuco is the capital.

Cava dei Tirreni, a town, bishop's see, and summer resort of the province of Salerno, Campania, Italy, 6 miles N.W. from Salerno by the railway to Naples. Population, about 16,250.

Cavagnari, Sir Pierre Louis Napoleon (1841-1879), British military administrator, was by birth a Frenchman, being the son of a French general by his marriage with an Irish lady, and was born at Stenay, in the department of the Meuse, 4th July 1841. He nevertheless obtained naturalization as an Englishman and entered the military service of the East India Company. After passing through the college at Addiscombe, he served through the Oudh campaign against the mutineers in 1858 and 1859. In 1861 he was appointed an assistant commissioner in the Punjab, and in 1877 became deputy commissioner of Peshawar, and took part in several expeditions against the hill tribes. In 1878 he was attached to the staff of the British embassy to Kabul, which the Afghans refused to allow to proceed. In May 1879, after the death of the Amir Sher Ali, Cavagnari negotiated and signed the treaty of Gandamak with his successor, Yakub Khan. By this the Afghans agreed to admit a British resident at Kabul, and the post was conferred on Cavagnari, who also received the Star of India and was made a K.C.B. He took up his residence in July, and for a time all seemed to go well, but on 3rd September Cavagnari and the other European members of the embassy were massacred in a sudden rising of mutinous Afghan troops. (See AFGHANISTAN.)

Cavallotti, Felice (1842-1898), Italian politician, was born at Milan, 6th November 1842. In 1860 and 1866 he fought with the Garibaldian Corps, but first attained notoriety by his anti-monarchical lampoons in the *Gazzetta di Milano* and in the *Gazzettina Rosa* between 1866 and 1872. Elected to Parliament as deputy for Corteolona in the latter year, he took the oath of allegiance after having publicly impugned its validity. Eloquence and turbulent combativeness in and out of Parliament secured for him the leadership of the Extreme Left on the death of Bertani in 1886. During his twelve years' leadership his party increased in number from twenty to seventy, and at the time of his death his parliamentary influence was greater than ever before. Though ambitious and addicted to defamatory methods of personal attack which sometimes savoured of political blackmail, Cavallotti's eloquent advocacy of democratic reform, and apparent generosity of sentiment, secured for him a popularity surpassed by

that of no contemporary save Crispi. Services rendered in the cholera epidemic of 1885, his numerous lawsuits and thirty-three duels, his bitter campaign against Crispi, and his championship of French interests, combined to enhance his notoriety and to increase his political influence. By skilful alliances with the marquis di Rudinì he more than once obtained practical control of the Italian Government, and exacted notable concessions to Radical demands. He died on 6th March 1898, the House of Savoy losing a relentless foe and the revolutionary elements in Italy a gifted, if not entirely trustworthy leader. (H. W. S.)

Cavalry.—The derivation of the word cavalry is quaintly given in the oldest English work which deals exclusively with the subject: "Cavalrie, so called of Cavallo, which in the Italian and Spanish signifieth a horse, derived from the Latin word Caballus, and this from the Greek, *καβάλλης*." Ideal cavalry consists of a body of trained and disciplined horsemen, mounted on sound and well-broken horses, under the command of efficient officers. The weapons of cavalry are now, almost universally, a magazine carbine, sighted to about 2000 yards, and *l'arme blanche*, that is, the sword and the lance, although the use of the latter weapon is not general in all cavalry in all European armies. The rôle of cavalry is in the offensive: it supplies the eyes and ears of the army; it acts as a veil to screen the disposition of its comrades of other arms, as was well illustrated by the Germans in the campaign of 1870; and it serves as a hammer to clinch a victory and turn the retreat of a shaken foe into a disastrous rout. Murat's pursuit of the Germans after Jena is a brilliant example of this form of cavalry action. It forms a shield and sometimes a scapegoat to sacrifice itself, so that time may be gained to enable other arms to rally or retreat, as was shown by the Austrian cavalry at Königgrätz, and by the French at Wörth and at Sedan. Napoleon lays down as a maxim that "it is the business of cavalry to follow up the victory and to prevent the beaten enemy from rallying," and this is the keynote of the action of victorious cavalry on a stricken field. Another golden rule which has to be impressed on every trooper is that with "the enemy once found touch must never be lost." Denison, in his *History of Cavalry*, quotes Murat's pursuit of the retreating Russians beyond Moscow, when he resolutely set his face towards Asia in spite of every discouragement, as one of the grandest examples that history records.

Improvements in the firearms of the present day have rendered a successful cavalry charge upon unshaken infantry only possible under abnormal conditions, and it is in taking advantage of cover, and in seizing the fleeting opportunities of surprise, that the cavalry charge will depend for great results. It was the sudden and unexpected charge of Kellerman's cuirassiers at Marengo that turned the triumphant advance of the Austrians into a rout of far-reaching and disastrous consequences, and there may yet occur chances of successful enterprise of this description for well-trained cavalry under a bold and vigilant commander, though such golden opportunities seem likely to be few and far between. At the same time, the very improvements in firearms that make the charge difficult have conferred on cavalry an independence and self-reliance hitherto unknown. Associated with mobile horse artillery, galloping quick-firing guns, machine guns, and perhaps mounted infantry and cyclists, cavalry should now be able to travel far and fast, and, so long as supplies are forthcoming, to render itself to some degree independent of the slow-moving infantry; thus rapid raids may be carried out, as was so well done in the American war by both Federals and Confederates, and positions may be seized and turning movements effected that were formerly impossible. The German uhlans in 1870, whose only firearm was a pistol, were constantly checked by French franc-tireurs, and were obliged to await the arrival of supporting infantry before they could advance. This could hardly occur nowadays.

The individual cavalryman should be able to ride and shoot, to find his way across country, to scout in such a way as to see without being seen, and to report intelligently what he has seen, to shift for himself and for his horse under all conditions, and last, but not least, to be master of his weapons. Intelligent, active, healthy men who can do all this are the right material for cavalry. The recruit having been medically passed, is put through a course of gymnastics, at the same time being taught to groom his horse and to clean his kit. Riding and foot-drill follow; he is taught the sword, lance, and carbine exercises, and how to perform the various and complicated evolutions of increasing and diminishing the front, &c., which still obtain in Great Britain, though much simplified in other countries. In about six months he should be thoroughly trained on foot. He also goes through a recruit's musketry training during his first year, consisting of preliminary drills, practices, and lectures, followed by the firing of 200 rounds at a target. After this he becomes a trained soldier, and as such undergoes an annual course of squadron training, riding, and musketry. There are, besides, special courses open to such men as are selected as suitable in pioneering, horse-shoeing, cooking, saddling, sketching, signalling, first aid to wounded, and working the machine gun, as well as a voluntary school of elementary education. Squadron training is a course of instruction under the squadron commander which lasts about two months every year, in which the soldier should be thoroughly taught his duties in the field and camp; in fact, made efficient for war.

Training.

The whole secret of teaching a man to ride is to give him confidence, without which he will never develop into a dashing horseman. Every endeavour should be made to raise the pupil's courage, and care taken never to damp it; experience shows that the recruit who has been allowed to use his stirrups and to cling to his wallets or saddle with all his might, until he has gained the art of balance and acquired confidence, will very soon be proud to ride with crossed stirrups, loose reins, and folded arms. Lessons should not exceed an hour, and half an hour with crossed stirrups is ample. All work should be gradual; first the walk, then the trot, then the canter. The details of the ride will be found in *Cavalry Drill*, 1898, page 36. Briefly, the recruit will learn the turns, circles, inclines, bending lesson, passaging, &c., finally jumping and post practice. In four months he should begin to learn to wield his weapons—to cut, thrust, and guard sword exercise, pursuing practice, lance exercise, &c. In six months he should be fit to take his place in the ranks.

The young horse on arrival in barracks is examined by the veterinary surgeon, and if free from contagious disease is sent to the stable set apart for the young horses, where he is put on soft food and given gentle exercise, being quietly led about for the first six weeks until he has sufficiently improved in condition to commence his training. This consists of steady lunging on a cavesson for about a fortnight for ten minutes to half an hour a day until he gets his paces. In addition he must be regularly exercised for an hour a day. He will then be quietly saddled, and next mounted and dismounted, then led round on a cavesson with a man on his back, and then ridden without cavesson at a walk, then a trot. He is gradually taught to bend, to rein back,

Horses.

to passage, and to make the turns and circles; after this he will be taught to canter. All this having been done on the bridoon or snaffle-rein, he will now be bitted, steady straightforward work being done for about a fortnight so as not to spoil his mouth. The drill of the ride is gradually taken up, and the horse is accustomed to carry the sword and the carbine bucket. After about six months' training he should be taught to jump, first of his own accord without a rider, and then mounted. He must be trained to stand fire, and after about eight months to go down the heads and posts. Finally, he may work with the other young horses in the field; and after twelve months he should be fit to take his place in the ranks, as a five- or six-year-old, as the case may be. An article in the "Badminton Library" volume on *Riding*, by Captain Robert Weir, gives an excellent description of how to train young horses. Throughout his training the horse must be encouraged, lessons being short, and everything done as quietly and gently as possible. "Never act with anger towards a horse is the first and best precept that can be impressed upon the mind." Xenophon wrote this twenty-three centuries ago, and it is as true now as it was in his time.

Generally speaking—for war naturally creates an exception—the supply of troop horses for the British cavalry comes principally, but by no means exclusively, from Ireland. They are bought at ages of from rising 4 to 7 (usually rising 4 to 5 and untrained); their height ranges from 15.2 to 16 hands, and the price paid is, as a rule, from £30 to £40. The remount department, with which the horse supply rests, consists of the inspector-general of remounts, 3 assistant purchasing officers, 2 staff captains who have charge of the remount depots at Woolwich and Dublin, 2 captains and quartermasters of the Army Service Corps who deal with forage, &c., and 3 veterinary surgeons. The horses are sent direct to their destined regiments, or temporarily retained at one of the two remount depots at Woolwich or Dublin. For purposes of supply in time of war there is a system of registration which was introduced by General Ravenhill in 1892, by which a retaining fee of 10s. per horse per annum is paid to owners on condition that they produce the horse at forty-eight hours' notice, or render themselves liable to a fine of £50. The price at which each horse is to be bought, if taken, is arranged between the owner and inspector from year to year; the agreement may be terminated at six months' notice on either side. For purposes of registration Great Britain and Ireland are divided into fifty districts, to each of which a veterinary surgeon is attached. It is estimated that there are 3,000,000 horses in the British isles. Selected officers are also sent to foreign countries for the purchase of remounts when occasion demands. With regard to the supply of horses to foreign armies, some are obtained by purchase as in England, but many are bred at the Government haras or breeding establishments. Horses are, as a rule, well trained before being sent to their regiments, a system which prevents men from being taken from the ranks in order to break the young horses.

Organization.

The same organization of cavalry holds good, with few exceptions, throughout the great military nations of the world. A cavalry division consists of 2 brigades; a brigade of 2 regiments (3 in the case of England); a regiment of 4 to 6 service squadrons and a depot squadron. In the British army there are only 3 service and 1 depot squadrons, and an English cavalry regiment meeting a foreign regiment in the field would consequently be outnumbered by from 150 to 450 men. The tactical unit is the squadron, which consists as a rule of 150 men, and is divided into four troops of roughly from 25 to 35 men, and each troop is divided into three or four sections. The war establishment of an English cavalry brigade consists of the following:—

Staff—4 officers, 17 warrant N.C.O.s, and 19 men.
3 Cavalry regiments—75 officers and 1518 men, 3 machine guns.
1 Battery R.H.A.—6 officers, 176 men, 6 guns.
Ammunition column—4 officers, 106 men.
2 Companies mounted infantry—12 officers, 294 men, 2 machine guns.
Supply column—5 officers, 120 men.
Bearer company—3 officers, 94 men.
Field hospital—5 officers, 56 men.
Total, 114 officers and 2383 men.
2448 Horses, of which 9 are pack and 556 draught.
32 Two-horse vehicles, including 5 machine guns.
82 Four-horse vehicles.
22 Six-horse vehicles, including 6 R.H.A. guns.

Although the squadron system obtains throughout Europe, there are of course details of equipment which vary in different armies. Thus the Germans since the war of 1870 have armed the whole of their cavalry with lances, using hollow steel instead of ash or bamboo poles. The Austrians, on the other hand, since 1885 have abolished the lance; and the French have no lancers, but the front rank of their dragoons carry lances. In Great Britain, besides the regular lancer regiments, the front ranks of dragoon guards and dragoons are also armed with lances. The Russians have two lancer regiments of the guard, and vast numbers of Cossack lancers, but the 56 dragoon regiments of the line which form the main body of the Russian regular cavalry are armed with long rifles and bayonets. The Italians arm their first 10 regiments with lances. The remaining Italian cavalry carry carbines with a light bayonet, which when not wanted is inverted over the cleaning-rod. The French supplement their cavalry with infantry cyclists, using the folding cycle invented by their commander, Major Gerard. The machine can be folded up and slung on the back in thirty seconds. It is claimed by the French that the cycle has proved its usefulness for military purposes, and that wherever the roads are good and the country suitable they will play an important part in future wars. Other nations are beginning to follow suit, all using cyclists as messengers whenever possible, to save their horses. The Berthon boat accompanies German cavalry. In Great Britain two companies of mounted infantry are attached to a cavalry brigade; these are simply mounted riflemen, and are not expected to fight on horseback. A machine gun is attached to every British cavalry regiment and to each company of mounted infantry, but has not as yet been adopted by the cavalry of foreign nations. The French alone maintain the cuirass for war, unlike other nations who use it only for parade. The 13 regiments of cuirassiers are armed with straight swords, 47 inches long, and revolvers, and are also provided with 60 carbines per regiment. The Hungarian cavalry are all hussars. The Austrian cavalry consists of uhlans and dragoons. The Austrians supplement their cavalry with quick marching infantry, and 35 miles in a day is no unusual distance for Austrian foot to cover on manœuvres. Signallers are trained to a great degree of proficiency in the British cavalry, but are little used by other nations. Automobiles and motors have been experimented with in both Austria and France for military purposes, and particularly for cavalry transport. The above are some of the points of difference of equipment that occur in the cavalry of Europe. Drill, except in the case of the Russian dragoons, is practically the same throughout, the great desideratum being to make it as simple as possible.

Yeomanry.—The first idea of yeomanry appears in 1745, when the gentlemen of Yorkshire raised a royal regiment of hunters to fight against Prince Charles Edward. The idea was resuscitated at the end of the 18th century, when Great Britain was in dread of an invasion by Napoleon.

The British yeomanry force now numbers some 11,000 men, whose annual training lasts about ten days a year. With so short a training great results are not to be expected, but it is wonderful how much is accomplished in the time, and men and horses are excellent. The Imperial Yeomanry employed in South Africa consisted of men specially enlisted for one year, or until the end of the war, to act as mounted infantry. (See also under ARMIES.) (W. A.-T.)

Cavan, an inland county of Ireland, province of Ulster.

Population.—The area of the administrative county in 1900 was 497,025 acres, of which 132,391 were tillage, 261,104 pasture, 127 fallow, 5281 plantation, 13,493 turf-bog, 4685 marsh, 12,375 barren mountain, and 37,569 water, roads, fences, &c. The new administrative county under the Local Government (Ireland) Act, 1898, is identical with the old judicial county. Population (1881), 129,476; (1891), 111,917; (1901), 97,368, of whom 49,982 were males and 47,386 females, divided as follows among the different religions:—Roman Catholics, 78,021; Protestant Episcopalians, 14,095; Presbyterians, 3256; Methodists, 981; other denominations, 115. The decrease of population between 1881 and 1891 was 13·56. The average number of persons to an acre was ·23. The following table gives the degree of education in 1891:—

	Males.	Females.	Total.	Percentage.		
				R.C.	Pr. Epis.	Presb.
Read and write .	36,806	35,391	72,257	68·3	82·9	87·9
Read only . .	5,873	6,920	12,793	13·6	8·9	7·3
Illiterate . . .	8,591	7,692	16,283	18·1	8·2	4·8

In 1881 the percentage of illiterates among Roman Catholics was 25·2. In 1891 there were 7 superior schools, with 150 pupils (67 Roman Catholics and 83 Protestants), and 295 primary schools, with 17,314 pupils (13,879 Roman Catholics and 3435 Protestants). The number of pupils on the rolls of the national schools on 30th September 1899 was 18,953, of whom 15,248 were Roman Catholics and 3705 Protestants. The following table gives the numbers of births, deaths, and marriages in various years:—

Year.	Births.	Deaths.	Marriages.
1881	3099	2091	328
1891	2148	1826	377
1899	2003	1472	376

In 1899 the birth-rate per 1000 was 17·9, and the death-rate 13·2; the rate of illegitimacy was 1·5 per cent. of the total births. The total number of emigrants who left the county between 1st May 1851 and 31st December 1899 was 110,468, of whom 56,084 were males and 54,384 females. The following are the chief towns in the county, with their populations in 1891:—Cavan, 2968; Belturbet, 1675; Cootehill, 1593.

Administration.—The county is divided into two parliamentary divisions, East and West, the number of registered electors in 1900 being respectively 9372 and 9944. The rateable value in 1900 was £278,596. By the Local Government (Ireland) Act, 1898, the fiscal and administrative duties of the grand jury and (to a less extent) of other bodies were transferred to a county council, urban and rural district councils were established, and under that Act the county now comprises 2 urban and 7 rural sanitary districts.

Agriculture.—The following tables show the acreage under crops (including meadow and clover), and the amount of live stock, in 1881, 1891, 1895, and 1900:—

	Wheat.	Oats.	Barley, Beans, etc.	Potatoes.	Turnips.	Other Green Crops.	Meadow and Clover.	Flax.	Total.
1881	379	46,856	91	26,355	2015	2083	60,083	8897	148,169
1891	474	39,547	215	25,939	3421	3181	70,167	3382	147,676
1895	270	31,979	60	24,781	3551	2866	70,030	4944	141,475
1900	504	30,349	79	23,654	2021	3028	70,657	1219	732,361

For 1899 the total value of cereal and other crops was estimated by the Registrar-General at £906,713. The number of acres under pasture in 1881 was 246,141, and in 1900, 261,104.

	Horses and Mules.	Asses.	Cattle.	Sheep.	Pigs.	Goats.	Poultry.
1881	11,503	3131	104,737	14,360	31,753	15,442	510,318
1891	13,304	3749	121,243	25,634	51,084	20,342	594,589
1895	14,017	3943	117,423	18,251	51,797	18,581	640,093
1900	13,268	3379	121,908	26,562	56,171	18,284	737,320

The number of milch cows in 1891 was 45,224, and in 1900, 45,903. It is estimated that the total value of cattle, sheep, and pigs in 1899 was £1,650,243. In 1900 the number of holdings not exceeding 1 acre was 1169; between 1 and 5, 1447; between 5 and 15, 6916; between 15 and 30, 6913; between 30 and 50, 2471; between 50 and 100, 931; between 100 and 200, 222; between 200 and 500, 46; and above 500, 6—total, 20,121. The number of loans issued (the number of tenants being the same as the number of loans) under the Land Purchase Acts, 1885, 1891, and 1896, up to 31st March 1900, was 1854, amounting to £335,831. The number of loans sanctioned for agricultural improvements under sect. 31 of the Land Act, 1881, between 1882 and 1900, was 702, and the amount issued was £40,327. The total amount issued on loan for all classes of works under the Land Improvement Acts, from the commencement of operations in 1847 to 31st March 1900, was £55,690. (W. H. Po.)

Cavendish, George (1500-1562?), the biographer of Cardinal Wolsey, was the elder son of Thomas Cavendish, clerk of the pipe in the exchequer, and his wife, Alice Smith of Padbrook Hall. He was probably born at his father's manor of Cavendish, in Suffolk. Later the family resided in London, in the parish of St Alban's, Wood Street, where Thomas Cavendish died in 1524. Shortly after this event George married Margery Kemp, of Spains Hall, an heiress, and the niece of Sir Thomas More. About 1527 he entered the service of Cardinal Wolsey as gentleman-usher, and for the next three years he was divided from his wife, children, and estates, in the closest personal attendance on the great man. Cavendish was wholly devoted to Wolsey's interests, and also he saw in this appointment an opportunity to gratify his master-passion, a craving "to see and be acquainted with strangers, in especial with men in honour and authority." He was faithful to his master in disgrace, and showed the courage of the "loyal servitor." It is plain that he enjoyed Wolsey's closest confidence to the end, for after the cardinal's death George Cavendish was called before the Privy Council and closely examined as to Wolsey's latest acts and words. He gave his evidence so clearly and with so much natural dignity, that he won the applause of the hostile council, and the praise of being "a just and diligent servant." He was not allowed to suffer in pocket by his fidelity to his master, but retired, as it would seem, a wealthy man to his estate of Glemsford, in West Suffolk, in 1530. He was only thirty years of age, but his appetite for being acquainted with strange acts and persons was apparently sated, for we do not hear of his engaging in any more adventures. It is not to be doubted that Cavendish had taken down notes of Wolsey's conversation and movements, for many years passed before his biography was composed. At length, in 1557, he wrote it out in its final form. It was not, however, possible to publish it in the author's lifetime, but it was widely circulated in MS. Evidently one of these MSS. fell into Shakespeare's hands, for that poet made use of it in his *King Henry VIII.*, although it is excessive to say, as Singer has done, that Shakespeare "merely put Cavendish's language into verse." The book was first printed in 1641, in a garbled text, and under the title of *The Negotiations of Thomas Wolsey.* The genuine text, from contemporary MSS., was given to the world in 1810, and more fully in 1815. Until that time it was believed that the book was the composition of George Cavendish's younger brother William, the founder of Chatsworth, who also was attached to Wolsey. Joseph Hunter proved this to be impossible, and definitely asserted the claim of George. The latter is believed to have died at Glemsford in or about 1562. The intrinsic value of Cavendish's *Life of Cardinal Wolsey* has long been perceived, for it is the sole authentic record of a multitude of events highly important in a particularly interesting section of the history of England. Its importance as a product of biographical

literature was first emphasized by the late bishop of London, Dr Mandell Creighton, who insisted over and over again on the claim of Cavendish to be recognized as the earliest of the great English biographers and an individual writer of particular charm and originality. He writes with simplicity and with a certain vivid picturesqueness, rarely yielding to the rhetorical impulses which governed the ordinary prose of his age. (E. G.)

Cawnpore (KHANPUR), a city and district of British India, in the Allahabad division of the North-West Provinces. The city is situated on the right bank of the Ganges, 417 feet above the sea; 684 miles by rail from Calcutta. In 1881 it had a population of 151,444; in 1891, of 188,712, showing an increase of nearly 25 per cent. In 1901 the population was 197,000, showing a further increase of 4 per cent. The municipal income in 1896-97 was Rs.3,61,899. In 1897 the death-rate was 49·59 per thousand. The municipality, with a population of 163,779, is governed by a board of 24 members, of whom 22 are elected. The waterworks provide an annual supply of about 480 million gallons of filtered water, being 8 gallons a head daily, at a total cost of four annas per thousand gallons. In 1897-98 the chief items of expenditure were: Rs.72,234 on water-supply, Rs.14,657 on drainage, and Rs.56,459 on other public works. The principal educational institutions are: the aided Christ Church College, with 36 students in 1896-97; the Government agricultural school for the province; industrial schools maintained by the S.P.G. and the American mission; and several high schools. There are 29 printing-presses, issuing 5 English and 5 vernacular newspapers. Besides Government manufactories of leather and flour, Cawnpore possesses 4 cotton-mills, having a total capital of Rs.59,00,000, with 1638 looms and 230,000 spindles, employing more than 6000 hands, producing 25,000,000 lb of yarn and woven goods valued at Rs.30,43,000; a woollen mill, having a capital of Rs.20,00,000, with 302 looms and 12,000 spindles, employing 1500 hands, producing all kinds of goods valued at Rs.15,35,000; a jute mill, having a capital of Rs.3,75,000, with 73 looms and 1574 spindles, employing 345 hands; two flour-mills, employing 132 hands, with an out-turn valued at Rs.9,70,000; four large tanneries and leather factories; a small iron-foundry; and factories of ice and mineral waters. Cawnpore is also a great railway centre, where the lines of the East Indian, the Oudh and Rohilkhand, the Indian Midland, and the Rajputana railways all meet. Since 1875 the Ganges has been crossed by an iron girder bridge of 25 spans, superseding the former bridge of boats. The cantonments, to the east of the native quarter, contain accommodation for a battery of artillery, a European and native infantry regiment, and a native cavalry regiment.

The district of CAWNPORE has an area of 2363 square miles. It had a population in 1881 of 1,181,396, and in 1891 of 1,209,695, showing an increase of 2 per cent., and an average density of 512 persons per square mile. In 1901 the population was 1,259,243, showing a further increase of 4 per cent. The land revenue and rates were Rs.24,47,361, the incidence of assessment being R.1:6:7 per acre; the cultivated area in 1896-97 was 737,218 acres, of which 241,883 were irrigated; the number of police was 3606; the number of vernacular schools in 1896-97 was 140, with 6435 pupils; the registered death-rate in 1897 was 41·15 per thousand. The district is watered by four branches of the Ganges canal, and traversed by two lines of railway. There are 98 indigo factories, employing 5000 persons, with an out-turn valued at Rs.8,84,000, and sugar-works with an out-turn valued at Rs.3,00,000.

Cayley, Arthur (1821-1895), English mathematician, born at Richmond in Surrey, 16th August 1821, was the second son of Henry Cayley, a Russian merchant, and Maria Antonia Doughty. Mr Henry Cayley retired from business in 1829 and settled in Blackheath, where Arthur was sent to a private school kept by the Rev. G. B. F. Potticary; at the age of fourteen he was transferred to King's College School, London. He soon showed that he was a boy of great capacity, and in particular that he was possessed of remarkable mathematical ability. On the advice of the school authorities he was entered at Trinity College, Cambridge, as a pensioner. He was there coached by William Hopkins of Peterhouse, was admitted a scholar of the college in May 1840, and graduated as Senior Wrangler in 1842, and obtained the first Smith's Prize at the next examination. In 1842, also, he was elected a Fellow of Trinity, and became a Major Fellow in 1845, the year in which he proceeded to the M.A. degree. He was assistant tutor of Trinity for three years. In 1846, having decided to adopt the law as a profession, he left Cambridge, entered at Lincoln's Inn, and became a pupil of the conveyancer Mr Christie. He was called to the Bar in 1849, and remained at the Bar fourteen years, till 1863, when he was elected to the new Sadlerian Chair of Pure Mathematics in the University of Cambridge. He settled at Cambridge in the same year, and married Susan, daughter of Robert Moline of Greenwich. He continued to reside in Cambridge and to hold the professorship till he died, 26th January 1895. From the time he went first to Cambridge till his death he was constantly engaged in mathematical investigation. The number of his papers and memoirs, some of them of considerable length, exceeds 800; they were published, at the time they were composed, in various scientific journals in Europe and America, and are now embodied, through the enterprise of the syndics of the Cambridge University Press, in thirteen large quarto volumes. These form an enduring monument to his fame. He wrote upon nearly every subject of Pure Mathematics, and also upon Theoretical Dynamics and Spherical and Physical Astronomy. He was quite as much a geometrician as he was an analyst. Among his most remarkable works may be mentioned his ten Memoirs on Quantics, commenced in 1854 and completed in 1878; his creation of the Theory of Matrices; his researches on the Theory of Groups; his Memoir on Abstract Geometry, a subject which he created; his introduction into geometry of the "Absolute"; his researches on the higher singularities of curves and surfaces; the classification of cubic curves; additions to the Theories of Rational Transformation and Correspondence; the theory of the twenty-seven lines that lie on a cubic surface; the theory of elliptic functions; the attraction of ellipsoids; the British Association Reports, 1857 and 1862, on recent progress in general and special theoretical dynamics and on the secular acceleration of the moon's mean motion. He is justly regarded as one of the greatest of mathematicians. Competent judges have compared him to Euler for his range, analytical power, and introduction of new and fertile theories. He was the recipient of nearly every academic distinction that can be conferred upon an eminent man of science. Amongst others may be noted honorary degrees by the universities of Oxford, Dublin, Edinburgh, Göttingen, Heidelberg, Leyden, and Bologna. He was Fellow or foreign corresponding member of the French Institute, the Academies of Berlin, Göttingen, St Petersburg, Milan, Rome, Leyden, Upsala, and Hungary; and he was nominated an officer of the Legion of Honour by President Carnot. At various times he was President of the Cambridge Philosophical Society, of the London Mathematical Society, and of the Royal Astronomical

Society. He was elected a Fellow of the Royal Society in 1852, and received from that body a Royal Medal in 1859 and the Copley Medal in 1882. He also received the De Morgan Medal from the London Mathematical Society, and the Huyghens Medal from Leyden. His nature was noble and generous, and the universal appreciation of this fact gave him great influence in his university. His portrait, by Lowes Dickinson, was placed in the hall of Trinity College in 1874, and his bust, by Henry Wiles, in the library of the same college in 1888. (P. A. M.)

Ceará, an Atlantic state of Brazil, situated between 2° 45′ and 7° 11′ S. lat., and 36° 45′ and 41° 15′ W. long. Its area is 40,253 square miles. The population in 1872 was 721,086, and in 1890 was 805,687. The capital, Fortaleza, has 48,000 inhabitants. Amongst the other towns are Aracaty (18,000 inhabitants), Barbalha, Cascavel, Crato, Granja, Icó, Igatú, Quixeramobim, Sant' Anna, Quixadá, and San Bernardo das Russas. There are railways from the port of Camocim to Sobral (80 miles), and from Fortaleza to Quixeramobim-Quixadá (117 miles).

Cebu, capital of the island of Cebu, Philippine Islands, beautifully situated on its eastern coast, a little north of the centre. Its port, formed by the islands of Mactan and Opon, is well protected from violent winds. The streets are wide and regularly laid out. The Government buildings are fair, and the church buildings very fine. It is an episcopal see, and the palace of the bishop, although small, is noted for its interior decorations. The Augustinian church is famous for its so-called miraculous image of Santo Niño. The Recoleto monastery and the seminary of San Carlos are worthy of mention. The cathedral was finished towards the end of the 18th century. There is a leper hospital in the outskirts of the town. Historically, Cebu is famous as the scene of Magellan's landing in 1521. A cross, said to be the identical one first erected by him, is still preserved in the cathedral. The great explorer lost his life in the neighbouring island of Mactan. The first Spanish settlement in the Philippines was established at Cebu in 1565, and from that year to 1571 it was the capital of the colony. Commercially, it is the third city of the Philippines. Its trade amounts to some $3,000,000 (gold) annually. Hemp and sugar are the most important exports. Salt, pottery, and fabrics of silk, sinamay, hemp, and cotton are manufactured, and sugar sacks are woven in considerable quantity. In addition to the trade with foreign ports, an important domestic commerce is carried on with Manila, Bohol, Negros, and northern Mindanao. The language is Cebu-Visayan. Population, 24,000.

Cedar Creek, a small branch of the North Fork of Shenandoah river, in a valley of Virginia, U.S.A. It is known in American history as the scene of a memorable battle, which took place on 9th October 1864, between the Union army under Sheridan and the Confederates under Early. The Confederates attacked at daybreak, effecting a surprise, and driving back the Union forces in confusion. Sheridan was at this time on his way back to his army from an absence in Washington, and reached the field in the midst of the rout. By his presence he stopped the retreat, the advancing Confederates were checked, and then, taking the offensive, the Union troops drove the Confederates from the field, gaining a complete victory. The losses on both sides were heavy. Those on the Federal side were 6000 in killed and wounded, and the Confederates admitted a loss of 3100.

Cedar Falls, a city of Blackhawk county, Iowa, U.S.A., on the Red Cedar river. Population (1890), 3459; (1900), 5319, of whom 863 were foreign-born.

Cedar Rapids, a city of Linn county, Iowa, U.S.A., situated in 41° 58′ N. lat. and 91° 31′ W. long., on Cedar river, in the eastern part of the state, at an altitude of 732 feet. It is the headquarters of the Burlington, Cedar Rapids, and Northern railway, with its works, and is entered also by the Illinois Central, the Chicago and North-Western, and the Chicago, Milwaukee, and St Paul railways, which make it an important transportation centre. The city has a fine water-power in Cedar river, and its manufactures are extensive and varied. Coe College, a Presbyterian institution, was founded in 1881. In 1898 it had a faculty numbering ten, and was attended by 106 students, more than half of whom were women. Population (1880), 10,104; (1890), 18,020; (1900), 25,656, of whom 4478 were foreign-born and 230 were negroes.

Cefalu, a seaport town and bishop's see of Sicily, Italy, in the province of Palermo, on a promontory on the N. coast, 42 miles by rail E. by S. of Palermo on the line to Messina. A bronze statue was erected here in 1894 to the Sicilian patriot Niccolo Botta. The people carry on sardine-fishing, and there is some trade. Population, about 16,000.

Ceglie, a town of the province of Lecce, Apulia, Italy, 23 miles W. from Brindisi. It produces olive oil, lime, and building stone. Population, about 14,000.

Cehegin, a town of Spain, in the province of Murcia, with a population in 1897 of 11,365. It is situated on the right bank of the river Quipar. On the height styled Cabecico de Roenas stood the Roman town of Begastri, from the ruins of which the inhabitants for centuries obtained the stone for their principal church, the house of Yañez Espin, and the convent of San Francisco, on whose walls can be seen the Roman inscriptions and designs. Spanish antiquaries believe the name Cehegin came from the Berber invaders of the 10th century, Zinhagies or Sinhachie.

Celænæ, in ancient geography an important city of Phrygia, situated on the great trade route to the East. Its acropolis was considered by Alexander to be impregnable. Beneath it were the palace of Xerxes and the Agora, in or near which was the cavern whence the Marsyas, one of the sources of the Mæander, issued. According to Xenophon, Cyrus had a palace and large park full of wild animals at Celænæ. The town was deserted when Apamea was founded.

Celebes, one of the four great Sunda Isles in the Dutch East Indies. Area, including the neighbouring islands (Sangir, Talaut, Saleyer, Buton, &c.), 77,865 square miles. The eastern part of the northern peninsula, Minahassa, consisting of volcanic rock with conglomerates and tufas, is separated by the Mongondo chain from the granitic diorite and gneiss of the western part (Boni chain), and the old eruptive rocks and slate of the Matinang and Oleida chains between Bwool and the Gulf of Tomini. The same (crystalline) slate occurs in Central Celebes, near Lake Posso, but, except in Minahassa, no volcanoes are found. The older sedimentary and eruptive rocks are surrounded by Tertiary and Quaternary alluvium, clay, and coralline limestone, but Mesozoic formations are wanting. The south-western peninsula has a volcano, the Peak of Bonthain. P. and F. Sarasin are of the opinion that the northern and southern peninsulas originally formed separate islands which were united to Central Celebes about the end of the Mesozoic period. The variations in surface relief are in conformity

with the geological structure. Minahassa consists of a plateau divided into smaller sections by volcanoes (highest Klabat, 6620 feet). In the west of the northern peninsula the interior consists in part of plateaux of considerable extent enclosed by the coast ranges. Near Lake Posso the mountains are higher; the Tampiko massif has a height of nearly 5000 feet, the chains south and west of the lake have a general altitude of about 5450 feet, with peaks still loftier. In the southern peninsula two chains stretch parallel with the west and east coasts; the former is the higher, with a general altitude of 3200 feet. In the south it joins the Peak of Bonthain, a volcanic mass as colossal as Etna, 10,088 feet high. An alluvial coast plain, 7 to 9 miles wide, stretches along the foot of the western chain, and between the two chains is the basin of the Walanmaë, flowing northwards into Lake Sidenreng. The orography of the eastern peninsula is still unexplored.

The rivers of the narrow mountainous peninsulas form many rapids and cataracts; as the Tondino, draining the lake of the same name to Menado; the Rano i Apo, flowing over the plateau of Mongondo to the Gulf of Amurang; the Poigar, issuing from a still unknown lake of that plateau; the Lombagin, traversing narrow cañons; and the river of Boni, which has its outfall in the plain of Gorontalo, near the mouth of the Bolango or Tapa, the latter connected by a canal with the Lake of Limbotto. All these rivers are navigable by praus or rafts for only a few miles above the mouth. In Central Celebes, the Kodina flows into Lake Posso, and the Kalaëna discharges to the Gulf of Boni; the Posso, navigable by *blottos* (canoes formed of hollowed tree-trunks), is the only river flowing from the lake to the Gulf of Tomini. The rivers of the southern peninsula, owing to the relief of the surface, are navigable to a somewhat greater extent. The Walanmaë flows into Lake Tempe, and, continued by the Jenrana (Tienrana), which discharges into the Gulf of Boni, is navigable for little boats; the Sadang, with many affluents, flows to the west coast, and is navigable by *sampans*. The Jenemaja (Djenemadja) is a broad river, navigable far from the mouth (Weber and Wichmann).

The coasts of Celebes consist of alluvium and of Tertiary strata (except where older rocks reach the coast); they are often fertile and well populated; but, as shown by the marine charts, many sand, mud, and stone banks lie near the shore, and consequently there are few accessible or natural ports or good roadsteads.

The climate of the island, everywhere accessible to the influence of the sea, is maritime-tropical, the temperature ranging generally between 77° and 80° F., the extremes being about 90° and 70° F., only on the higher mountains falling during the night to 54° or 55° F. The rainfall in the northern peninsula (north of the equator) differs from that of the southern; the former has rains (not caused by the monsoon), and of smaller amount, 102 inches annually; the latter has a greater rainfall, 157 inches, brought by the north-western monsoon, and of which the west coast receives a much larger share than the east. In natural vegetation and fauna, as well as in cultivated products, Celebes presents the transitional link between the Asiatic and the Australian regions of the Malayan province. For example, rice is produced here in smaller quantity and of inferior quality to that in the western part of the archipelago, but superior to that in the eastern section, where sago and miloe form the staple articles of food. The products of the forests, which differ in like manner, amount to from £80,000 to over £160,000 annually, supplying about half the total exports. Coffee in Minahassa yielded 9000 piculs in 1897. The fisheries include trepang, turtle, and pearl oysters. Gold is worked under European direction in the district of Gorontalo, but with only partial success; the search for coal in the southern peninsula has yielded no satisfactory results; tin, iron, and copper, found in the eastern peninsula and elsewhere, are utilized only for native industries.

Celebes is divided, for administrative purposes, into the Residency of Menado and the Government of Celebes with dependencies. The eastern peninsulas belong politically to the Residency of Ternate.

The *Residency of Menado* comprises three districts: Minahassa, the little states along the north coast west of Minahassa, and Gorontalo, including the other states of the northern peninsula lying along the Gulf of Tomini. Total area, 22,147 square miles. The following table shows the distribution and composition of the population:—

Districts.	Europeans.	Chinese.	Arabs.	Other Oriental Foreigners.	Natives.	Total.
Minahassa .	836	3574	286	16	296,617	301,329
Gorontalo .	115	505	133	...	247,056	247,809

The density of population being calculated at about 2·7 to 3 per square mile for Celebes, is 16·2 for Minahassa, but only 1·5 to 2 for the Residency of Menado. Centres of population in Menado are Amurang (3000), the seat of a controller, and a calling place for the steamers of the Indian Packet Company; Menado (10,000), the chief town of the residency, the principal station of the Dutch missionaries, with a fair amount of trade (200,000 tons), but an unsafe roadstead; Tondano (12,000; 10,000 Christians), near the lake and river of the same name, at an altitude of nearly 2000 feet, and one of the chief centres; Gorontalo, one of the most important towns of Celebes, carrying on direct trade with Singapore and Europe. All the other coast places have some importance as chief villages of the little states and as ports of call for the vessels of the steam packet company, but have only from 500 to 1000 inhabitants.

The *Government of Celebes and Dependencies* is subdivided into the government territory, the vassal states (Boni and Ternate), and the federal countries. The following figures show the number and composition of the population:—

	Europeans.	Chinese.	Arabs.	Other Oriental Foreigners.	Natives.	Total.
Government of Celebes and Dependencies	1414	3738	554	54	1,442,962	1,448,722

The density of population for the whole government is estimated at 3·7, or 4 per square mile, varying from 2·2 in the vassal and federated states to 14·7 to 18·4 for Macassar and the districts directly governed by the Dutch. The density of population in districts outside the influence of European government sinks to 1 and less per square mile. As in the case of Minahassa, the difference must be explained by physical and moral conditions. Two-thirds of the natives live by agriculture, and one-third by trade, navigation, shipbuilding, and other industries. The difference in occupation, as compared with Menado, is shown in the following table:—

	Traders.	Fishermen and Sailors.	Salt Workers.	Shipbuilders.	Gold and silversmiths.	Armourers.	Dyers in yarn.	Other Trades.
Government of Celebes and Dependencies	6753	13,419	604	248	658	188	226	6275
Minahassa .	225	1,431	27	..	42	..	..	149
Gorontalo .	1055	1,583	107	..	87	20	36	1582

In agreement with the three principal occupations, the centres of population are found in southern Celebes, on the coast (not in the interior plains or on the lake, as in Menado). Palos (3000), with good port; Pare-Pare, connected by road with Lake Tempe; and Macassar, the seat of the governor and the centre of trade for the eastern part of the archipelago. Declared a free port in 1832, the value of the trade of Macassar increased from £125,000 in that year to £1,250,000 in 1895. Of the 17,925 inhabitants, Europeans numbered 940, Chinese 2618, and Arabs

168. On the south coast must also be named Bonthain (4000); on the east coast, Balong-Nipa; and Buton and Saleyer, seats of administration and ports of call for the packet company's steamers, on the island groups of the same names.

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(C. M. K.)

Celle, a town of Prussia, province of Hanover, 27 miles by rail N.E. of Hanover, the former capital (14th century to 1705) of the dukes of Brunswick-Lüneburg. The ducal castle, begun in 1485, but dating in part from the 18th century, still stands. The parish church contains the tombs of the dukes, also of Sophia Dorothea, the divorced wife of George I. (of England). The law courts, with a good library, the national museum, and the hall of the estates, are the remaining buildings of note. There are manufactures of woollen yarn, tobacco, umbrellas, printers' ink, &c., and a lively trade is conducted in wool, timber, honey, and wax. Gardening is also carried on. Population (1885), 18,782; (1900), 19,884.

Cellier, Alfred (1844-1891), English musical composer, was born at Hackney in 1844. As a boy he was a chorister at the Chapel Royal, St James's, under the Rev. Thomas Helmore, where Arthur Sullivan was one of his youthful colleagues. His first appointment was that of organist at All Saints' Church, Blackheath (1862). In 1866 he succeeded Dr Chipp as director of the Ulster Hall concerts, Belfast, at the same time acting as conductor of the Belfast Philharmonic Society. In 1868 he returned to London as organist of St Alban's, Holborn. From 1871 to 1875 he was conductor at the Prince's Theatre, Manchester; and from 1877 to 1879 at various London theatres. During this period he composed many comic operas and operettas, of which the most successful was *The Sultan of Mocha,* which was produced at Manchester in 1874, in London at the St James's Theatre in 1876, and revived at the Strand Theatre in 1887. In 1880 Cellier visited America, producing a musical version of Longfellow's *Masque of Pandora* at Boston (1881). In 1883 his setting of Gray's *Elegy* in the form of a cantata was produced at the Leeds Festival. In 1886 he won the great success of his life in *Dorothy,* a comic opera written to a libretto by B. C. Stephenson, which was produced at the Gaiety Theatre in September 1886, and, transferred first to the Prince of Wales's Theatre and subsequently to the Lyric Theatre, ran until April 1889. *Doris* (1889), and *The Mountebanks,* which was produced in January 1892, a few days after the composer's death, were less successful. Cellier owed much to the influence of Sullivan. He had little of the latter's humour and vivacity, but he was a fertile melodist, and his writing is invariably distinguished by elegance and refinement. He died in London in 1891. (R. A. S.)

Cement.—Any material capable of adhering to and uniting into a coherent mass fragments of a substance not in itself adhesive, is a cement. Glue, gum, paste, putty, mortar, and Portland cement are familiar examples of materials of this class. In practice, however, the term "cement" used without qualification means Portland cement, its modifications and congeners: these are all hydraulic cements, *i.e.*, when set they resist the action of water, and can, under favourable conditions, be allowed to set under water. It was well known to builders in the earliest historic times that certain limes would, when set, resist the action of water, *i.e.*, were hydraulic; it was also known that this property could be conferred on ordinary lime by admixture of silicious materials such as puzzuolana or tufa. We have here the two classes into which hydraulic cements are divided.

Puzzuolanic cement.

When pure chalk or limestone is "burned," *i.e.*, heated in a kiln until its carbonic acid has been driven off, it yields pure lime. This slakes violently with water, giving slaked lime, which can be made into a smooth paste with water and mixed with sand to form common mortar. The setting of the mortar is due to the drying of the lime (a purely physical phenomenon), no chemical action occurring between the lime and the sand. The function of the sand is simply that of a diluent to prevent undue shrinkage and cracking in drying. Subsequent hardening of the mortar is caused by the gradual absorption of carbonic acid from the air by the lime, a skin of carbonate of lime being formed; but the action is superficial. Mortar made from pure or "fat" lime cannot withstand the action of water, and is only used for work done above water-level. If, however, such "fat" lime is mixed in the presence of water, not with sand but with silica in an active form, *i.e.*, amorphous and (generally) hydrated, or with a natural silicate containing silica in an active condition, it will unite with the silica and form a silicate of lime capable of resisting the action of water. The mixture of the lime and active silica or silicate is a puzzuolanic cement. The simplest of all puzzuolanic cements would be a mixture of pure lime and hydrated silica, but though the latter is prepared artificially for various purposes, it is too expensive to be used as a cement material. A similar obstacle lies in the way of using a certain native form of active silica, viz., Kieselguhr, for it is too valuable as an absorbent of nitroglycerine, for the manufacture of dynamite, to be available for making puzzuolanic cement. There are, however, many silicious substances occurring abundantly in nature which can thus be used. They are mostly of volcanic origin, and include pumice, tufa, santorin earth, trass, and puzzuolana itself. The following analyses show their general composition:—

	Neapolitan Puzzuolana (per cent.).	Roman Puzzuolana (per cent.).	Trass (per cent.).
Soluble silica (SiO_2)	27·80	32·64	19·32
Insoluble silicious residue	35·38	25·94	50·40
Alumina (Al_2O_3)	19·80	22·74	13·88
Ferric oxide (Fe_2O_3)			3·10
Lime (CaO)	5·68	4·06	..
Magnesia (MgO)	0·35	1·37	0·18
Sulphuric anhydride (SO_3)	Trace	Trace	..
Combined water (H_2O)	4·27	8·92	7·57
Carbonic anhydride (CO_2)			..
Moisture	..	..	5·04
Alkalies and loss	6·72	4·33	0·58
	100·00	100·00	100·00

An artificial product which serves perfectly as a puzzuolana is granulated blast-furnace slag. The slag, which must contain a high percentage of lime, is granulated by being run while fused into abundance of water. This granulated slag differs from the same slag allowed to cool slowly, in that a portion of the energy which it possesses while fused is retained after it has solidified. It bears to ordinary slowly-cooled slag a similar relation to that borne by plastic sulphur to ordinary crystalline sulphur. This potential energy becomes kinetic when the slag is brought

into contact with lime in the presence of water, and causes the formation of a true hydraulic silicate of lime. The following analysis shows the composition of a typical slag:—

	Per cent.
Insoluble residue	1·04
Silica (SiO_2)	31·50
Alumina (Al_2O_3)	18·56
Manganous oxide (MnO)	0·44
Lime (CaO)	42·22
Magnesia (MgO)	3·18
Soda (Na_2O)	0·70
Sulphuric anhydride (SO_3)	0·45
Sulphur (S)	2·21
	100·30
Deduct oxygen equivalent to sulphur	1·10
	99·20

Granulated slag of this character is ground with slaked lime until both materials are in a state of fine division and intimately mixed. The usual proportions are three of slag to one of slaked lime by weight. The product termed slag cement sets slowly, but ultimately attains a strength scarcely inferior to that of Portland cement. Puzzuolanic cements are little used in England. Generally speaking they are only of local importance, their cheapness depending largely on the nearness and abundance of some suitable volcanic deposit of the trass or tufa class. They are not usually manufactured by the careful grinding together of the puzzuolana and the lime, but are mixed roughly, a great excess of puzzuolana being employed. This excess does no harm, for that part which fails to unite with the lime serves as a diluent, much as does sand in mortar. In fact, ordinary puzzuolanic cement made on the spot where it is to be used may be regarded as a better kind of common mortar having hydraulic qualities. Good hydraulic mortars may be made from lime mixed with furnace ashes or burnt clay as the puzzuolanic constituent.

Portland cement.

Cements of the Portland type differ in kind from those of the puzzuolanic class; they are not mechanical mixtures of lime and active silica ready to unite under suitable conditions, but consist of definite chemical compounds of lime and silica and lime and alumina, which, when mixed with water, combine therewith, forming crystalline substances of great mechanical strength, and capable of adhering firmly to clean inert material, such as stone and sand. They are made by heating to a high temperature an intimate mixture of a calcareous substance and an argillaceous substance. The commonest of such substances in England are chalk and clay, but where local conditions demand it, limestone, marl, shale or any similar material may be used, provided the correct proportions of calcium carbonate, silica, and alumina are maintained. The earliest forms of cements of the Portland class were the hydraulic limes. These are still largely used, and are prepared by burning limestones containing clayey matter. Some of these naturally possess a composition differing but little from that of the mixture of raw materials artificially prepared for the manufacture of Portland cement itself. Although hydraulic limes have been in use from the most ancient times, their true nature and the reason of their resistance to water have been known for less than 100 years. Next in antiquity to hydraulic lime is Roman cement, prepared by heating an indurated marl occurring naturally in nodules. Its name must not be taken to imply that it was used by the ancients; in point of fact the manufacture of this substance dates back only about 100 years.

With the growth of engineering in the early part of the 19th century arose a great demand for hydraulic cement. The supply of materials containing naturally suitable proportions of calcium carbonate and clay being limited, attempts were made to produce artificial mixtures which would serve a similar end. Among those who experimented in this direction was Joseph Aspdin, of Leeds, who added clay to finely-ground limestone, calcined the mixture, and ground the product, which he called Portland cement. The only connexion between Portland cement and the place Portland is that the cement when set somewhat resembles Portland stone in colour. True, it is possible to manufacture Portland cement from Portland stone (after adding a suitable quantity of clay), but this is merely because Portland stone is substantially carbonate of lime; any other limestone would serve equally well. Although Portland cement is later in date than either Roman cement or hydraulic lime, yet on account of its greater industrial importance, and of the fact that, being an artificial product, it is of approximately uniform composition and properties, it may conveniently be treated of first. The greater part of the Portland cement made in England is manufactured on the Thames and Medway. The materials are chalk and Medway mud; in a few works the latter is replaced by gault.

The composition of typical samples of chalk and clay is shown in the following analyses:—

Chalk.	Per cent.	Clay.	Per cent.			
Silica (SiO_2)	0·92	Insoluble silicious matter	26·67	Consisting of Quartz (SiO_2)	19·33	
Alumina + ferric oxide (Al_2O_3 + Fe_2O_3)	0·24	Silica (SiO_2)	31·24	Silica (SiO_2)	5·19	Felspar 7·34 per cent.
Lime (CaO)	55·00	Alumina (Al_2O_3)	16·60	Alumina (Al_2O_3)	1·47	
Magnesia (MgO)	0·36	Ferric oxide (Fe_2O_3)	8·66	Magnesia (MgO)	0·03	
Carbonic anhydride (CO_2)	43·40	Lime (CaO)	0·25	Soda (Na_2O)	0·65	
	99·92	Magnesia (MgO)	1·91		26·67	
		Soda (Na_2O)	1·00			
		Potash (K_2O)	0·45			
		Sodium chloride (NaCl)	1·86			
		Combined water, organic matter, and loss	11·36			
			100·00			

These materials are mixed in the proportion of about 3:1 by weight so that the dried mixture contains approximately 75 per cent. of calcium carbonate, the balance being clay. The mixing may be effected in several ways. The method once exclusively used consists in mixing the raw materials with a large quantity of water in a wash mill, a machine having radial horizontal arms driven from a central vertical spindle and carrying harrows which stir up and intermix any soft material placed in the pit in which the apparatus revolves. The raw materials in the correct proportion are fed into this mill together with a large quantity of water. The thin watery "slip" or slurry flows into large settling tanks ("backs") where the solids in suspension are deposited; the water is drawn off,

Mixing.

leaving behind an intimate mixture of chalk and clay in the form of a wet paste. This is dug out, and after being dried on floors heated by flues is ready for burning. This process is now almost obsolete. According to present practice the raw materials are mixed in a wash mill with so much water that the resulting slurry contains 40 to 50 per cent. of water. The slurry, which is wet enough to flow, is ground between millstones so as to complete the process of comminution begun in the wash mill. Thorough grinding and mixing are of the utmost importance, as otherwise the cement ultimately produced will be unsound and of inferior quality. The drying of the slurry is generally effected by the waste heat of the kilns, so that while one charge is burning another is drying ready for the next loading of the kilns. The kilns most commonly employed nowadays are "chamber kilns," circular structures not unlike an ordinary running lime kiln, but having the top closed and connected at the side with a wide flue in which the slurry is exposed to the hot products of combustion from the kiln. The farther ends of the flues of several such kilns are connected with a chimney shaft. The slurry, in drying on the floor of the flue, forms a fairly tough cake which cracks spontaneously in the process of drying into rough blocks suitable for loading into the kiln. At the bottom of the kiln is a grate of iron bars, and on this wood and coke are piled to start the fire. A layer of dried slurry is loaded on this, then a layer of coke, then a layer of slurry, and so on until the kiln is filled with coke and slurry evenly distributed. Fresh slurry is run on to the drying floors, and the kiln is started. The construction of an ordinary chamber kiln may be gathered from the accompanying diagram (Fig. 1).

Loading the kiln.

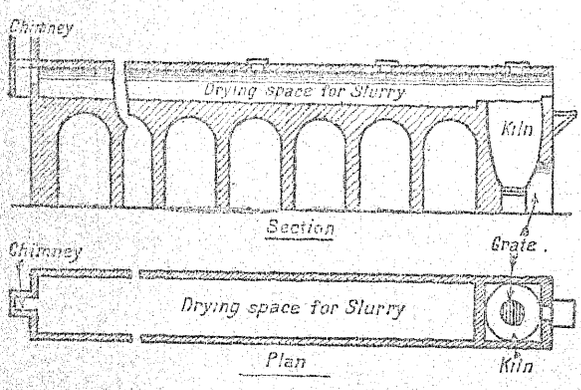

Fig. 1.

The operation of burning is a slow one. An ordinary kiln, which will contain about 50 tons of slurry and 12 tons of coke, will take two days to get fairly alight, and will be another two or three days in burning out. Therefore, allowing adequate time for loading and unloading, each kiln will require about one week for a complete run. The output will be about 30 tons of "clinker" ready to be ground into cement. The grinding of the hard rock-like masses of clinker is effected between millstones, or in modern plants in ball-mills, tube-mills, and edge-runners. It is an important part of the manufacture, because the finished cement should be as fine and 'floury' as possible. The foregoing description represents the procedure in use in many English factories. There are various modifications in practice according to local conditions; a few of these may be described. In all cases, however, the main operations are the same, viz., intimately mixing the raw materials, drying the mixture, if necessary, and burning it at a clinkering temperature (about 1500° C. = 2732° Fahr.). Thus when hard limestone is the form of calcium carbonate locally available, it is ground dry and mixed with the correct proportion of clay also dried and ground. The mixture is slightly damped, moulded into rough bricks, dried and burned. A possible alternative is to burn the limestone first and mix the resulting lime with clay, the mixture being burned as before. By this method grinding the hard limestone is avoided, but there is an extra expenditure of fuel in the double burning.

Many different forms of kiln are used for burning Portland cement. Besides the chamber kilns which have been described, there are the old-fashioned bottle kilns, which are similar to the chamber kilns, but are bottle-shaped and open at the top, they do not dry the slurry for their next charge. Their use is becoming obsolete. There are also stage kilns of the Dietsch type, which consist of two vertical shafts, one above the other, but not in the same vertical line, connected by a horizontal channel. At this middle portion and in the upper part of the lower shaft the burning proper proceeds; the upper shaft is full of unburnt raw material which is heated by the hot gases coming from the burning zone, and the lower shaft contains clinker already burned and hot enough to heat the incoming air which supplies that necessary for combustion at the clinkering zone. A pair of Dietsch kilns, built back to back, are shown in Fig. 2. Another form is the

Other kilns.

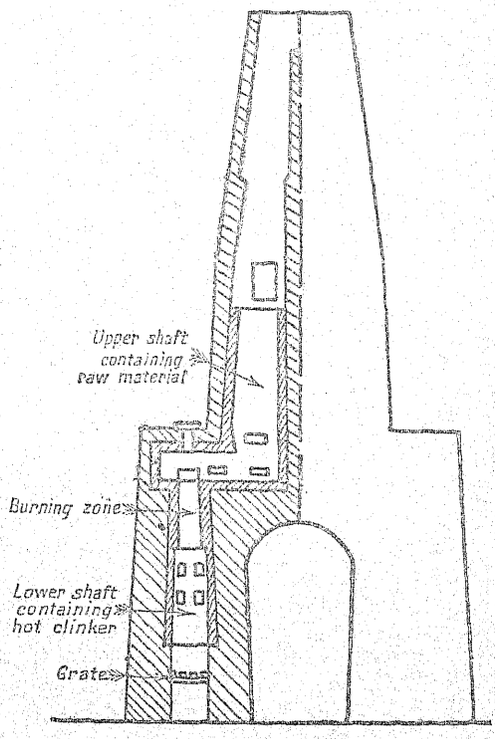

Fig. 2.

Hoffmann or ring kiln, made up of a number of compartments arranged in a ring and connected with a central chimney; in these compartments rough brick-shaped masses of the raw materials are stacked, and between these bricks fuel is sprinkled. At a given moment one of these compartments is burning and at its full temperature; the air for combustion is drawn in through one or more compartments behind it which have just finished burning, and is thereby strongly heated; the products of combustion pass away through one or more compartments in front of it and heat their contents before they are subjected to actual combustion. It will be seen that the principle of the ring kiln is similar to that of the stage kiln. In each case the clinker which has just been burned and is fully hot serves to heat the air supply to the com-

partment where combustion is actually proceeding; in like manner the raw materials about to be burned are well heated by the waste gases from the compartment in full activity before they themselves are burned. (It may be noted that here and generally in this article "burn" is used in the technical sense; it is technically correct to speak of cement clinker being "burned," although it is not a fuel; in accurate terms it is the fuel which is burned, and it is the heat it generates which raises the clinker to a high temperature, *i.e.*, technically "burns" it.) By this device a great part of the heat is regenerated and a saving of fuel is effected.

Rotatory kiln.

A more modern method of burning cement is by means of rotatory kilns. These are largely used in the United States, and are being introduced into England and on the Continent. They consist of cylinders about 60 ft. long and 6 ft. in diameter placed at a slight angle with the horizontal, and carried on rollers so that they can be rotated by power. The cylinders are made of boiler plate and lined with refractory bricks. At the upper end the raw material is fed in either as a dry powder or as slurry; at the lower end is a powerful burner. Most of the kilns used in the United States employ petroleum as a fuel, but more recently powdered coal injected by a blast of air has been adopted. The rotation and slight inclination of the cylinder cause the raw material to descend towards the lower end. At the upper end the raw material is dried and heated moderately; as it descends it reaches a part of the kiln where the temperature is higher; here the carbonic acid of the carbonate of lime and the combined water of the clay are driven off, and the resulting lime begins to act chemically on the dehydrated clay. The material is then in a partially burnt and slightly sintered state, but is not fully clinkered and would not make Portland cement. As the kiln continues to revolve, the partly burnt material reaches the lower end of the kiln which is nearest the burner, and where the temperature is highest, and is there heated so highly that the union of the lime, silica, and alumina is complete, and fully burned clinker falls out of the kiln. It is extremely hot, and passes down one or more inclined rotating cylinders

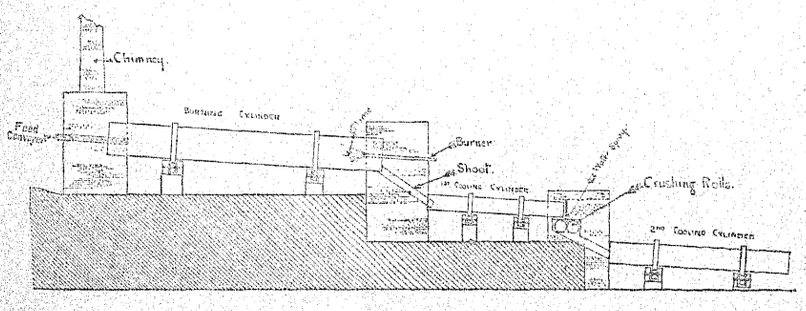

Fig. 3.

similar to the first, but acting as coolers instead of kilns. On its way down the cylinders the clinker meets a current of cold air and is cooled, the air being correspondingly warmed and passing on to aid in the combustion of the fuel used in heating the kiln. This regenerative heating is similar in principle and effect to that obtained by means of the Dietsch and ring kilns. The output of one of these kilns is about 200 tons per week, as against 30 tons for an ordinary chamber kiln. A large saving in labour is also secured. The system presents many advantages, and is likely to replace the older methods of cement making. Fig. 3 represents diagrammatically a rotatory cement plant on the Hurry and Seaman system.

Portland cement clinker, however produced, is a hard, rock-like substance of semi-vitrified appearance and very dark colour. The product from a well-run rotatory kiln is all evenly burnt and properly vitrified; that from an ordinary fixed kiln of whatever type is apt to contain a certain amount (5 to 15 per cent.) of underburnt material, which is yellowish and friable and is not properly clinkered. This material must be picked out, as such underburnt stuff contains free lime or unsaturated lime compounds. These may slake slowly in the finished cement and cause such expansion as may destroy the work of which it forms part. Well-burnt, well-picked clinker when ground yields good Portland cement. Nothing is added during or after grinding save a small amount (1 to 2 per cent.) of calcium sulphate in the form either of gypsum or of plaster of Paris, which is sometimes needed to make the cement slower-setting. This small addition for this specified purpose is recognized as legitimate, but the employment of various cheap materials such as ragstone and blast-furnace slag, sometimes added as diluents or make-weights, is adulteration and therefore fraudulent.

Cement clinker.

The composition of Portland cement varies within comparatively narrow limits, and the variations are tending to become smaller as regularity and skill in manufacture increase. The following analysis may be taken as typical of cements made from chalk and clay on the Thames and Medway:—

Composition.

	Per cent.
Silica (SiO_2)	22·0
Insoluble residue	1·0
Alumina (Al_2O_3)	7·5
Ferric oxide (Fe_2O_3)	3·5
Lime (CaO)	62·0
Magnesia (MgO)	1·0
Sulphuric anhydride (SO_3)	1·5
Carbonic anhydride (CO_2)	0·5
Water (H_2O)	0·5
Alkalies	0·5
	100·0

There may be minor variations from this composition. Thus the silica may range from 20 per cent. to 24 per cent., the alumina and ferric oxide jointly from 9 per cent. to 13 per cent., the lime from 60 per cent. to 65 per cent. Other things being equal, the higher the percentage of lime within the limits indicated above the stronger is the cement, but such highly limed cement is less easy to burn than cement containing about 62 per cent. of lime; and unless the burning is thorough and the raw materials are intimately mixed, the cement is apt to be unsound. Although the ultimate composition of cement, that is, the percentage of each base and acid present, can be accurately determined by analysis, its proximate composition, *i.e.*, the nature and amount of the compounds formed from these acids and bases, can only be ascertained indirectly and with difficulty. The best and most recent investigation on this subject has been made by M. H. le Chatelier, whose work has since been supplemented by that of Messrs Spenser B. Newberry and W. B. Newberry. According to Le Chatelier, the chief constituent of Portland cement is tri-calcium silicate, $3CaO\ SiO_2$, a substance which when mixed with water combines with it according to the equation

$$2\,[3CaO\ SiO_2] + 9\,H_2O = 2[CaO\ SiO_2]\,5\,H_2O + 4Ca(OH)_2.$$

The products of this reaction, hydrated mono-calcium silicate and calcium hydroxide, crystallize and form a mass of interlocking crystals which constitutes the bulk of

set cement. The other chief constituent of Portland cement is a calcium aluminate. According to Le Chatelier, this body is a tri-calcium aluminate and sets when mixed with water and lime derived from other constituents of the cement, such as unstable ferrites, or from the decomposition of the tri-calcium silicate mentioned above, according to the equation

$$3CaO\,Al_2O_3 + Ca(OH)_2 + 11\,H_2O = 4CaO\,Al_2O_3\,12\,H_2O.$$

According to Messrs Newberry, however, the aluminate is di-calcium aluminate, $2\,CaOAl_2O_3$; the mode of hydration and setting of this body has not been studied. Although the precise composition of the aluminate is still a matter for discussion, it is generally admitted that it is the chief agent in the first setting of the cement. The ultimate hardening and the attainment of strength are due to the tri-calcium silicate. The function of the ferric oxide present in ordinary cement is little more than that of a flux to aid the union of the silica, alumina, and lime in the clinker; its rôle in the setting of the cement is altogether secondary. Magnesia is present in most Portland cements in quantities varying from 1 to 5 per cent. Within this range it appears to be inert, forming no cementitious compound. There is evidence that in larger proportion, *e.g.*, 10 to 15 per cent., it may hydrate and set after the general setting of the cement, and may give rise to disruptive strains and cause the cement to "blow" and fail. In so-called natural cement (p. 633) which is comparatively lightly burnt, the magnesia appears to be inert, and as much as 20 to 30 per cent. may be present. Another constituent of Portland cement which influences its setting time is calcium sulphate, naturally formed from the sulphur in the raw materials or fuel, or intentionally added to the finished cement as gypsum or plaster of Paris. It has a remarkable retarding effect on the hydration of the calcium aluminate, and consequently on the setting of the cement; thus it is that a little gypsum is often added to convert a naturally quick-setting cement into one which sets slowly. It will be observed that in the hydration of tri-calcium silicate, the main constituent of Portland cement, a large portion of the lime appears as calcium hydroxide, *i.e.*, slaked lime. It is evident that this will form a puzzuolanic cement (p. 628) if a suitable silicious material such as trass is added to the cement. The ultimate product when set may be regarded as a mixed Portland and puzzuolanic cement. The use of trass in this manner as an adjunct to Portland cement has been advocated by Michaelis, but has not become general.

Testing. The quality of Portland cement is ascertained by its analysis and by determining its specific gravity, fineness, mechanical strength, and soundness. A good sample will have a composition within the limits cited above and approximating to the typical figures given on p. 631. It will be ground so finely that not more than 10 per cent. will be left on a sieve of 76×76 meshes per square inch, the wires of the sieve being 0·005 inch in diameter. It will have, when freshly burned, a specific gravity not lower than 3·15, and briquettes made from it and kept in water will possess a tensile strength of 400–500 lb per square inch seven days after they are made, while briquettes made from a mixture of 3 parts by weight of sand and 1 of cement will give about 200 lb per square inch at twenty-eight days. The soundness of the cement is ascertained by keeping thin pats of cement in water for seven and twenty-eight days at the ordinary temperature. The test is accelerated so that a valid opinion may be pronounced in a short time by keeping the water hot, *e.g.*, at 110° Fahr. or 176° Fahr. In this case an unsound cement may generally be detected in twenty-four hours. A pat of sound cement under these conditions remains free from cracks and does not buckle. A cement slightly unsound will show numerous small cracks, while one which is markedly unsound may even go to pieces. A rigorous and exact test for soundness is that formulated by Deval, who has shown that briquettes of 3 of sand and 1 of cement kept in water for two days at 80° C. = 176° Fahr. attain approximately the same strength as similar briquettes attain at seven days in water at the ordinary temperature. In like manner briquettes kept at 176° Fahr. for seven days are equal in strength to those kept at the ordinary temperature for twenty-eight days. A cement not perfectly sound will give low results in the hot test, and a cement of indifferent soundness will crack and go to pieces. The test is admittedly severe, but can be passed without difficulty by cement made with proper care and skill. There are many modifications and elaborations of all the tests which have been mentioned. Cement for all important work is submitted to a rigorous system of testing and analysis before it is accepted and used.

Hydraulic Lime is a cement of the Portland as distinct from the puzzuolanic class. The most typical hydraulic lime is that known as Chaux du Theil, made from a limestone found at Ardèche in France. This limestone consists of calcium carbonate most intimately intermixed with very finely divided silica. It contains but little alumina and oxide of iron, which are the constituents generally necessary to bring about the union of silica and lime to form a cement, but in spite of this the silica is so finely divided and so well distributed that it unites readily with the lime when the limestone is burned at a sufficiently high temperature. English hydraulic limes are of a different class. They contain a good deal of alumina and ferric oxide, and in composition resemble somewhat irregular Portland cement. Analyses of the two classes of hydraulic lime are as follows:—

	Chaux de Theil. Per cent.	Blue Lias. Per cent.
Insoluble silicious matter	0·3	2·39
Silica (SiO_2)	21·7	14·17
Alumina (Al_2O_3)	1·8	6·79
Ferric oxide (Fe_2O_3)	0·6	2·34
Lime (CaO)	74·0	63·43
Magnesia (MgO)	0·7	1·54
Sulphuric anhydride (SO_3)	0·3	1·63
Carbonic anhydride (SO_2)	0·6	3·64
Water (H_2O)		2·69
Alkalies and loss	...	1·38
	100·0	100·0

Hydraulic lime contains a good deal of uncombined lime, and has to be slaked before it is used as a cement. In France this slaking is conducted systematically by the makers, the freshly burned lime being sprinkled with water and stored in large bins where slaking proceeds slowly and regularly until the whole of the surplus uncombined lime is slaked and rendered harmless, while the cementitious compounds, notably tri-calcium silicate, remain untouched. In English practice hydraulic lime is slaked by the user. Seeing that regular and perfect slaking is more easily attained when working systematically on a large scale and by storing the material for a long period, the French method is the better and more rational. The product may then be regarded as a cement of the Portland class mixed with slaked lime. When gauged with water and made into a mortar it sets slowly, but ultimately becomes almost as strong as Portland cement. Its slow setting is an advantage for some purposes, *e.g.*, for foundations and abutments where settlements may occur. The structure is free to take its permanent position before the lime sets, and cracks are thus avoided. A case in point is the employment of hydraulic lime in place of Portland cement as grouting outside the cast-iron tubes

used for lining tunnels made by the modern shield system.

Roman Cement is another cement of the Portland class which came into use some hundred years ago, shortly before the manufacture of artificial Portland cement was attempted. It is still in use, though only for special purposes where a quick-setting material is required. It is made from septaria nodules which are dredged up on the Kent and Essex coasts and consist of about 60 per cent of calcium carbonate mixed with clay, the mass being sufficiently indurated to remain coherent under water. The nodules are not prepared in any way, but simply burned at a moderate red heat. The resulting cement varies somewhat in composition, but approximates to the following figures :—

	Per cent.
Insoluble silicious matter	5·86
Silica (SiO_2)	19·62
Alumina (Al_2O_3)	10·30
Ferric oxide (Fe_2O_3)	7·44
Manganese dioxide (MnO_2)	1·57
Lime (CaO)	44·54
Magnesia (MgO)	2·92
Sulphuric anhydride (SO_3)	2·61
Carbonic anhydride (CO_2)	3·43
Water (H_2O)	0·25
Alkalies and loss	1·46
	100·00

The most characteristic constituent is the oxide of iron, which gives the cement a reddish colour, and the presence of manganese also differentiates Roman from Portland cement, which rarely contains appreciable quantities of that element. The high percentage of alumina causes the cement to be quick-setting, and it becomes hard in about five minutes. It resists the action of water, salt or fresh, very well, and is therefore useful in situations where the work is likely to be submerged immediately after it has been put in place.

The term *Natural Cements* is applied to cements made by burning mixtures of clay and carbonate of lime naturally occurring in approximately suitable proportions. They may be regarded as badly-mixed Portland cements, and need no special description. American "natural" cements are of a somewhat different class. They are usually made from a silicious limestone containing magnesia, and are comparatively lightly burned. The following analysis is typical of a cement of this kind :—

	Per cent.
Silica (SiO_2)	24·30
Alumina (Al_2O_3)	7·22
Ferric oxide (Fe_2O_3)	5·06
Lime (CaO)	33·70
Magnesia (MgO)	20·94
Water, carbonic anhydride, and loss	8·78
	100·00

These irregular cements of the Portland class are good building materials for ordinary purposes, but are not so suitable as good artificial Portland cement for heavy and important undertakings.

Uses of hydraulic cements.

The chief use of hydraulic cements, whether of the puzzuolanic or Portland class, is to act as an adhesive material in work which is to be exposed to water. No doubt in times of remote antiquity it was found that the jointing of masonry which was to be immersed required the use of a cement indifferent to the action of water. Ordinary mortar failed in such positions; mortar made from lime prepared from limestones or chalks containing a little clay was found to stand; mortar made from lime mixed with trass or similar active silicious material was also found to stand. On this observation rests the whole of the present enormous employment of hydraulic cements. It was a natural transition to utilize these cements not merely for jointing masonry but also for making concrete, and the only reason why hydraulic cements, as distinct from cements which are not hydraulic (*e.g.*, ordinary mortar), are used for the latter purpose is their great mechanical strength. Their use in above-water work is checked by the low price of common brick. Even in such work, where it would be thought that masses of burnt clay would be the cheapest conceivable material, concrete is at least on level terms with its rival. It must be remembered that one of the great advantages of concrete is that five-sixths of its total mass may be provided from local sand and gravel, on which no carriage has to be paid. The cement, on which alone freight is to be reckoned, converts these from loose incoherent material into a solid stone. Thus it comes about that the largest use of cement is for manufacturing concrete for dock and harbour work, and for the making of foundations. It is also employed for the building of light bridges, floors, and pipes constructed of cement mortar disposed round a skeleton of iron rods. Such composite structures take advantage at once of the high tensile strength of iron and of the high compressive strength of cement mortar.

Good hydraulic cements are highly permanent materials, provided certain conditions be observed. It might be supposed that hydraulic cements from their nature would be indifferent to the action of water, but this is only true if the structures of which they form part are sufficiently compact. In this case the action of the water is checked by the film of carbonate of lime which eventually forms on the surface of calcareous cement. This, together with the compactness of the mortar, hinders the ingress and egress of water, and prevents the dissolution and ultimate destruction of the cement. But where the concrete or mortar is not well made and is porous, the continual passage of water through it will gradually break up and dissolve away the calcareous constituents of the cement until its strength is utterly destroyed. This destructive action is increased if the water contains sulphates or magnesium salts, both of which act chemically on the calcareous constituents of the cement. As sea-water contains both sulphates and magnesium salts, it is especially necessary in concrete for harbour work to take every care to produce an impervious structure. There are various minor external causes for the failure and ultimate destruction of cement mortar and concrete, but their discussion is a matter for the specialist. Failure from inherent vice in the cement has been already touched on; it can always be traced to want of skill and care in manufacture.

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(B. BL.)

Census—*United Kingdom.*—The historical account of the census in the United Kingdom has been already given in detail up to and including that of 1871. Since then the changes in procedure have not been numerous, though some are of considerable importance. In England and Wales the growth of population necessitated the increase of the enumerating agency from 32,543 in 1871 to 34,711 in 1881, to 35,507 in 1891, and to 38,200 in 1901, while the operations have been complicated by the greater number of local subdivisions to be recognized in the returns. Between 1871 and the next census, for instance, the creation of sanitary districts entailed

the compilation of population figures for 966 new areas. In the ensuing decade 44 of these were absorbed in their neighbours, 89 fresh ones were constituted, and 138 altered in boundaries. Three-fourths of the 14,600 civil parishes, again, were similarly modified, and changes of areas under the Local Government and Redistribution Acts added to the labour of tabulation. Material improvements were effected in the classification of occupations; and in 1891, upon the recommendation of the Treasury Committee appointed for the purpose, additional columns were included in the schedule in order to show separately the employers of labour, the employed, and the independent worker, an innovation which, however, failed, owing to inaccuracy of return, to fulfil anticipations. The subdivision of houses into separate occupancies was also prescribed, together with the return of the number of rooms, where less than five, occupied by each family. The Act regulating the census of 1901 further simplified the record by substituting the term tenement for storey, and providing for the separate record of houses altogether uninhabited as distinguished from those occupied only during the daytime. The record of nationality, again, was further extended at the 1901 census beyond the mere specification of the British subjects born abroad, and included that of all persons not born within the United Kingdom. In 1891 a return was obtained of all persons in Wales and Monmouth speaking either Welsh only or both Welsh and English, but owing to the imperfection of the results it was prescribed that the corresponding return for 1901 should include those who speak English only, and should exclude children under three years old. In Scotland a similar return of those who speak Gaelic was obtained in 1881, extended at the next census, and made to correspond with the return for Wales for the enumeration of 1901. The complexity of areas does not exist north of the Tweed to anything like the extent to which it prevails in England, but the Local Government Act for Scotland of 1889 afforded means of simplification of which great advantage was taken in the census of 1891. The definition of a house in the north was changed in 1881 so as to correspond with that in use in England, since previously the tenement in the former was the house of the latter, and *vice versâ*. For the census of 1901 Scotland was included with England in a single Act, with the necessary modification in nomenclature and other detail. The census of Ireland continues to differ from that of the sister island—first, in that the enumeration is undertaken by the constabulary and the schedule not left to be filled up by the householder; secondly, in the wider use made of statistics other than those directly collected at the census; thirdly, in the collection of statistics of religious denomination, this part of the return, however, being left optional in 1881 and 1891 with the person enumerated. Advantage was taken of this relaxation of the rule in no more than 530 cases on the former occasion, and 871, chiefly in Ulster, on the latter. Finally, a return of temporary illness, of literacy, and fuller detail of house accommodation is here required, under the authority of the Local Government.

The results of the enumerations described above will be found under other heads, and only their most general features need be here set forth. Between the first general census of 1801 and that of 1901 the population of the three kingdoms as a whole increased by 161 per cent. In the case of England and Wales the growth amounted to 271·6 per cent. Scotland shows an increase of 178, whilst Ireland fell off to the extent of 17·3. Thus in 1821, when the census was first taken on a uniform system, the distribution of the total population was in the proportion of 57·4 per cent. in England, 10·0 in Scotland, and 32·6 in Ireland; in 1851 the first had risen to 65·5, the second to 10·6, and the third had fallen to 23·9 per cent., whilst in 1901 the corresponding relation was 78·4, 10·8, and 10·8 per cent. Scotland stands nearly where she did in 1821, but England has gained and Ireland lost about 21 per cent. in the scale. The following percentages show that the rate of variation has been by no means regular throughout the period in question :—

	1821-31.	1831-41.	1841-51.	1851-61.	1861-71.	1871-81.	1881-91.	1891-1901.
England and Wales	15·8	14·5	12·9	11·9	13·2	14·4	11·7	12·17
Scotland .	13·0	10·8	10·2	6·0	9·7	11·2	7·8	11·1
Ireland .	14·2	5·5	*19·8*	*11·8*	*6·7*	*4·4*	*9·1*	*5·3*
United Kingdom[1]	15·0	11·2	2·5	5·6	8·8	10·8	8·2	9·9

Comparison of the census figures with the birth and death returns indicates that since 1851 emigration has been the chief retarding influence in all three countries; while in England, at all events, the correlation of the age, birth, and marriage returns seems to indicate a tendency to diminishing fecundity due both to relatively fewer marriages and to the later age at which women enter the conjugal state. A marked decline in the death-rate, in fact, is slightly outweighed by the falling-off in the rate of births. In relation to the area of the three countries, the weight of the population upon a square mile has risen in England and Wales from 153 in 1801 to 558 in 1901. In Scotland the addition has been from 54 to 150, and in Ireland the burden has fallen from 166 to 137.

British Colonies and Dependencies.—In Canada and the Cape the predecessors of the British in European colonization had begun early in the history of their enterprise to take stock periodically of the population and resources of the tracts occupied. In Canada the first return was prepared as early as 1665, and the Netherlands East India Company obtained a rough return in 1687 for the Cape. These, however, can scarcely be included under the head of census, since they were based upon locally-prepared reports mainly relating to agriculture and cattle. Similarly, in New South Wales, "musters" were held annually from the year of settlement; but it was not till 1828 that these assumed the form of a census, and the first regular enumeration was that of 1841, in which Tasmania and New Zealand joined. A census of Cape Colony was taken in 1865, and has been succeeded by others in 1875 and 1891. Natal initiated the operation in the last-named year. In Australia, Queensland has taken a census quinquennially since 1875, and New Zealand since 1881. Uniformity in the procedure of 1891 was secured by a Congress of Statists held in the preceding year. Canada took its first general census in 1871, a year which may be considered the starting-point of the imperial enumeration. India was not included in the synchronous undertaking until 1881, when a population of 254 millions, raised in 1901 to 294 millions, placed the operation at the head of all census enterprise. Each colony and dependency adopts a separate system, and adds such columns to those relating to the primary statistical facts forming the basis of the census as may be required to obtain detail for local purposes. Canada, for instance, follows the plan of the United States, and issues a schedule so voluminous that the official enumerator, specially instructed, has to fill it up, as in Ireland, instead of the householder, and is allowed a month or so for the purpose. In India the same plan is necessary for a far simpler schedule by reason of the general illiteracy of the people, and the census has to be divided accordingly into two operations, the preliminary filling up of the record and the final checking it on the census night. In several of the governments the census has been hitherto confined to the towns or to persons of European descent, and excludes altogether the often large native population, as in Natal and the settlements in Borneo and West Africa, or is satisfied with a rough tribal tally, by families or otherwise, furnished by the chiefs or headmen. In round numbers, the total enumerated population of the British empire is 353 millions, whilst the tracts which still remain uncensused contain an estimated population of about 44 millions, chiefly in Africa. As compared with this total of 397 millions there is the figure of 235 millions published with the census of 1871, that of 254 millions in 1881, and of 372 millions ten years later, none of them claiming more than approximation to accuracy or relating to identical areas.

Other Countries.—Partial enumerations of population and stock were undertaken in several European countries as early as the 17th century on much the same lines as those prescribed by the French authorities in Lower Canada soon after the country was settled. These operations, however, were generally directed towards a special administrative object such as taxation or military service, and, being conducted more or less independently by the authorities of parishes or similar small areas, do not come under the head of

[1] Omitting Man and the Channel Islands.

census. Synchronous enumerations of the population, though suggested on several occasions by eminent men of science, were generally discouraged, probably on the grounds set forth by St Simon, who held that "these impious operations have always irritated the Creator and brought down His heavy hand upon those who ordained them." At all events, although prescribed by the French Convention in 1791 and by its successor in 1793, the census, as we now understand it, is the offspring of the 19th century. France and England led the way in 1801; most of the German states were enumerated in 1816, and shortly afterwards Scandinavia improved on modern lines its already existing system. The United States of America incorporated the periodical census into their Constitution in 1787; but the first enumeration, in 1790, was substantially little more than an experiment. Leaving out of consideration the Turkish dominions, the census at stated intervals has now become the practice of all European States. Russia, the last to adopt it, completed its first enumeration in 1897, the operations embracing a population of 129 millions in two continents. The efforts of statisticians of all countries have been for some time directed towards the establishment of uniformity in the results derivable from the census, and by international conferences a considerable degree of success has been attained. As regards the primary facts to be ascertained, comparison is now very generally possible; and information as to sex, age, civil condition, birthplace, and certain infirmities is becoming of more value at each period. In each country, moreover, special information has to be acquired at the census on topics of local importance which are not equally susceptible of international comparison. For example, many if not most of the European schedules provide columns for one or more of such subjects as mother-tongue, nationality, illiteracy, religious denomination, military service; and in Russia, for the recognized social grades; and in France, for the number of children in each family. Occupation, again, is recorded at nearly all enumerations, though not invariably upon a uniform system nor enjoying so much confidence as to accuracy as the rest. There are, finally, differences of practice as regards the mode of obtaining the record, whether by official agency or on the responsibility of the householder, and in some countries the figure of the actual, in others of the legal, population is the object in view. On the whole, the practical value of periodical enumeration has now been recognized throughout the civilized world, although, for financial or political reasons, the census has not yet become a universal institution. From the following table it will be seen that the great *lacunæ* in this branch of statistics are to be found in the Far East, on the one hand, and amongst the tropical states of the Old and New Worlds on the other:—

Continent.	Population (in thousands).		Percentage Enumerated (1901).
	Enumerated.	Estimated.	
Europe .	387,308	6,314	98·4
Asia . .	323,569	550,713	37·0
Africa .	19,741	144,578	12·3
America .	135,118	10,543	92·8
Oceania .	4,771	881	84·5
Total .	870,507	713,029	55·0

(J. A. B.)

United States.—The United States census of 1870 probably marked the lowest ebb of census work in the United States. Its accuracy was generally denied by competent scholars both in and out of the census office. This unfortunate result was due partly to the unsatisfactory character of the law imposing the local work upon officials already burdened with other duties and not subject to the control of the census office, and partly to the disturbed condition of the Southern states immediately after the Civil War. The serious errors were errors of omission, were probably confined to the Southern states, and were especially frequent among the negroes. Since 1870 the development of census work in the United States has been steady and rapid. The law, which had been prepared for the census of 1870 by a committee of the House of Representatives with much care, skill, and ability, but which had failed of enactment at the last moment in the Senate, furnished a basis for greatly improved legislation in 1879, under which the tenth census was taken. By this law the census office for the first time was allowed to call into existence and to control an adequate local staff of supervisors and enumerators. The scope of the work was so extended as to make the twenty-two quarto volumes of the tenth census almost an encyclopædia, not only of the population, but also of the products and resources of the United States. Probably no other census in the world has ever covered so wide a range of subjects, and perhaps none except that of India and the eleventh American census has extended through so many volumes. The topics usually contained in a census suffered from the great addition of other and less pertinent matter, and the reputation of the work was unfavourably affected by the length of time required to prepare and publish the volumes (the last ones not appearing until near the end of the decade), the original underestimate of the cost of the work, which made frequent supplementary appropriations necessary, the resignation of the superintendent, Francis A. Walker, in 1882, and the disability and death of his successor, Charles W. Seaton. The eleventh census was taken under a law almost identical with that of the tenth, and extended through twenty-five large volumes, presenting a work almost as encyclopædic, but much more distinctively statistical.

The popular opinion of a census, at least in the United States, depends largely upon the degree to which its figures for the population of the country, of states, and especially of cities, meet or fail to meet the expectations of the interested public. Judged by this standard, the census of 1890 was less favourably received than that of 1880. The enumerated population of the country in 1880 was larger than had been anticipated; and in the face of these figures it was difficult for local complaints, even where they were made, to find hearing and acceptance. But according to the eleventh census the decennial rate of growth of population fell suddenly from over 30 per cent., which the figures had shown between 1870 and 1880, and in every preceding decade of the century except that of the Civil War, to less than 25 per cent., in spite of an immigration nearly double that of any preceding decade. For this change no adequate explanation was offered by the census office. Hence the protests of those who believed that the figures for population were too small swelled into a general chorus of dissatisfaction. But the census was probably more correct than the critics. Most of the motives influencing popular estimates of population in the United States tend to exaggeration. The convention which drafted the Constitution of the United States attempted to secure a balance of interests by apportioning both representatives in Congress and direct taxes according to population. A passage in *The Federalist* suggests the motives of the convention as follows:—

> As the accuracy of the census to be obtained by Congress will necessarily depend in a considerable degree on the disposition if not co-operation of the states, it is of great importance that the states should feel as little bias as possible to swell or reduce the amount of their numbers. Were their share of representation alone to be governed by this rule, they would have an interest in exaggerating their inhabitants. Were the rule to decide their share of taxation alone, a contrary temptation would prevail. By extending the rule to both objects the states will have opposite interests, which will control and balance each other, and produce a requisite impartiality.

With the disappearance of direct taxation as a source of federal revenue, the motive mentioned for understating the population disappeared. On the other hand, the desire for many representatives in Congress has been reinforced by the more influential feelings of local pride and of rivalry with other cities of somewhat similar size. Hence a complaint that the population is overstated is seldom heard, and hence, also, popular charges of an undercount afford little evidence that the population was really larger than stated by the census.

After the detailed tabulation had been completed, it

was shown that the number of persons under ten years of age in 1890 was surprisingly small, and that this deficiency in children was a leading cause of the slow growth in population. Before the tabulation had been made Mr Francis A. Walker wrote:—"If the birth-rate among the previously existing population did not suffer a sharp decline . . . the census of 1890 cannot be vindicated. To ascertain the facts we must await the tabulation of the population by periods of life, and ascertain how many of the inhabitants of the United States of 1890 were under ten years of age." These results thus confirmed the accuracy of the count of 1890. Efforts to invalidate the census returns by comparison with the registration records of Massachusetts cannot be deemed conclusive, since in the United States, as in Great Britain, the census must be deemed more accurate and less subject to error than registration records. A strong argument in favour of the eleventh census, apart from its self-consistency, is that its results as a whole fit in with the subsequent state enumerations. In eleven cases such enumerations have been taken; and on computing from them and the results of the federal census of 1880 what the population at the date of the eleventh census should have been, if the annual rate of increase had been uniform, it appears that in no case, except New York city and Oregon, was the difference between the enumerations and these estimates over 4 per cent. In Oregon about 30,000 more people were found in 1890 than the estimate would lead one to expect; in New York city, about 100,000 less. It seems not improbable that in the latter, where the difficulties incident to a count during the summer are almost insurmountable, serious omissions occurred. Still, such a comparison confirms the accuracy of the eleventh census as a whole.

The results of the twelfth census (1900) further refute the argument that would maintain the eleventh census to be inaccurate because it showed a smaller rate of increase in population during the preceding decade than had been recorded by other censuses during earlier decades. The rate of increase during the decade ending in 1900 was even less than that for the preceding decade; and it is impossible that a falling off so marked could in two successive enumerations be the result of sheer inaccuracy. The rate of increase from 1890 to 1900, eliminating from the computation the population of Alaska, Hawaii, Indian Territory, and Indian reservations, was 20·7; the rate of increase if these places are included—in which case the figures of the population of Hawaii in 1890 must be taken from the census of the Hawaiian Government in that year—was 21 per cent.

The law regulating the twelfth census deserves to rank with those of 1790, 1850, and 1879 as one of the four important laws relative to census work. By this law the census office was far more independent than ever before. Appointments and removals were made by the Director of the Census rather than by the Secretary of the Interior, and in all plans for the execution of the law the head of the office was responsible for success. The law divided the subjects of census inquiry into two parts—first, those of primary importance, requiring the aid of the enumerator; and, secondly, those of subsidiary importance, capable of production without the aid of the enumerator. The former had to be finished and published by 1st July 1902; the latter were not to be undertaken until the former were well advanced towards completion. By this means the attention of the office could be concentrated on a small number of subjects rather than distributed over the long list treated in the volumes of the tenth and eleventh censuses.

Under the federal form of government, with its delegation of all residuary powers to the several states, the United States have no system of recording deaths, births, and marriages. Hence there is no such basis as exists in nearly every other civilized State for a national system of registration, and the country depends upon the crude method of enumerators' returns for its information on vital statistics, except in the states and cities which have established a trustworthy registration system of their own. These are the New England states and a few others in their vicinity or influenced by their example. Enumerators' returns in this field are so incomplete that hardly two-thirds of the deaths which have occurred in any community during the preceding year are obtained by an enumerator visiting the families, no satisfactory basis for the computation of death-rates is afforded, and the returns have comparatively little scientific value. In the regions where census tables and interpretations are derived from registration records kept by the several states or cities they are often made more complete than those in the state or municipal documents. The census of agriculture is also liable to a wide margin of error, owing to defects in farm accounts and the inability of many farmers to state the amount or the value even of the leading crops. The census figures relate to the calendar year preceding 1st June 1900, and hurried and careless answers about the preceding year's crop are almost sure to have been given by many farmers in the midst of the summer's work.

The difficulties facing the manufacturing census were of a different character. A large proportion of the industries of the country keep satisfactory accounts, and can answer the questions with some correctness. But manufacturers are likely to suspect the objects of the census, and to fear that the information given will be open to the public or betrayed to competitors. Furthermore, the manufacturing schedule presupposes some uniformity in the method of accounting among different companies or lines of business, and this is often lacking. Another source of error in the manufacturing census of the United States is that the words of the census law are construed as requiring an enumeration of the various trades and handicrafts, such as carpentering. The deficiencies in such returns are gross and notorious, but the census office feels obliged to seek for them and to report what it finds, however incomplete or incorrect the results may be. Even on the population returns certain answers, such as the number of the divorced or the number unable to read and write, may be open to question.

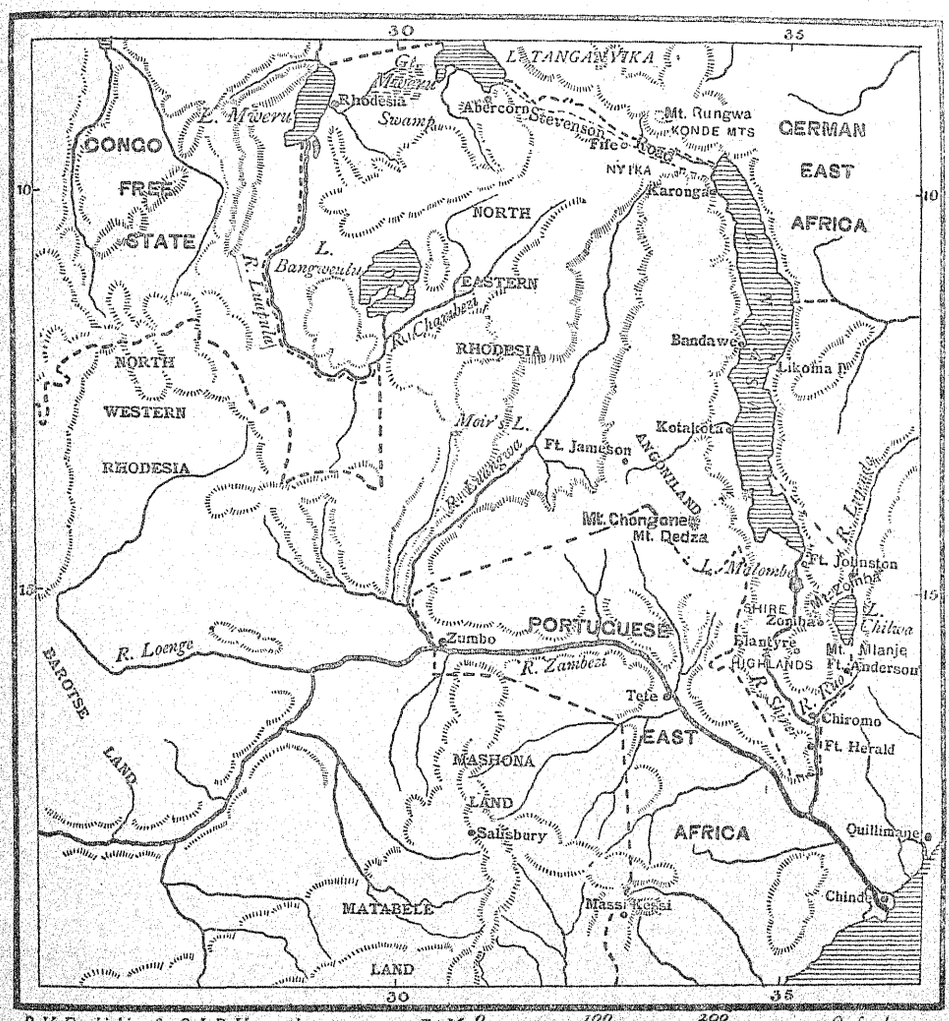
The wide range of the American census, and the publication of uncertain figures, find a justification in the fact that the development of accurate census work requires a long educational process in the office, and, above all, in the community. Rough approximations must always precede accurate measurements; and these returns, while often inaccurate, are, being the best obtainable, better than nothing, and probably improve with each decade.

Besides the breadth of its scope, in which the American census stands unrivalled, the most important American contribution to census work has been the application of electricity to the tabulation of the results, as was first done in 1890. The main difficulties which this method reduced were two. The production of tables for so enormous a population as that of the United States through the method of tallying by hand requires a great number of clerks and a long period of time, and when complete cannot be verified except by a repetition of the process. The new method abbreviates the time, since an electric current can tally almost simultaneously the data, the tallying of which by hand would be separated by appreciable intervals. The method also renders comparatively easy the verification of the results of certain selected parts. (W. F. W.)

Centerville, the capital of Appanoose county, Iowa, U.S.A., situated in a coal-mining region. Population (1890), 3668; (1900), 5256, of whom 499 were foreign-born and 149 were negroes.

Central Africa, British.—The term given to what is at present a not well defined appendage of the British empire in South Central Africa. Broadly speaking, it may be taken to include a large territory lying between S. latitude 8° 25′ on Lake Tanganyika and latitude 17° 6′ on the river Shiré, near its confluence with the Zambezi, and between longitude E. 36° 10′ (district of Mlanje) and 28° 20′ (river Luapula). Originally the term British Central Africa was first applied by the writer of this article to all the territories under British influence to the north of the Zambezi, which were formerly intended to be under one administration; but the course of events having obviated the connexion of Barotseland (see BAROTSE) with any direct British administration north of the Zambezi, the term British Central Africa is now confined to the British Protectorate on the Shiré and about Lake Nyasa; the titles "North-Eastern Rhodesia" and "North-Western Rhodesia" have been officially applied to the two divisions of the British South Africa Company's territory north of the Zambezi. The western boundary, however, of the territory here described has been

taken to be a line drawn from the south-easternmost corner of the Congo Free State frontier to the north-westernmost corner of the Portuguese possessions on the east bank of the Luangwa river. Within these limits we have a territory of about 150,000 square miles, which includes two-thirds of Lake Nyasa, the south end of Lake Tanganyika, more than half Lake Mweru, and the whole of Lake Bangweulu, nearly the whole courses of the rivers Shiré and Luangwa, the whole of the river Chambezi (the head-waters of the river Congo), the right or east bank of the Luapula (or Upper Congo) from its exit from Lake Bangweulu to its issue from the north end of Lake Mweru.



Sketch Map of British Central Africa.

Other lesser sheets of water included within the limits of this territory are the Great Mweru Swamp, between Tanganyika and Mweru, Moir's Lake (a small mountain tarn lying between the Luangwa and the Luapula), Lake Malombe (on the upper Shiré), and the salt lake Chilwa, which lies on the borders of the Portuguese province of Mocambique. The southern border of all this territory is separated from the river Zambezi by the Portuguese possessions; nevertheless, considerably more than two-thirds of the country lies within the Zambezi basin, and is included within the subordinate basins of Lake Nyasa and of the river Luangwa. The remaining portions drain into the basins of the river Congo and of Lake Tanganyika, and also into the small Lake Chilwa, which at the present time has no outlet, though in past ages it probably emptied itself into the Lujenda river, and thence into the Indian Ocean.

As regards orographical features, much of the country is high plateau, with an average altitude of 3500 feet above sea-level. Only a very minute portion of its area—the country along the banks of the river Shiré—lies at anything like a low level; though the Luangwa valley may not be more than about 900 feet above sea-level. Lake Nyasa lies at an elevation of 1700 feet above the sea, is about 350 miles long, with a breadth varying from 15 to 40 miles. Lake Tanganyika is about 2680 feet above sea-level, with a length of about 400 miles and an average breadth of nearly 40. Lake Mweru and Lake Bangweulu are respectively 3000 feet and 3760 feet above sea-level; Lake Chilwa is 1946 feet in altitude. The highest mountain found within the limits previously laid down is Mount Mlanje, in the extreme south-eastern corner of the Protectorate. The highest peak of Mlanje reaches an altitude of 9683 feet. (In German territory, near the north end of Lake Nyasa, and close to the British frontier, is Mount Rungwa, the altitude of which exceeds 10,000 feet.) Other high mountains are Mounts Chongone and Dedza, in Angoniland, which reach an altitude of 7000 feet, and points on the Nyika Plateau and in the Konde Mountains to the north-west of Lake Nyasa, which probably exceed a height of 8000 feet. There are also Mounts Zomba (6900 feet) and Chiradzulu (5500 feet) in the Shiré Highlands. The principal plateaux or high ridges are (1) the Shiré Highlands, a clump of mountainous country lying between the river Shiré, the river Ruo, Lake Chilwa, and the south end of Lake Nyasa; (2) Angoniland—a stretch of elevated country to the west of Lake Nyasa and the north-west of the river Shiré; (3) the Nyika Plateau, which lies to the north of Angoniland; and (4) the Nyasa-Tanganyika Plateau, between the basin of the river Luangwa, the vicinity of Tanganyika, and the vicinity of Lake Mweru. Finally may be mentioned the tract of elevated country between Lake Bangweulu and the river Luapula, and between Lake Bangweulu and the basin of the Luangwa.

The whole of this part of Africa is practically without any stretch of desert country, being on the whole favoured with an abundant rainfall. The nearest approach to a desert is the rather dry land to the east and north-east of Lake Mweru. Here, and in parts of the lower Shiré

district, the annual rainfall probably does not exceed an average of 35 inches. Elsewhere, in the vicinity of the highest mountains, the rainfall may attain an average of 75 inches, in parts of Mount Mlanje possibly often reaching to 100 inches in the year. The average may be put at 50 inches per annum, which is also about the average rainfall of the Shiré Highlands, that part of British Central Africa which at present attracts the greatest number of European settlers.

No part of the country comes within the forest region of West Africa. The whole of it may be said to lie within the savannah or park-like division of the continent. As a general rule the landscape is of a pleasing and attractive character, well covered with vegetation and fairly well watered. Actual forests of lofty trees, forests of a West African type, are few in number, and are chiefly limited to portions of the Nyika, Angoniland, and Shiré Highlands plateaux, and to a few nooks in valleys near the south end of Tanganyika. Patches of forest of tropical luxuriance may still be seen on the slopes of Mounts Mlanje and Chiradzulu. On the upper plateaux of Mount Mlanje there are forests of a remarkable conifer (*Widdringtonia whytei*), a relation of the cypress, which in appearance resembles much more the cedar, and is therefore wrongly styled the "Mlanje cedar." This tree is remarkable as being the only conifer found growing in Central Africa between the mountains of Cape Colony and Natal in the south, and the highlands of Kilima-Njaro, Kenia, and Abyssinia in the north.[1] Immense areas in the lower-lying plains are covered by long, coarse grass, sometimes reaching 10 feet in height. Most of the West African forest trees are represented in British Central Africa. A full list of the known flora has been compiled by Sir W. Thiselton-Dyer and his assistants at Kew, and is given in the first and second editions of Sir H. H. Johnston's work on British Central Africa. Amongst the principal vegetable products of the country interesting for commercial purposes may be mentioned coffee (wild coffee is said to grow in some of the mountainous districts, but the actual coffee cultivated by the European settlers has been introduced from abroad); indiarubber—derived chiefly from the various species of *Landolphia* and from other apocynaceous plants; the *Strophanthus* pod (furnishing a valuable drug); ground nuts (*Arachis* and *Voandzeia*); the cotton plant; all African cultivated cereals (sorghum, pennisetum, maize, rice, wheat — cultivated chiefly by Europeans — and eleusine); and six species of palms—the oil palm on the north-west (near Lake Nyasa, at the south end of Tanganyika, and on the Luapula), the *Borassus* and *Hyphæne*, *Phœnix* (or wild date), *Raphia* and the cocoa-nut palm. The last-named was introduced by Arabs and Europeans, and is found on Lake Nyasa and on the Lower Shiré. Most of the European vegetables have been introduced, and thrive exceedingly well, especially the potato. The mango has also been introduced from India, and has taken to the Shiré Highlands as to a second home. Oranges, lemons, and limes have been planted by Europeans and Arabs in a few districts. European fruit-trees do not ordinarily flourish, though apples are grown to some extent at Blantyre. The vine hitherto has proved a failure. Pineapples give the best result amongst cultivated fruit, and strawberries do well in the higher districts. In the mountains the native wild brambles give blackberries of large size and excellent flavour.

The fauna is on the whole very rich. It has affinities in a few respects with the West African forest region, but differs slightly from the countries to the north and south by the absence of such animals as prefer drier climates, as for instance the oryx antelopes, gazelles, and the ostrich. There is a complete blank in the distribution of this last between the districts to the south of the Zambezi and those of East Africa between Victoria Nyanza and the Indian Ocean. The giraffe is found in the Luangwa valley; it is also met with in the extreme north-east of the country. The ordinary African rhinoceros is still occasionally, but very rarely, seen in the Shiré Highlands. The African elephant is fairly common throughout the whole territory. Lions and leopards are very abundant; the zebra is still found in great numbers, and belongs to the Central African variety of Burchell's zebra, which is completely striped down to the hoofs, and is intermediate in many particulars between the true zebra of the mountains and Burchell's zebra of the plains. The principal antelopes found are the sable and the roan (*Hippotragus*), five species of *Cobus* or waterbuck (the puku, the Senga puku, the lechwe, Crawshay's waterbuck, and the common waterbuck); the pallah, the tsessébe, the hartebeest, the gnu, the duyker, the klipspringer, the oribi, the steinbok, and the reedbuck. Among tragelaphs are the bushbuck, the inyala, the water tragelaph (*Tragelaphus selousi*), the kudu, and Livingstone's eland. The only buffalo is the common Cape species. The hyæna is the spotted kind. The hunting dog is present. There are some seven species of monkeys, including two baboons and one colobus. The hippopotamus is found in the lakes and rivers, and all these sheets of water are infested with crocodiles, apparently belonging to but one species, the common Nile crocodile.

The human race is represented by only one indigenous native type—the Negro. No trace is anywhere found of a Hamitic intermixture. Arabs from Zanzibar have settled in the country of late years, but not, as far as we know, from any period exceeding a century back. As the present writer takes the general term "Negro" to include equally the Hottentot, Bushman, and Pigmy tribes of Africa, this designation will cover all the natives of British Central Africa; they exhibit, however, in some parts signs of Hottentot or Bushman intermixture, and there are legends in some mountain districts of the former existence of unmixed Bushman tribes, while Bushman stone implements are found at the south end of Tanganyika. At the present day the population is, as a rule, of a black or chocolate-coloured Negro type, and belongs, linguistically, entirely and exclusively to the Bantu family. The languages spoken offer several very interesting forms of Bantu speech, notably in the districts between the north end of Lake Nyasa, the south end of Lake Tanganyika, and the river Luapula. In the more or less plateau country included within these geographical limits the Bantu dialects are of a very archaic type, and to the present writer it has seemed as though one of them, Kiemba—or Kiwemba—came nearer than any other spoken tongue to the original form of the Bantu mother language. Through dialects spoken on the west and north of Tanganyika these languages of the northern districts are somewhat closely connected with the Bantu dialects of Uganda. They also offer some resemblance to Zulu-Kaffir, and it would seem as though the Zulu-Kaffir race must have come straight down from the countries to the north-west of Tanganyika, across the Zambezi, to their present home. Curiously enough, some hundreds of years after this southward migration, intestine wars and conflicts actually determined a north-westward return migration of Zulus. From Matabeleland Zulu tribes crossed the Zambezi at various periods (commencing from about eighty years ago), and gradually extended their ravages and dominion over the plateaux to the west,

[1] The present writer has explored the Cameroon Range in West Equatorial Africa, and found no conifer there. It would seem therefore as though conifers had been limited in their African distribution to the eastern half of the continent.

north, and north-east of Lake Nyasa. The Zulu language is still spoken by the dominating caste in West Nyasaland. As regards foreign settlers in this part of Africa, the Arabs may be mentioned first, though they are now met with only in very small numbers. The Arabs undoubtedly first heard of this rich country—rich not alone in natural products such as ivory, but also in slaves of good quality—from their settlements on the river Zambezi, and these settlements date back to a very early period, and are possibly coeval with the pre-Islamite Arab settlements in the gold-bearing regions of South-East Africa. But the Arabs do not seem to have made much progress in their penetration of the country in the days before firearms; and when firearms came into use they were for a long time forestalled by the Portuguese, who ousted them from the Zambezi. But about one hundred years ago the increasing power and commercial enterprise of the Arab sultanate of Zanzibar caused the Arabs of Maskat and Zanzibar to march inland from the east coast. They gradually began to found strong slave-trading settlements on the east and west coasts of Lake Nyasa, and thence westwards to Tanganyika and the Luapula. They never came in great numbers, however, and, except here and there on the coast of Lake Nyasa, have left no mixed descendants in the population. Of Europeans British Central Africa proper (the Protectorate) now possesses about 450 settlers, including about 100 officials and military and naval officers. The Europeans are chiefly natives of the United Kingdom, but there are a few Germans, Dutchmen, French, Italians, and Portuguese. The British protectorate established over Central Africa has attracted an increasing number of Indian traders, besides whom about 300 British Indian soldiers (Sikhs) are employed as the nucleus of an armed force.

The total value of the trade of the British Central Africa Protectorate in the year 1899-1900 was £255,384, showing an increase of 75 per cent. on the figures for the previous year. Imports were valued at £176,035, an increase of 62 per cent., and exports at £79,449, an increase of 109 per cent. The principal exports are coffee, rubber, and ivory. A number of Englishmen and Scotsmen (perhaps a hundred) are settled, mainly in the Shiré Highlands, as coffee planters. A railway from the coast to Lake Nyasa is now considered, however, to have become an imperative necessity if the trade of the Protectorate is still further to increase. The African trans-continental telegraph line runs through the Protectorate, and a branch line has been established from Lake Nyasa to Fort Jameson, the present headquarters of the Chartered Company in North-Eastern Rhodesia. The principal European settlement or town is Blantyre, at a height of about 3300 feet above the sea, in the Shiré Highlands. This place was named after Livingstone's birthplace, and was founded in 1876 by the Church of Scotland Mission. The Government capital, however, is Zomba, at the base of the mountain of that name. Other townships or sites of European settlements are Port Herald (on the lower Shiré), Chiromo (at the junction of the Ruo and the Shiré), Fort Anderson (on Mt. Mlanje), Fort Johnston (near the outlet of the river Shiré from the south end of Lake Nyasa), Kotakota and Bandawe (on the west coast of Lake Nyasa), Likoma Island (off the east coast of Lake Nyasa), Karonga (on the north-west coast of Lake Nyasa), Fife (on the Nyasa-Tanganyika plateau), Abercorn (on the south end of Lake Tanganyika), and Rhodesia (on the east coast of Lake Mweru). The present political divisions of the country are as follows:—The districts surrounding Lake Nyasa and the Shiré Province are governed directly under the Imperial Government by a Commissioner, who acts under the orders of the Foreign Office. The districts to the westward forming the province of Northern Rhodesia are governed by an official of the British South Africa Chartered Company under the direction of the aforesaid Commissioner and of the Foreign Office. In process of time the two administrations will probably be fused in name as they are already in actuality.

History.—The history of the territory dealt with above is recent and slight. Apart from the vague Portuguese wanderings during the 16th and 17th centuries, the first European explorer of any education who penetrated into this country was the celebrated Portuguese official, Dr F. J. M. de Lacerda e Almeida, who journeyed from Tete on the Zambezi to the vicinity of Lake Mweru. But the real history of the country begins with the advent of Livingstone, who in 1859 penetrated up the Shiré river and discovered Lake Nyasa. Livingstone's subsequent journeys to the south end of Tanganyika, to Lake Mweru, and to Lake Bangweulu (where he died in 1873), opened up this important part of South Central Africa and centred in it British interests in a very particular manner. Livingstone's death was soon followed by the entry of various missionary societies, who commenced the evangelization of the country; and these missionaries, together with a few Scottish settlers, steadily opposed the attempts of the Portuguese to extend their sway in this direction from the adjoining provinces of Moçambique and of the Zambezi. From out of the missionary societies grew a trading company, the African Lakes Trading Corporation. This body came into conflict with a number of Arabs who had established themselves on the north end of Lake Nyasa. About 1885 a struggle began between Arab and Briton for the possession of the country, which was not terminated until the year 1896. The African Lakes Corporation in its unofficial war enlisted volunteers, amongst whom were Captain (afterwards Brigadier-General) Lugard and Mr Alfred Sharpe. Both these gentlemen were wounded, and the operations they undertook were not crowned with complete success. The present writer was sent out in 1889 to endeavour to effect a possible arrangement of the dispute between the Arabs and the African Lakes Corporation, and also to ensure the protection of friendly native chiefs from Portuguese aggression beyond a certain point. The outcome of these efforts and the treaties made was the creation of the British Protectorate and sphere of influence north of the Zambezi. In 1891 Mr (afterwards Sir) Harry Johnston returned to the country as Imperial Commissioner and Consul-General. In the interval between 1889 and 1891 Mr Alfred Sharpe, on behalf of Mr Rhodes, had brought a large part of the country into treaty with the British South Africa Company. These territories, now known as Northern Rhodesia, were administered for a considerable period by the present writer in connexion with the British Central Africa Protectorate. Between 1891 and 1895 a long struggle continued between the British authorities on the one hand and the Arabs and Mahommedan Yaos on the other regarding the suppression of the slave trade. By the beginning of 1896 the last Arab stronghold was taken and the Yaos were completely reduced to submission. Then followed during 1896-98 wars with the Zulu tribes, who claimed to dominate and harass the native populations to the west of Lake Nyasa. The Zulus having been subdued, there was every prospect of the country enjoying a settled peace and considerable prosperity. The native population numbers about 2,000,000, and is well disposed towards European rule, having indeed at all times furnished the principal contingent of the armed force with which the African Lakes Company or the British Government endeavoured to oppose Arab or Zulu aggression. The

Imperial Government maintains six gunboats on Lake Nyasa and the rivers Shiré and Zambezi. The actual native (African) strength of the 1st battalion British Central Africa Regiment in 1900 was 865; a 2nd battalion was raised for service outside the Protectorate.

Unfortunately, though so rich and fertile, the land is not as a rule very healthy for Europeans, though of late it has shown signs of improvement in this respect. The principal scourge is black-water fever, which appears to be a result of the opening up of fresh untilled soil to cultivation. The climate is agreeable, and except in the low-lying districts is never unbearably hot; while on the high mountain plateaux frost frequently occurs during the dry season.

See The Lands of Cazembe (Dr Lacerda's journey to Cazembe in 1798), a compilation by the late Sir R. F. BURTON.—*The Second Zambesi Expedition and Last Journeys of Dr Livingstone*, by the late Rev. HORACE WALLER.—*The Life of Livingstone*, by Sir H. H. JOHNSTON.—Captain ELTON'S *Travels in East Africa.*—*Adventures in Nyasaland*, by L. MONTEITH FOTHERINGHAM.—*To the Central African Lakes and Back*, by JOSEPH THOMSON.—*An Encyclopædic Dictionary of the Mangwaja Language as spoken in British Central Africa*, by the Rev. D. C. SCOTT.—*British Central Africa*, by Sir H. H. JOHNSTON.—*Africana*, by the Rev. ALEXANDER DUFF.—*The Shiré Highlands*, by JOHN BUCHANAN.—*Three Years in Savage Africa*, by LIONEL DÉCLE. (H. H. J.)

Central America, that portion of the American continent which lies between Mexico and Colombia, and comprises the area of the five states of Guatemala, Honduras, Salvador, Nicaragua, and Costa Rica. An attempt, in which the Guatemalan president was the chief mover, was made in 1884 and 1885 to unite these states in a Central American federation, but both constitutional methods and military coercion failed. In 1895 the three states of Honduras, Salvador, and Nicaragua united for the purposes of foreign relations in a confederation called the Greater Republic of Central America. A Diet was convened and officials were appointed for the direction of affairs; but in 1898, when the new régime was on the point of commencing, a revolution overthrew the Salvadorian government, and the Greater Republic separated into its constituent states.

Central Falls, a city in Providence county, Rhode Island, U.S.A., formed from a part of Lincoln town. It is on Blackstone river and on a branch of the New York, New Haven and Hartford railway. It has extensive manufactures, principally of cotton and woollen goods. Population (1900), 18,167.

Central India, the official name of a collection of native states under a political agent to the Governor-General, who resides at Indore. They cover a large tract of country eastward of Rajputana, including Malwa, and extending northwards from the Nerbudda river to the Chambal and the Sone. There are seven subordinate agencies: Gwalior, Indore, Bhopal, Bhopawar, West Malwa, Bundelkhand, and Baghelkhand. Their total area is 77,808 square miles. The population in 1881 was 9,387,119; in 1891 it was 10,318,812, showing an increase of 10 per cent. and an average density of 133 persons per square mile. In 1901 the population was 8,501,883, showing a decrease of 17 per cent., due to the effects of famine, which was most severely felt in Bhopal and West Malwa. The whole is now fairly provided with railways, largely at the expense of Sindhia. There are British cantonments at Mhow, Neemuch, and Nowgong.

Central Provinces, the official name of a province of British India, under the administration of a chief commissioner. It lies in the very middle of the peninsula, and comprises several native states still in a backward stage of civilization. The total area, including feudatory states, occupies 115,936 square miles; in 1891 the population was 12,944,805. The capital is Nagpur.

Population.—The following table gives the area and population of the Central Provinces in 1891:—

British Territory.		Area in Square Miles.	Number of Towns and Villages.	Population, Census of 1891.			Density of Population to Square Mile.	Population, Census of 1881.
Divisions.	Districts.			Males.	Females.	Total.		
Nagpur	Nagpur	3,843	1,691	382,863	374,999	757,862	197	697,256
	Bhandara	3,968	1,620	366,696	376,154	742,850	187	683,779
	Chanda	10,749	2,751	352,327	345,282	697,610	65	649,146
	Wardha	2,428	914	203,286	197,568	400,854	165	387,221
	Balaghat	3,139	1,102	190,649	192,682	383,331	122	340,554
		24,127	8,078	1,495,821	1,486,686	2,982,507	123	2,758,056
Chhattisgarh	Raipur	11,724	5,083	775,736	808,691	1,584,427	135	1,405,171
	Bilaspur	7,341	3,806	573,077	591,081	1,164,158	160	1,017,827
	Sambalpur	4,948	2,852	396,874	399,539	796,413	161	695,499
		23,013	11,741	1,745,687	1,799,311	3,544,998	142	3,118,497
Jubbulpore	Jubbulpore	3,948	2,316	375,964	372,182	748,146	189	687,233
	Sangor	4,007	1,583	305,712	286,031	591,743	148	564,059
	Damoh	2,831	1,138	167,329	158,284	325,613	115	312,957
	Seoni	3,198	1,402	184,841	185,926	370,767	116	334,758
	Mandla	5,056	1,757	171,253	168,120	339,373	67	301,760
		19,040	8,146	1,205,099	1,170,543	2,375,642	124	2,201,057
Nerbudda	Hoshangabad	4,594	1,883	270,623	259,322	529,945	115	488,787
	Narsinghpur	1,916	1,012	184,057	182,969	367,026	192	305,173
	Betul	3,334	1,150	162,662	160,594	323,196	84	281,915
	Chindwara	4,630	1,745	202,120	205,365	407,494	88	272,893
	Nimar	3,857	904	131,226	125,260	256,486	75	231,351
		18,321	6,699	950,697	930,459	1,881,147	102	1,780,105
Total British Territory		85,501	34,265	5,397,304	5,386,999	10,784,294	125	9,858,715
Total Native States		29,435	10,497	1,089,011	1,071,500	2,160,511	73	1,709,720
Grand Total		115,936	44,762	6,486,315	6,458,499	12,944,805	111	11,568,511

Between 1881 and 1891, population increased at the rate of 9·6 per cent. in British territory, and at the rate of 26 per cent. in native states. Classified according to religion, in British districts only, Hindus numbered 8,831,467, or 82 per cent. of the total

population; Mahommedans, 297,604, or 2·3 per cent., mostly confined to the towns, being a much smaller proportion than in any other province of India. Aboriginal tribes numbered 1,592,149, or 15 per cent., the proportion rising to as high as 46 per cent. in the four hill districts on the Satpura range. Most of these are Gonds, who still preserve their own language, spoken by 1,379,580 persons in all India. In the native states the proportion of aboriginal tribes was 23 per cent. Christians numbered 12,979, or ·12 per cent., of whom 4782 were Europeans, 2105 Eurasians, and 578 Indo-Portuguese, leaving 5514 for native converts, chiefly in the two districts of Nagpur and Raipur. In the native states the total number of Christians was 338, having risen from 24 since the previous census. Jains numbered 48,644, chiefly in Saugor district; Parsis, 781, chiefly in Nagpur; and "others," 938.

The preliminary returns of the census of 1901 gave a total population for the British districts of 9,845,318, showing a decrease of 938,976 or 8·7 per cent., due to the results of famine. In the feudatory states the population in 1901 was 1,983,496, showing a decrease of 8 per cent.

Out of a total surveyed area of 55,413,037 acres, the area assessed to land revenue is 28,486,863, the average incidence being Rs.0:4:7 (say 5d.) per acre. In 1897-98 the total cultivated area was 15,390,504 acres, of which 1,134,727 acres were cropped more than once. The total irrigated area was 562,628 acres, almost entirely rice-land watered from tanks. There are no Government canals. The principal crops are rice (in Chhattisgarh), wheat (in the Nerbudda valley), millet, pulse, oil-seeds, and cotton (in the Wardha valley). In 1896-97 the total area under cotton was 737,104 acres.

Industries.—The only important industries are connected with cotton and coal. In 1897 the total number of factories under Government inspection was 35, of which 26 worked in cotton. The total number of hands employed was 10,359, of whom 509 were children. The number of cotton-mills was 6, all owned by companies having a nominal capital of Rs.70,00,000, with 1708 looms and 124,610 spindles, working up in the year 200,000 cwt. of raw cotton, and employing 6930 hands, of whom 4830 were adult males. The total out-turn was 18,334,320 lb of yarn, chiefly of counts between Nos. 6 and 22; and 5,110,292 lb of woven goods. There are also about 30 factories for cleaning and pressing cotton. In 1896 a brewery was established at Jubbulpore, with an out-turn of 155,000 gallons. Two coal-mines are worked in the Central Provinces, at Warora and Mopani, to each of which there is a branch line of railway. In 1897-98 the output of the Warora colliery was 115,632 tons. The number of persons employed was 1435, of whom 1263 were adult males. In connexion with the colliery there is a fireclay business, which raised 2065 tons of fireclay and sold firebricks and tiles to the value of Rs.34,948. The Mopani colliery, which dates back to 1860, is worked by a joint-stock company. In 1898 the output was 22,472 tons, and the number of persons employed 276.

Railways.—Until recently, the only railway in the Central Provinces was the Great Indian Peninsula, with two branches, one terminating at Nagpur, the other at Jubbulpore, whence it was continued by the East Indian system to Allahabad. The Bengal-Nagpur line has now opened up the eastern portion of the country, bringing it into direct connexion with Calcutta; and a new branch of the Indian Midland, from Saugor through Damoh, has been partly constructed as a famine work. Large portions, however, in the hilly centre and in the south-east, are still remote from railways.

Trade.—The trade of the Central Provinces is conducted mainly by rail with Bombay and with Calcutta. The following table gives the average value of imports and exports for three quinquennial periods ending 1887-88, 1892-93, and 1897-98:—

	Imports.	Exports
	Rs.	Rs.
Average, 1883-84 to 1887-88	3,54,32,617	4,16,27,507
,, 1888-89 to 1892-93	3,42,23,356	5,19,61,509
,, 1893-94 to 1897-98	4,33,44,883	5,11,24,312

The chief imports are cotton piece goods, cotton twist, salt, sugar, provisions, railway materials, raw cotton, metals, coal, tobacco, spices, and kerosene oil. The chief exports are raw cotton, rice, wheat, oil-seeds, hides, and lac. The exports of wheat are liable to extreme fluctuations. During the five years ending 1887-88 they averaged nearly 8 million maunds; in 1888-89 they reached their maximum of 10 million maunds; during the five years ending 1897-98 they averaged only 2 million maunds, while in the famine year, 1897-98, they dropped to 280,000 maunds.

Local Government.—The total number of civil and revenue courts is 245, and of criminal courts, 385. In 1898 the total number of police was 8606. The total number of municipalities in the Central Provinces is 53, with an aggregate population of about 800,000. In all of them, except the hill station of Pachmarhi, a majority of the municipal committee is elected. Out of a total of 623 members, 445 are elected, and 565 are natives of India. In 1897-98 the aggregate municipal income was Rs.13,91,958, of which Rs.8,08,782 was derived from octroi and Rs.86,422 from water-rates. The aggregate municipal expenditure was Rs.13,95,266, of which Rs.2,69,986 was devoted to conservancy, Rs.1,28,896 to waterworks, Rs.1,51,490 to education, Rs.73,616 to public works, and Rs.80,067 to hospitals. In every district, except Mandla, there is a district council, with subordinate local boards. The total number of members of these bodies is 1197, of whom 913 are elected and 1162 are natives of India. The aggregate income was Rs.7,97,158, of which Rs.3,76,000 was derived from local rates and Rs.1,95,000 from cattle pound fees. The aggregate expenditure was Rs.7,18,221, of which Rs.2,89,000 was devoted to education, Rs.1,94,000 to roads and public works, and Rs.87,000 to hospitals and sanitation.

The net revenue and expenditure of the Central Provinces (in tens of rupees) for 1897-98 was as follows, distributed under the three heads of imperial, provincial, and local:—Net revenue, imperial, Rx.377,503; provincial, Rx.835,210; local, Rx.75,555; total, Rx.1,288,268. Net expenditure, imperial, Rx.1,189,376; provincial, Rx.821,193; local, Rx.89,572; total, Rx.2,100,141. The chief sources of revenue were: land, Rx.664,856; excise, Rx.173,168; stamps, Rx.158,414.

Education.—The following table gives the chief statistics of education in the Central Provinces for the decennial years 1886-87 and 1896-97:—

	1886-87.		1896-97.	
	Schools.	Pupils.	Schools.	Pupils.
Colleges	3	100	5	312
Secondary Schools	71	4,216	248	26,216
Primary Schools	1799	102,173	2262	122,616
Special Schools	18	463	9	363
Private Institutions	4	49	...	...
Total	1895	107,001	2524	149,507

Compared with the estimated population of school-going age (15 per cent. of the total population), the proportion of boys at school rose between 1895 and 1901 from 11·3 to 14·2 per cent., and the proportion of girls from ·8 to 1·1 per cent. The expenditure on education was, in 1886-87, Rs.8,19,228; in 1896-97, Rs.10,52,805.

Famine.—The Central Provinces have suffered from famine more severely than any other part of India. The complete failure of rain in the autumn of 1896 caused scarcity to develop suddenly into famine, which lasted until the end of 1897. The total number of persons in receipt of relief reached its maximum of nearly 700,000 in May 1897. The expenditure on relief alone was Rs.1,56,10,739 (say 1 million sterling); and the total cost of the famine, including loss of revenue, amounted to nearly twice that amount. During 1897 the death-rate for the whole province rose to 69 per thousand, or double the average, while the birth-rate fell to 27 per thousand. The Central Provinces were stricken by another famine, yet more severe and widespread, caused by the complete failure of the rains in 1899. The maximum of persons relieved for the whole province was 1,971,000 in June 1900. In addition, about 68,000 persons were in receipt of relief in the native states. During the three years 1899-1902 the total expenditure on famine relief amounted to Rs.6,10,81,000 (say 4 millions sterling).

See R. H. Craddock. Report on *The Famine in the Central Provinces in* 1896 *and* 1897. Nagpur, 1898. (J. S. Co.)

Centralia, a city of Marion county, Illinois, U.S.A., situated south of the centre of the state, on the Illinois Central railway and three smaller railways, at an altitude of 490 feet. It contains works of the Illinois Central railway, coal-mines and iron-works. Population (1880), 3621; (1890), 4763; (1900), 6721, of whom 571 were foreign-born and 418 were negroes.

Centuripe, formerly Centorbi, a town of Sicily, Italy, in the province of Catania, 32 miles N.W. from Catania (28 miles by rail to Catenanuova; thence 4 miles by road). It stands on a cliff (2307 ft.) overlooking the valley of the Simeto, and carries on sulphur-mining and flour-milling. The ancient *Centoripa*, it was a town of considerable importance both in Sikelian and in Roman times, but was

destroyed by the Emperor Frederick II. as a punishment for having revolted, and its inhabitants were removed to Augusta. Numerous antique vases, coins, &c., have been found in the vicinity. Population, about 10,000.

Cephalonia. See GREECE (*Ionian Islands*).

Ceram, or **Sirang,** an island of the Dutch East Indies, north of Amboyna. Area, 6612 square miles. Professor Martin has demonstrated the similarity of its geological structure—consisting chiefly of eruptive rocks and crystalline limestone—to that of northern Amboyna. The isthmus connecting the two parts of the island is very narrow, and has a height of only 460 to 490 feet. In the eastern section the prevailing rock is crystalline chalk, similar to that of Buru. No central chain of mountains stretches west and east through the island, but near the north coast mountains, rising 2300 to 2600 feet, slope steeply to the shore. Near the south coast, west of the Bay of Elpaputi, a complex mass of mountains forms a colossal pyramid, with peaks rising to nearly 5000 feet. The rivers flow north and south into bays, but are navigable only for a few miles during the rainy season. On the north coast the bays of Savai and Waru are accessible for small vessels. Besides other products, tobacco is cultivated for the European market. The island, which belongs to the Residency of Amboyna, is divided into Kairatu or West Ceram, Wahai and Amahei, the northern and the southern parts of Middle Ceram, and Waru or Eastern Ceram. Recent estimates give only 100,000 for the population (of whom 12,000 are Christians and 16,000 Mahommedans). About 4000 persons perished in the earthquake of 1899.

Ceramics. See POTTERY.

Cernuschi, Henri (1821-1900), Italian politician and economist, was born of wealthy parents at Milan in 1821, and was destined for the legal profession. During his studies he became involved in the revolutionary movement. He played a conspicuous part in the insurrection at Milan in 1848, and also at Rome in 1849, where he had a seat in the National Assembly. On the collapse of the Revolutionary Government he was arrested (1850), but managed to escape to France, where he engaged in commerce and banking, became naturalized, and acquired a large fortune. He took a prominent part in opposing the Socialist movement, and in April 1870, having subscribed a large sum to the funds of a committee formed to combat the Napoleonic plebiscite, had to leave the country. In September the formation of the Third Republic enabled him to return, but he soon left Paris to travel in the East, whence he returned with a fine art collection, particularly of Japanese objects. Cernuschi is best known for his publications on financial questions, more especially bimetallism. Of the latter he was an ardent champion, and the word itself is commonly supposed to have originated with him—at least in its English form it is first found in his *Silver Vindicated* (1876). Among his other works may be mentioned: *Mécanique de l'échange* (1861); *Illusion des sociétés coopératives* (1866); *Le Bimetallisme en Angleterre* (1879); *Le grand procès de l'Union latine* (1884.) He died in 1900. (J. M'F.)

Cerro de Pasco, or PASCO, a town of Peru, in the department of Junin, with a population estimated at about 15,000, wholly devoted to mining. The average annual output of the silver mines has since their opening been about 1,600,000 ounces of pure silver. It is estimated that the copper deposits contain 15 million tons of ore, or about 3 million tons of metallic copper. They will probably be worked as soon as the railway from Oroya can be built, which will put the mines in direct communication with Callao.

Cervera, Pascual Cervera y Topete (1839———), Spanish admiral, was born at Medina Sidonia on 18th February 1839. He showed an early inclination for the sea, and his family sent him to the Naval Cadet School at the age of twelve. As a sub-lieutenant he took part in the naval operations on the coast of Morocco during the campaign of 1859-60. Then he was for some time engaged in operations in the Sulu Islands and the Philippines. Afterwards he was on the West Indian station during the early part of the first Cuban war (1869-78), returning to Spain in 1873 to serve on the Basque coast against the Carlists. He distinguished himself in defending the Carraca arsenal near Cadiz against the Federals in 1873. He won each step in his promotion up to flag-rank through his steadiness and brilliant conduct in action, and was awarded the crosses of the Orders of Military and Naval Merit, Isabella the Catholic, and St Hermengilde, besides several medals. Cervera had a great reputation for decision, unbending temper and honesty, before he was placed at the head of the Bilbao building-yards. This post he resigned after a few months in order to become Minister of Marine in 1892, in a Cabinet presided over by Sagasta. He withdrew from the Cabinet when he found that his colleagues, from political motives, declined to support him in making reforms and, on the other hand, unwisely cut down the naval estimates. When the war broke out with the United States, Cervera was selected to command a squadron composed of four first-class cruisers, the *Maria Theresa*, his flagship, *Oquendo*, *Vizcaya*, and *Columbus*, and several destroyers. This ill-fated squadron only started upon its reckless cruise across the ocean after its gallant commander had repeatedly warned both the Minister of Marine and the Prime Minister, Sagasta, in despatches from Cadiz and from the Canary and Cape Verde Islands, that the ships were insufficiently provided with coal and ammunition. Some of them, indeed, even lacked proper guns. In compliance with the instructions of the Government, Admiral Cervera made for the landlocked harbour of Santiago de Cuba, where he co-operated in the defence, landing some guns and a naval brigade. In spite of his energetic representations, Cervera received an order from Madrid, dictated by political considerations, to sally forth. It meant certain destruction. The gallant squadron met forces trebly superior to it, and was totally destroyed. The admiral, three of his captains, and 1800 sailors and marines were taken by the victors to Portsmouth, in the United States. After the war, Cervera and his captains were tried before the supreme naval and military court of the realm, which honourably acquitted them all.

Cette, a seaport of France, in the arrondissement of Montpellier, department of Hérault, 17 miles S.W. of that town, on the railway from Bordeaux to Montpellier. The total value of imports (general commerce) in 1899 was £5,192,000, and of the exports £1,372,000. In 1899 the number of vessels entered was 1135, tonnage 615,006 (of which 54 of 41,762 tons were from England); and cleared 1090, tonnage 556,059. Trade is chiefly carried on with Spain (about half the total). The foregoing figures do not include the coasting trade, in connexion with which 757 vessels of 379,187 tons entered and 752 of 381,664 tons cleared. The harbour comprises three basins and a comprehensive system of canals, the total area of which is 111 acres, and the total length of quayage 9656 yards. Further improvements are in progress. Population (1881), 32,665; (1901), 33,065.

Cettigne (CETINJE), the capital of the principality of Montenegro, situated in a hollow plain (*Polje*)

deeply sunk in the heart of the limestone mountains, at a height of 2470 feet above the sea. It consists of some streets and a large market-place of little, clean houses, and has much more the appearance of a village than of a town. The principal buildings are the monastery, the old palace (*Bigliardo*), the palaces of the prince and of the prince-royal, the hotel, the hospital, the reading-hall (*Citaonica*), the women's institute, and the new military barracks. The old palace, a great quadrangular building, contains the ministries, the gymnasium, and the tribunal. The population of the whole hollow, including Cetinje, Bajce, Martinitché, Hum, and Donji Kraj, is about 1500.

Cetywayo, king of Zululand, was the son of King Umpanda. As early as 1856 he showed aspirations to the throne, which soon led to open war, and by victories over his father and brothers he virtually became king. By a compromise King Umpanda was made the "head" or adviser, with Cetywayo as the "feet" or administrator of the nation. The old king died in 1873, and Cetywayo was duly crowned in the presence of Mr (afterwards Sir) Theophilus Shepstone. The military power exercised by Cetywayo was, however, regarded by Sir Bartle Frere as a menace to Natal and the Transvaal, so he despatched an ultimatum to Cetywayo in December 1878, directing him to disband his formidable army, indemnify British subjects for outrages, and admit a British Resident. No reply being vouchsafed, Lord Chelmsford, at the head of 13,000 troops, entered Zululand on 11th January 1879. The disaster of Isandlana and the defence of Rorke's Drift signalized the commencement of the campaign, but on 4th July Cetywayo was utterly routed by Lord Chelmsford, and was captured by Major Marter on 28th August. Zululand was placed under a British Resident, and Cetywayo was taken to Cape Town, and afterwards to England, where he arrived 3rd August 1882. He remained in London until the following September, when the Government announced that they had decided upon his restoration, and sent him back to Africa. To his great disappointment, however, this proved to refer only to a portion of his old domains, the country north of the Umhlatusi river. Even here one of his chief enemies, Usibepu, was allowed to retain some territory allotted to him by Sir Garnet (afterwards Lord) Wolseley. Cetywayo's enemies, headed by Usibepu, soon attacked him, and after a struggle of nearly a year's duration he was defeated and his kraal destroyed. He then took refuge in the Native Reserve, where he died 8th February 1884. Cetywayo was a typical Zulu, brave and proud, but sunk in superstition and reckless of human life and human suffering. (G. F. B.)

Ceuta, a Spanish station and seaport on the north coast of Morocco, nearly opposite Gibraltar, in 35° 54′ N. lat., 5° 18′ W. long. It is situated on a sort of promontory connected with the African mainland by a narrow isthmus. The population has steadily grown in the last forty years, outside the penal settlement and the garrison, which have also been increased. In 1897 there were 12,868 inhabitants, as compared with 10,600 in 1887. The garrison averages 3500 men, and the number of convicts ranges from 2000 to 2500. The garrison is under the command of a general of division, resident in the citadel of El Hacho, with military commandants in charge of the principal defences, exterior lines, forts Isabel II. and Prince Alphonso, and other outworks. The local militia is composed of a squadron of mounted rifles of Africa, a marine company, and sharpshooters of the Riff. There is also in Ceuta one of the three African infantry regiments, and the disciplinary corps of military convicts styled "Fijo de Ceuta." The Spanish forces in the other stations at Melilla, Islas Chaffarinas, Peñon de la Gomera, Alhucemas on the north coast of Morocco, are under the orders of the commander-in-chief of Ceuta. In the 'nineties the governments of the Regency of Queen Christina were forced by public opinion to increase the garrison, fortifications, land and sea defences of Melilla. Little has been done, however, to improve the shallow harbour, much exposed to winds and gales that have often damaged its very imperfect moles and quays. The bay is commanded by the Mountain of the Marabout, a Moorish sepulchre better known as the Tomb of the Renegadi. Ceuta has only lately been better fortified seawards, and guns have been mounted in works that are intended to be troublesome for the highway of the seas into the Mediterranean. On the land side Ceuta is defended by three lines of fortifications, the first including only the antiquated citadel of El Hacho, between which and the third line stands the town proper, on the site of the ancient Sebta of the Arabs. On the north and west fronts of the peninsula the modern Ceuta rises in some sort in an amphitheatre. Beyond the third line of the fortification lies the neutral ground. The town has no striking public buildings: a modest cathedral of the 15th century, the town hall, barracks, a statue of Charles IV., and the convict prison in the old convent of San Francisco. Ceuta forms one of the judicial districts of the province of Cadiz, and is under the naval jurisdiction of Algeciras.

Ceylon, a large island and British colony, lying E. of the extreme southern point of India, with a greatest length from north to south of 271½ miles, a greatest breadth of 137½ miles, and an area of 25,363 miles, or somewhat less than four-fifths that of Ireland. Topographical, trigonometrical, cadastral, and archæological surveys have been placed upon a sound basis, but no geological survey, of which there is great need, has yet been definitely commenced.

Meteorology.—Notice should be directed to the wonderful immunity of Ceylon from cyclones, earthquakes, or other volcanic disturbances, and from destructive hurricanes. The latest tables of rainfall and temperature are as follows:—

Name of Station.	Altitude of Station.	Annual Rainfall in Inches.	Barometer (reduc. to 32° F.)		Mean Air-Temperature.	Mean Daily Movement of Wind.	Number of Days on which Rain fell.	Greatest Rainfall in 24 Hours.
			Highest recorded.	Lowest recorded.				
	Feet.					Miles.		
Colombo . .	40	88·31	30·072	29·607	80·07	198·2	178	11·90
Ratnapura . .	84	150·13	30·003	29·314	79·1	81·0	207	11·42
Puttalam . .	27	46·08	30·106	29·535	79·5	208·0	77	12·06
Anuradhapura .	295	54·44	29·840	29·264	80·2	54·8	104	9·32
Mannar . .	12	38·24	30·103	29·588	81·7	214·7	61	11·00
Jaffna . .	9	43·98	30·157	29·552	81·7	216·0	74	9·42
Trincomalee .	12	62·74	30·062	29·462	81·2	241·7	112	8·21
Batticaloa . .	26	55·35	30·108	29·565	80·4	120·7	102	10·46
Hambantota .	50	36·17	30·034	29·583	79·7	199·7	85	5·06
Galle . .	48	91·33	30·081	29·621	79·7	150·8	208	7·66
Kandy . .	1654	81·55	28·426	27·975	75·3	49·5	193	8·95
Hakgalla . .	5581	91·12	24·725	24·205	60·8	161·4	203	7·40
Badulla . .	2225	79·51	27·905	27·396	73·0	47·3	111	9·46
Vavuniya . .	317	59·48	29·850	29·271	80·3	78·7	100	5·40
Kurunegala .	381	84·30	..	..	79·6	29·6	172	6·97
Nuwara Eliya .	6188	94·14	24·228	23·800	57·9	81·8	202	9·11

The above figures give the results of twenty-eight years' unbroken observations.

Flora and Fauna.—A great change has been effected in the appearance of the country by the introduction of the tea plant in place of the coffee plant, after the total failure of the latter owing to disease. Unlike the coffee plant, the hardy tea plant grows from sea-level to 7000 feet altitude; but Crown forest-lands above 5000 feet are no longer sold, so that a very large area on the highest mountain ranges and plateaux is still under forest. Moreover, on the tea plantations arboriculture is attended to in a way unknown in 1875; the Australian eucalypts, acacias, and grevilleas, Indian and Japanese conifers, and other trees of different lands, are now freely planted for ornament, protection

from wind, for firewood, or for timber. A great advance has been made at Hakgalla and Nuwara Eliya, in Upper Uva, and other high districts, in naturalizing English fruits and vegetables. The calamander-tree is nearly extinct, and ebony and other fine cabinet woods are getting scarce; but the conservation of forests after the Indian system has been taken in hand under a director and trained officers, and much good has been done. The cinnamon-tree (wild in the jungles, cultivated as a shrub in plantations) is almost the only one yielding a trade product which is indigenous to the island. The cocoa-nut and nearly all other palms have been introduced.

A Game Preservation Society and the judicious action of Government have done much to prevent the wanton destruction of Ceylon deer, elephants, &c., by establishing a close season. It is estimated that there must be 5000 wild elephants in the Ceylon forests. Since 1864, 2800 elephants have been exported (worth nominally, on the spot, £80,000), chiefly to India. A license to shoot or capture and an export royalty are now levied by Government. Capt. V. Legge includes 371 species of birds in Ceylon, of which only two have been introduced into the island. Insects and reptiles do not trouble European residents so much as in early years—at any rate in the towns, while in the higher planting districts there is almost complete exemption from their unwelcome attentions. Bungalows are more carefully built to resist white ants, drainage and cleanliness prevent mosquitoes and ticks from multiplying, while snakes and leeches avoid cultivated, occupied ground.

Population.—The total population of Ceylon in 1891 and 1901, distributed according to the nine provinces now existing, was as follows:—

	Area in sq. Miles.	Total Pop. 1891.	Total Pop. 1901.	Males, 1901.	Females, 1901.	Estate Pop. 1901.[3]
Western	1,492	764,328	925,212	492,864	431,348	26,815
Central	2,300	474,670	622,832	339,060	283,772	285,096
Northern	3,363	319,686	342,109	172,870	169,239	807
Southern	2,146	490,074	566,690	288,812	277,878	8,508
Eastern	4,037	149,726	174,156	91,122	83,034	592
North-Western	2,997	320,070	353,703	195,777	157,926	9,726
North-Central	4,002	75,333	79,101	43,273	35,828	..
Uva	3,155	159,201	191,925	106,031	85,894	51,793
Sabaragamuwa	1,901	258,626	321,262	176,352	144,910	58,090
Total, Ceylon	25,393[1]	3,012,224	3,576,990[2]	1,907,161	1,669,829	441,523

[1] A more accurate survey now gives the total area as 25,363 square miles. The new provinces of Uva and Sabaragamuwa are almost entirely included in Kandyan territory.
[2] Including military, 8360; shipping, 4164; Boer prisoners of war, 4913.
[3] Almost entirely immigrant coolies from Southern India.

The distribution as to race is as follows (1901):—

Sinhalese, including Kandyans	2,334,817
Tamils	952,237
"Moormen" (Mahommedans, chiefly Arab descendants)	224,719
Malays	11,207
Javanese, Kaffirs, Afghans, Parsees, &c.	20,115
Veddahs	1,000
Burghers and Eurasians	23,312
Europeans, Americans, &c.	9,583

Altogether there are representatives of some seventy races in Ceylon. The Veddahs, who run wild in the woods, are the aborigines of the island. The population of Colombo, the commercial, social, and political capital, is now 158,093, inclusive of a floating population of about 4000.

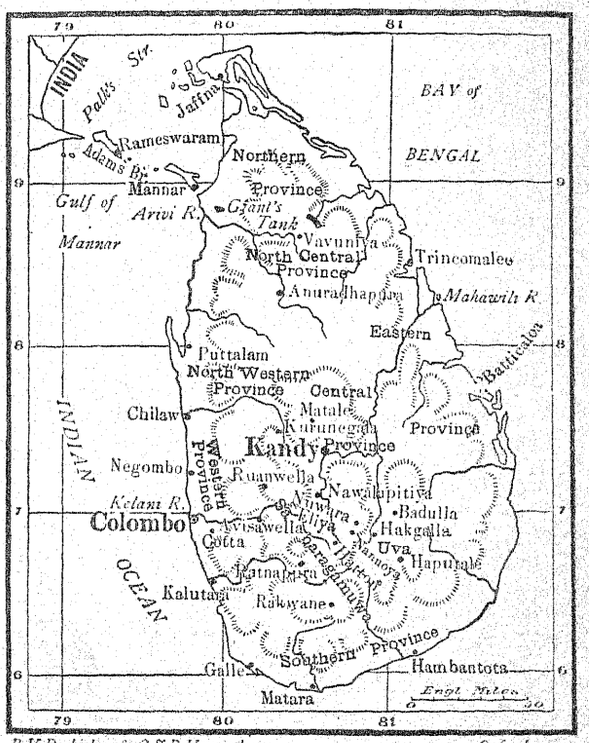
Administration.—The legislative council now includes, besides the governor as president and the nine official members, eight unofficial members—one for the Kandyan Sinhalese (or Highlanders) and one for the "Moormen" having been added in 1890. The term of office for the unofficial members is limited to five years, though the governor may reappoint if he choose. The king's advocate, the deputy-advocate, and the surveyor-general are now respectively styled attorney-general, solicitor-general, and director of public works. The civil service has been reconstituted into five classes, not including the colonial secretary as a staff appointment, nor ten cadets; these five classes number seventy officers. The jurisdiction of the district and police courts was increased a few years ago. The district judges (numbering 19) can punish up to two years' imprisonment, and impose fines up to Rs.1000. The police magistrates (numbering 25) can pass sentences up to six months' imprisonment, and impose fines of Rs.150. The criminal law has since 1890 been codified on the model of the Indian penal code; criminal and civil procedure have also been the subject of codification. There are twenty-three prisons in the island, mostly small; but convict establishments in and near the capital take all long-sentence prisoners. The average annual number of prisoners is 2271, each costing about £15 per annum. The total outlay on prisons is Rs.4,50,000, or £30,000, a year. The police number 1700 men and officers, costing Rs.6,50,000, or £44,000, a year.

There are 65 hospitals and asylums (including lunatic and leper asylums and the Royal Victoria Home for Incurables), and 242 dispensaries. The Government Medical Department numbers 134 doctors and 227 apothecaries, and the whole establishment and administration cost annually about £80,000 net.

Religion.—The principal religions may be distributed as follows:—

Christians	Roman Catholics 280,000; Protestants 80,000	360,000
Buddhists		2,075,000
Hindus		900,000
Mahommedans		240,000

The anomaly of an ecclesiastical establishment of Anglican and Presbyterian chaplains with a bishop of Colombo paid out of the general revenues has been abolished in Ceylon, and only the bishop and two or three incumbents remain on the list for life, or till they retire on pension. Government has had to legislate for Buddhist temporalities, owing to the great corruption prevailing among priestly and lay trustees of temples; committees



B.V.Darbishire & O.J.R Howarth. *Oxford, 1901.*

SKETCH MAP OF CEYLON.

for each are now nominally appointed, but it is doubtful if they work satisfactorily. In the Kandyan district, the temples being endowed and the priests independent, the latter have generally neglected their duties of teaching the young boys and keeping up the zeal of the people. In the low country the priests, being dependent on voluntary offerings, have been generally zealous and active. Ignorance is greatest, as regards education, in the districts where Buddhism is strongest. Of late years there has been a revival of Buddhism in the towns and adjacent districts, and schools have been opened after Western models. There are about 10,000 Buddhist priests in Ceylon.

Education.—There has been a great advance in public instruction since 1875, through the multiplication of vernacular, Anglo-vernacular, and English schools by Government, by the different Christian missions, and by the Buddhists and Hindus who have come forward to claim the Government grant. The Government has also started a technical college, and an agricultural school has been reorganized. An agricultural department, recommended by a commission, should profit by the services of the entomologist, mycologist, and chemical analyst added by the governor to the staff of the Royal Botanic Gardens at Peradeniya. There are industrial and reformatory schools, which are partially supported by Government. In spite of the great advance that has been made, however, at the census of 1891 no fewer than 2,600,000 of the total population were entered as un-

able to read or write their own tongue, and the census of 1901 shows nearly two millions, out of a returned population of fully three and a half millions, still unable to read or write. The official returns (for 1898) show :—

500 Government schools	with	48,642	scholars
1328 Aided (chiefly mission) schools	,,	120,751	,,
2089 Unaided schools	,,	38,881	,,
Total, 3917 schools	,,	208,274	,,

The total expenditure was Rs.8,20,134, or about £55,000.

Finance.—With the disease of the coffee plant the general revenue fell from Rs.1,70,00,000 in 1877 to Rs.1,20,00,000 in 1882, when trade was in a very depressed state, and the general prosperity of the island was seriously affected. Since then, however, the revenue has steadily risen with the growing export of tea, cocoa-nut produce, plumbago, &c., and in 1900 it reached the unprecedented amount of Rs.2,73,25,930 against an expenditure of Rs.2,53,21,988, the rupee being fixed at 15 to the £ sterling. The railway and customs make up between them 56 per cent. of the revenue; arrack monopoly yields Rs.25,00,000, there being about 1500 taverns, selling, with the stores, 1,000,000 gallons of arrack. The salt monopoly yields Rs.10,00,000; stamp duties, Rs.15,00,000; land sales, Rs.7,50,000. The one-sided import duty on grain, affecting about five-eighths of the people, is indefensible, since the "paddy" rent (the levy on rice locally grown) was abolished in 1892. In expenditure, public works and railways absorb one-fourth of the revenue; military expenditure, Rs.19,00,000; public debt charges, Rs.30,00,000 (the public debt is about Rs.5,60,00,000, or not much more than two years' revenue); medical administration and hospitals, Rs.13,00,000; pensions, Rs.10,00,000; and the rest of the expenditure is absorbed by the various other branches of administration.

The Colombo municipality had a revenue for 1899 of Rs.10,88,520 against an expenditure of Rs.9,27,230. Kandy and Galle municipalities are much smaller, with revenues of about Rs.1,40,000 and Rs.80,000 respectively, and local boards established in fourteen minor towns raise about Rs.10,00,000 altogether.

Minerals.—Commercially there are two established industries: (1) that of digging for precious stones; and (2) the much more important industry of digging for plumbago or graphite, the one mineral of commercial importance found. Further developments may result in the shipment of the exceptionally pure iron ore found in different parts of Ceylon, though still no coal has been found to be utilized with it. Several places, too—Ruanwella, Rangalla, Ranghodde, &c.—indicate where gold was found in the time of the Kandyan kings; and geologists might possibly indicate a paying quartz reef, as in Mysore. Owing to the greatly increased demand in Europe and America, plumbago in 1899 more than doubled in price, rising from £40 to £80, and even £100 a ton for the finest. Latterly there has been a considerable fall, but the permanent demand is likely to continue keen in consequence mainly of the Ceylon kind being the best for making crucibles. One consequence of the plumbago boom has been to bring European and American capitalists and Cornish and Italian miners into a field hitherto almost entirely worked by Sinhalese. Though some of the mines were carried to a depth of 1000 feet, the work was generally very primitive in character, and Western methods of working are sure to lead to greater safety and economy. Besides a royalty or customs duty of 5 rupees (about 6s. 8d.) per ton on all plumbago exported, the Government issue licenses at moderate rates for the digging of plumbago on Crown lands, a certain share of the resulting mineral also going to Government. The plumbago industry, in all its departments of mining, carting, preparing, packing, and shipping, gives employment to fully 100,000 men and women, still almost entirely Sinhalese. The wealthiest mine-owners, too, are Sinhalese landowners or merchants. The export has quadrupled since 1874, the increase latterly being especially rapid—from 24,000 tons in 1898 to nearly 31,000 tons in 1899, when 15,000 tons went to the United States, 9300 tons to the United Kingdom, and nearly 6000 tons to the continent of Europe. The local customs value placed on the total export was about Rs.1,00,00,000 (nearly £700,000), but in the Western markets it was much larger. The export of plumbago in 1900 was under 20,000 tons. In all there must be from 2500 to 3000 plumbago pits or mines in Ceylon; but many of these are abandoned or shut up, and perhaps not more than from one-third to one-half are worked even under the influence of recent high prices. The finest bright silvery lump plumbago still commands prices up to 800 rupees (nearly £54) per ton; while the lower qualities in the form of chips and dust can be got at one-sixth (or less) that rate.

As regards *gems*, there are perhaps 500 gem pits or quarries worked in the island during the dry season from November to June in the Ratnapura, Rakwane, and Matara districts. Some of these are on a small scale; but altogether several thousands of Sinhalese find a precarious existence in digging for gems. Rich finds of a valuable ruby, sapphire, cat's-eye, amethyst, alexandrite or star stone, are comparatively rare; it is only of the commoner gems, such as moonstone, garnet, spinels, that a steady supply is obtained. The cat's-eye in its finer qualities is peculiar to Ceylon, and is occasionally in great demand, according to the fashion. The obstacle to the investment of European capital in "gemming" has always been the difficulty of preventing the native labourers in the pits—even if practically naked—from concealing and stealing gems. A Chamber of Mines, with a suitable library, was established in Colombo during 1899.

Agriculture.—The area of uncultivated land must exceed 20,000 of the 25,365 square miles in the island. Of course a great deal is waste, besides lagoons, tanks, backwaters, &c. Thick forest land does not cover more than 5000 square miles. Scrub, or chena, and patana grass cover a very great area. The following estimate of the cultivated area is taken from Ferguson's *Ceylon Handbook and Directory* for 1901 :—

	Acres cultivated.
Rice (paddy cultivation)	600,000
Other grain (kurakkan, Indian corn, pulses, and legumes)	120,000
Cocoa-nuts (European and native)	625,000
Areca nuts, Palmyra, and Kitul palms	135,000
Cinnamon	45,000
Cardamoms (European and native)	8,000
Other spices, nutmeg, clove, pepper, vanilla, ginger, &c.	10,000
Other palms and fruit-bearing trees and shrubs, jak, breadfruit, plantains, pines, oranges, mangoes, &c.	243,000
Garden vegetables, roots, yams, cassava, manioc, potatoes, cabbages, onions, chillies, cucumbers, &c.	100,000
Coffee (Arabica) European and native	7,700
Do. (Liberian) do. do.	2,500
Tea (European and native)	392,000
Chocolate plant (cacao) (European and native)	30,000
Cinchona	2,200
Sugar-cane	13,000
Cotton	1,000
Tobacco	25,000
Citronella grass and other essential oil grasses	40,000
Rhea, aloes, and other fibres	1,000
Rubber trees	2,600
Other new products	5,000
Blue gums and introduced timber trees	8,000
Cultivated grass land	15,000
Patana, natural pasturage, &c.	1,000,000
Total acres	3,434,000

Tea, cacao, cardamoms, cinchona, coffee, and indiarubber are the products cultivated by the European and an increasing number of native planters in the hill country and (for tea) part of the low country of Ceylon. It was owing to the failure of the coffee crops, as previously mentioned, that planters began extensively to grow the tea plant, which had already been known in the island for several years. By 1882 over 20,000 acres had been planted with tea, but the export that year was under 700,000 lb. Five years later the area planted was 170,000 acres, while the export had risen to nearly 14,000,000 lb. By 1892 there were 262,000 acres covered with tea, and 71,000,000 lb were that year exported. In 1897, 350,000 acres were planted, and the export was 116,000,000 lb. And in 1901 the total area cultivated with tea was not under 390,000 acres, while the estimate of shipments was put at 146,000,000 lb. The maximum area ever under coffee was 272,000 acres in 1877, when the total export of that product was equal to 103,000,000 lb. Now only a few thousand (perhaps 9000) acres of coffee are all that are left in Ceylon. From the first Ceylon tea found favour in the United Kingdom, Australia, and Canada, and its use is rapidly spreading throughout Europe and the United States. In 1900 the chief exports were to the United Kingdom, nearly 114,000,000 lb; to Australia, 17,600,000 lb; to Russia, nearly 9,000,000 lb; to America, 4,000,000 lb; and to China for America, 1,260,000 lb. Ceylon plantations of tea number in all about 1400, with as many European managers and assistants, giving employment to fully 400,000 Tamil men, women, and children. Nearly every plantation has its factory, with the machinery necessary to prepare the leaf as brought in from the bushes until it becomes the tea of commerce. The total amount of capital now invested in the tea industry in Ceylon cannot be less than £10,000,000 sterling. The tea-planting industry more than anything else has raised Ceylon from the very depressed state to which it fell in 1882. Before tea was proved a success, however, *cinchona* cultivation was found a useful bridge from coffee to the Ceylon planter, who, however, grew it so freely that in one year 15,000,000 lb bark was shipped, bringing the price of quinine down from 16s. to 1s. 6d. an ounce. Then the culture became

unprofitable, and in 1900 the export fell to 510,000 lb bark; but with higher prices there is likely to be a revival of the product in Ceylon. More important, however, among new planting products is *cocoa* (the "chocolate plant"), the growth and export of which have steadily extended since coffee failed, so that in 1899 the export was 42,745 cwt. Important also is the spice or aromatic product of *cardamoms*, of which the annual export is now about 540,000 lb.

The culture of *indiarubber* has been begun on low-country plantations, and the industry is full of promise. The area of cultivation of the cocoa-nut palm has been greatly extended since 1875 by natives as well as by Europeans. The products of this palm that are exported, apart from those so extensively used in the island itself, exceed in a good year £1,000,000 sterling in value. The native trade in cinnamon has likewise greatly increased. The export of bales and chips increased from 2,335,961 lb in 1890 to 4,541,517 lb in 1900; of oil, from 108,787 oz. in 1890 to 118,778 oz. in 1899, when also over 800,000 lb of wild cinnamon were exported. Of citronella oil, 1,478,756 lb were exported in 1899 as compared with 909,942 lb in 1890, while of coir—rope, yarn, and fibre—the amount rose from just over 120,000 cwt. to close on 215,000 cwt. in 1900, the increase being almost entirely in the export of fibre. It is expected that viticulture, cotton cultivation, and tobacco growing, the last of which is already freely carried on in the north and north-east districts, will be greatly developed along the course of the new northern railway. A scheme for growing sugar in the north-east of the island on a large scale is now under consideration. In January 1892 the immemorial rent or tax on fields of *paddy* (rice in the husk) was removed, but not the customs duty on imported rice. But even with the advantage of "protection" to the extent of 10 per cent. in the local markets, there has been no extension of paddy cultivation; on the contrary, the import of grain from India grows larger year by year. In connexion with the liberal project of railway extension (see below), systematic expenditure on irrigation works, up to Rs.5,000,000 (to be included in the public loan for railways) is to be undertaken, and a separate irrigation department has been formed to secure full attention in prosecuting the selected undertakings. Among these will be the full restoration of the Giant's Tank in the arid Mannar district, around which possibly some of the surplus population of southern India may be settled to cultivate rice, cotton, and perhaps tobacco, besides other vegetables necessary to their subsistence. Through these multiplied irrigation works, also, and the northern railway, rice culture may be sufficiently extended to save some of the large imports (8,000,000 to 9,000,000 bushels annually) now required from India.

Taking the trade in the products mentioned as a whole, no country can compete with the United Kingdom as a customer of Ceylon. But there is a considerable trade in nearly all products with Germany and America; in cardamoms with India; in cinnamon with Spain, Italy, Belgium, Australia, Austria, and France; in some or other of the products of the cocoa-nut palm (cocoa-nuts, cocoa-nut oil, copra, desiccated cocoa-nut, poonac, coir) with Belgium, Russia, France, Austria, Australia, and Holland; and in plumbago with Belgium.

Pearl Fishery.—Since 1874 there have been ten years with more or less successful fisheries at Arippu, on the north-west coast, the latest and most successful being in 1891, when over £86,000 was gained by the Government. Seventeen years were blanks. Capt. Donnan, on his inspection in March 1901, reported a prospect of successful fisheries in 1904. Professor Herdman, F.R.S., was appointed to inquire and report on the conservation and cultivation of the Ceylon pearl-oyster, and visits Ceylon in January 1902.

Manufactures.—Little is done save in the preparation in factories and stores, in Colombo or on the plantations, of the several products exported. The manufacture of jewellery and preparation of precious stones, and, among native women and children, of pillow lace, give employment to several thousands. Iron and engineering works are numerous in Colombo and in the planting districts. The Sinhalese are skilful cabinetmakers and carpenters. The Moormen and Tamils furnish good masons and builders.

Commerce.—There has been rapid development since 1882, and the returns for 1900 showed a total value for imports (including specie) of 122 millions of rupees (say, £8,130,000). The principal items were: articles of food and drink (chiefly rice from India), over 3 millions sterling; manufactured metals (with specie), £1,000,000; coal, 590,000 tons; cotton yarns and piece goods from Manchester, about half a million sterling; machinery and millwork, £160,000; apparel, &c., £150,000. The Ceylon customs tariff for imports is one of 6¼ per cent. *ad valorem*, save in the case of intoxicating drinks, arms, ammunition, opium, &c. The total value of the exports, including specie, for 1900 was 95 millions of rupees, or £6,400,000; tea was valued at nearly 28,000,000, and products of the cocoa-nut palm at £1,100,000. For 1900 the export trade was as follows:—

Exports to United Kingdom . .	Rs.5,62,95,525
,, ,, British Colonies . .	1,80,86,205
,, ,, Foreign countries . .	2,05,80,047
	Rs.9,49,62,277

i.e., goods to the value of nearly 4 millions sterling went to the United Kingdom out of a total export valued at £6,350,000 sterling.

Shipping and Navigation.—The headquarters of the mail steamers have been removed from Galle to Colombo, where a magnificent breakwater has been constructed and other harbour works have been undertaken. There has been a great increase in the number and tonnage of the vessels calling and coaling, as also a great development in the coasting trade. The total tonnage of vessels entered and cleared in 1900 was 8,316,191, of which 5,889,702 tons belonged to the United Kingdom, 207,026 tons to British colonies, and 2,219,463 tons to foreign countries.

Railways and Roads.—The railway system has developed from 100 to 297 miles in length, including one of the finest mountain lines in the world—over 160 miles long, rising to 6200 feet above sea-level, and falling at the present terminus to 4000 feet. The towns of Kandy, Matale, Gampola, Nawalapitiya, Hatton, and Haputale (and practically Nuwara Eliya) in the hills, are thus connected by rail, and in the low country the towns of Kurunegala, Galle, Matara, Kalutara, &c. These 297 miles (all Government) cost about 53 millions of rupees, but most of the debt is paid off, and the traffic receipts now make up nearly one-third of the general revenue. At present 200 miles more of railway are under construction (all on the same wide 5½-feet gauge) to connect Jaffna and the north with the rest of the island. This northern line will run from Kurunegala *viâ* Anuradhapura, "the buried city" and earliest capital of the Sinhalese, through the centre of the island and across the Jaffna peninsula. Two lines on a narrow (2½-feet) gauge are also under construction—(1) to connect Colombo through Cotta—also an early royal Sinhalese seat—with Avisawella and the Kelani valley tea-growing district, 45 miles; and (2) to connect Nanuoya, on the main line, with the sanatorium (Nuwara Eliya) and on to Udapusilava, over 20 miles. Other hill lines will follow, and also, probably, a prolongation of the Kelani railway through Colombo and northwards to the towns of Negombo, Chilaw, and Puttalam, serving one of the richest and most populous of native districts. The 270 additional miles actually sanctioned and under construction will cost over 15 millions of rupees. An Indo-Ceylon railway to connect the Indian and Ceylon systems has been the subject of separate reports and estimates by engineers serving the Ceylon and Indian Governments, who have pronounced the work across the coral reef between Mannar and Rameswaram quite feasible. Such a line is sure to be made for strategic as well as commercial purposes, and Colombo will then be more than ever the port for Southern India. Ceylon has now about 3800 miles of high roads, mostly macadamized, and the maintenance of these costs annually Rs.15,00,000 (or £100,000). There are besides perhaps 10,000 miles of minor—estate and village—roads.

Banks and Currency.—Ceylon has agencies of the National Bank of India, Bank of Madras, Mercantile Bank of India, Chartered Bank of India, Australia, and China, and of the Hongkong and Shanghai Bank, besides mercantile agencies of other banks. Also a Government Savings Bank at Colombo and Post Office Savings Banks all over the island. In 1884, on the failure of the Oriental Bank, the notes in currency were guaranteed by Government, and a Government note currency was started in supersession of bank notes. This note currency has now reached an average of 12 millions of rupees, giving an annual income to Government exceeding Rs.2,00,000. The banks' clearing-house returns for Colombo show nearly 200 million rupees of cheques per annum. The Savings Bank shows nearly 2 millions of rupees lodged from 13,000 depositors, besides small deposits in post office, and several provident funds. The *coin currency* of Ceylon is in rupees and decimals of a rupee, the value of the standard following that fixed for the Indian rupee, about 1s. 4d. per rupee. Of specie in 1900 the value imported was Rs.77,95,502; exported, Rs.29,19,796.

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of Ceylon. London, 1870.—Dr. COPLESTON, Bishop of Colombo. *Buddhism, Primitive and Present, in Magadha and in Ceylon*. London, 1892. (J. F.)

Chabrier, Alexis Emmanuel (1841-1894), French composer, was born at Ambert on 18th January 1841. At first he only cultivated music as an amateur, and it was not until 1879 that he threw up an administrative appointment in order to devote himself entirely to the art. He had two years previously written an *opéra bouffe* entitled *L'Étoile*, which was performed at the Bouffes Parisiens. In 1881 he was appointed chorus-master of the concerts then recently established by Lamoureux. Two years later he composed the brilliant orchestral rhapsody entitled *España*, the themes of which he had jotted down when travelling in Spain. His opera *Gwendoline* was brought out at Brussels on 10th April 1886, with considerable success, and was given later at the Paris Grand Opéra. The following year 1887, *Le Roi malgré lui*, an opera of a lighter description, was produced in Paris at the Opéra Comique, its run being interrupted by the terrible fire by which this theatre was destroyed. His last opera, *Briseis*, was left unfinished, and performed in a fragmentary condition at the Paris Opéra, after the composer's death in Paris on the 13th September 1894. Chabrier was also the author of a set of piano pieces entitled *Pièces Pittoresques*, *Valses Romantiques*, for two pianos, a fantasia for horn and piano, &c. His musical tendencies were very modern, and his great admiration for Wagner asserted itself in *Gwendoline*, a work which, in spite of inequalities due to want of experience, is animated by a high artistic ideal, is poetically conceived, and evinces considerable harmonic originality, besides a thorough mastery over the treatment of the orchestra. The characteristics of *Le Roi malgré lui* have been well summed up by M. Joncières when he alludes to "cette verve inépuisable, ces rythmes endiablés, cette exubérance de gaieté et de vigueur, à laquelle venait se joindre la note mélancolique et émue." Chabrier's premature death prevented him from giving the full measure of his worth. (A. HE.)

Chaco, a territory in the north of the Argentine Republic, bounded on the N. by the territory of Formosa, from which it is separated by the Rio Bermejo, on the S. by Santiago del Estero and Santa Fé, on the E. by Paraguay and Corrientes, and on the W. by Santiago del Estero and Salta. The official area at the census of 1895 comprised 52,741 square miles, with a population of 10,422. It is divided into five departments. The capital, Resistencia, on the Paraná, has a population of 3000. In 1895 the territory had 620 farms—11,214 acres planted in cereals, 83,952 head of cattle, 7671 head of sheep, and 5408 horses.

Chad, a large lake of northern Central Africa, of very variable extent, generally shallow, and containing many islands. It is fed principally by the Shari, coming from the south-east, but in the rains a considerable body of water is brought down by the Waubé from the west. The lake has no proper outlet, but at high water the surplus floods the swampy valley of the Bahr-el-Ghazal on the south-east; it does not, if recent accounts are to be trusted, reach the depression to the north-east known as Bodele, as was supposed by Nachtigal. In 1897 the southern part of the lake was for the first time navigated by a steamer, which had been brought from the south and launched on the Shari by the French expedition under Gentil. Lake Chad lies on the borderland between the wooded regions of the Sudan on the south and the arid steppes which merge into the Sahara on the north. Its shores are generally devoid of trees. The native sultanates of Bornu (south and west of the lake) and Wadai and Kanem (east and north) have by international agreements fallen to the spheres of Great Britain, France, and Germany, the partition taking no account of former boundaries. European influence had, before 1900, scarcely reached the lake, but the power of Rabah, usurping sultan of Bornu, was in that year finally broken by his defeat by the French. One of the long-established trade routes across the Sahara—that from Tripoli to Kuka in Bornu—strikes the lake at its north-west corner, but this has lost much of its former importance. Communication from Algeria to the lake *viâ* Air was, after repeated failures, opened by M. Foureau in 1899-1900, while Lieut. Joalland, member of the expedition originally entrusted to Capts. Voulet and Chanoine, also reached the lake from the Middle Niger, continuing his journey round the north end to Kanem.

See FOUREAU, in *Geographical Journal*, February 1901; JOALLAND, in *La Géographie*, June 1901.

Chadwick, Sir Edwin (1800-1890), was born at Longsight, near Manchester, in 1800. Called to the bar without any independent means, he sought to support himself by literary work, and his essays in the *Westminster Review* (mainly on different methods of applying scientific knowledge to the business of government) introduced him to the notice of Jeremy Bentham, who engaged him as a literary assistant and left him a handsome legacy. In 1832 he was employed by the Royal Commission appointed to inquire into the operation of the poor laws, and in 1833 he was made a full member of that body. In conjunction with Nassau Senior he drafted the celebrated report of 1834 which procured the reform of the old poor law. His special contribution was the institution of the union as the area of administration. He favoured, however, a much more centralized system of administration than was adopted, and he never ceased to complain that the reform of 1834 was fatally marred by the rejection of his views, which contemplated the management of poor-law relief by salaried officers controlled from a central board, the boards of guardians acting merely as inspectors. In 1834 he was appointed secretary to the Poor Law Commissioners. Finding himself unable to administer in accordance with his own views an Act of which he was largely the author, his relations with his official chiefs became much strained, and the disagreement led, among other causes, to the dissolution of the Poor Law Commission in 1846. Chadwick's chief contribution to political controversy was his constant advocacy of entrusting certain departments of local affairs to trained and selected experts, instead of to representatives elected on the principle of local self-government. While still officially connected with the poor law he had taken up the question of sanitation in conjunction with Dr Southwood Smith, and their joint labours produced a most salutary improvement in the public health. His report on "The Sanitary Condition of the Labouring Population" (1842) is a valuable historical document. He was a commissioner of the Board of Health from its establishment in 1848 to its abolition in 1854, when he retired upon a pension, and occupied the remainder of his life in voluntary contributions to sanitary and economical questions. He died on 6th July 1890. He had been made K.C.B. in 1889. The best account of his opinions is *The Health of Nations* (1887), which is practically a biography dictated by himself to the late Sir B. W. Richardson.

See also a volume on *The Evils of Disunity in Central and Local Administration . . . and the New Centralisation for the People*, by Edwin Chadwick (1885).

Chaffarinas, a Spanish station in a group of islands of the same name, on the north coast of Morocco, near the Algerian frontier, 2½ miles to the north of Cape del Agna. The largest of these isles, Del Congreso, is

rocky and hilly. It has a watch-house on the coast nearest to Morocco. The island of Isabella II. contains several batteries, barracks, and a penal convict settlement. For years the Spanish Government has been preparing works, breakwaters to unite this island with that of El Rey, with a view to enclose a deep and already sheltered anchorage. This roadstead even now can afford a safe refuge for 40 large vessels and many of light draught. The Chaffarinas, which are the *Presinsulæ* of the Romans and the *Zaferin* of the Arabs, were occupied by Spain in 1848. The population was 596 in 1897, including troops.

Chagos, a group of atolls in the Indian Ocean disposed in circular form round the Chagos bank, in 5° 30′ to 6° 30′ N. and 71° 30′ to 72° 30′ E., separated from the Maldives by a deep channel 300 miles wide. The atolls on the south and east side of the bank, which has a circumference of about 270 miles, have disappeared through subsidence; a few—Egmont, Danger, Eagle, and Three Brothers—still remain on the east side, but most of the population (700 in 1900) is centred on Diego Garcia, which lies on the south-east side, and is nearly 13 miles long by 6 wide. The lagoon, which is enclosed by two coral barriers and accessible to the largest vessels on the north side, forms one of the finest harbours in the world, and affords every facility for establishing repairing docks, victualling and coaling stations. The group, which has a total land area of 76 square miles, is dependent for administrative purposes on Mauritius, and is regularly visited by vessels from that colony. The only product is cocoa-nut oil, of which about 4800 hectolitres are annually exported. Since 1791 this industry has been in the hands of French Creoles from Mauritius.

Chaidam. See TSAIDAM.

Chalcedon, now KADIKEUI, on the shore of the Bosphorus, south of Scutari. Kadikeui forms the tenth "Cercle" of the municipality of Constantinople, and has a population of about 33,000, of whom 8000 are Moslems. There are a large British colony with a church, Greek and Armenian churches and schools, and a training college for Roman Catholic Armenians.

Challemel-Lacour, Paul Amand (1827-1896), French statesman, was born at Avranches on 19th May 1827. After passing through the *École normale supérieure*, he became professor of philosophy successively at Pau and at Limoges. The *coup d'état* of 1851 caused his expulsion from France for his republican opinions. He travelled on the Continent, and in 1856 settled down as professor of French literature at the Polytechnic of Zürich. The amnesty of 1859 enabled him to return to France, but a projected course of lectures was immediately suppressed. He now supported himself by his pen, and became a regular contributor to the reviews. On the fall of the second empire in 1870 the Government of National Defence appointed him prefect of the department of the Rhone, in which capacity he had to suppress the Communist rising at Lyons. Resigning his post in the following year, he was in 1872 elected to the National Assembly, and in 1876 to the Senate. He sat at first on the Extreme Left; but his philosophic and critical temperament was not in harmony with the recklessness of French Radicalism, and his attitude towards political questions underwent a steady modification, till the close of his life saw him the foremost representative of moderate republicanism. During Gambetta's lifetime, however, Challemel-Lacour was one of his warmest supporters, and he was for a time editor of Gambetta's organ, the *République Française*. In 1879 he was appointed French ambassador at Berne, and in 1880 was transferred to London; but he lacked the suppleness and command of temper necessary to a successful diplomatist. He resigned in 1882, and in February 1883 became minister of foreign affairs in the Jules Ferry Cabinet, but retired in November of the same year. In 1890 he was elected vice-president of the Senate, and in 1893 succeeded Jules Ferry as its president. His influence over that body was largely due to his clear and reasoned eloquence, which placed him at the head of contemporary French orators. In 1893 he also became a member of the French Academy. He distinguished himself by the vigour with which he upheld the Senate against the encroachments of the Chamber, but in 1895 failing health forced him to resign, and he died in Paris on 26th October 1896. He published a translation of Ritter's *History of Philosophy* (1861); *La philosophie individualiste: étude sur Guillaume de Humboldt* (1864); and an edition of the works of Madame d'Épinay (1869). In 1897 appeared *Œuvres oratoires de Challemel-Lacour . . . avec une introduction et des notices par Joseph Reinach.* (H. SY.)

Châlon-sur-Saône, chief town of arrondissement, department of Saône-et-Loire, France, 46 miles N. of Macon, on railway from Paris to Lyon. It has manufactures of machinery, vinegar, oil-refining, and iron and copper founding. In the square opposite the Palais de Justice is a fountain erected in memory of the Thévenin family, to whom the town is indebted for its water-supply. The ancient hospital in the St Laurent suburb has been rebuilt. Population (1881), 19,864; (1901), 29,058.

Châlons-sur-Marne, chief town of department Marne, France, 107 miles E. of Paris by rail. The town has become a great centre for the manufacture of beer, in part replacing that of wine. One of the large breweries occupies a series of galleries in the limestone rock originally excavated for the storage of wine. These galleries, with a total length of 6 miles, are now served by lines of railway which convey the beer directly to the station. The woollen industry has declined. Châlons is the headquarters of the 6th army corps. The port traffic on the Marne canal in 1899 was 47,374 tons. Population (1881), 17,298; (1901), 21,487.

Chamba, a native state of India, within the Punjab, amid the Himalayas. It has an area of 3126 square miles. In 1881 the population was 115,773; in 1891 it was 124,032, giving an average density of 40 persons per square mile; and in 1901 it was 128,005. The estimated gross revenue is Rs.3,50,000; the tribute, Rs.5000; the military force, 400. The sanitarium of Dalhousie, though within the state, is attached to the district of Gurdaspur.

Chamberlain, Joseph, (1836-——), British statesman, third son of Joseph Chamberlain, Master of the Cordwainers' Company, was born at Camberwell Grove, London, on 8th July 1836. His father was a well-to-do man of business, a Unitarian in religion and a Liberal in politics. Young Chamberlain was educated at Canonbury from 1845 to 1850, and at University College School, London, from 1850 to 1852. After two years in his father's office in London, he was sent to Birmingham to join his cousin Joseph Nettlefold in a screw business in which his father had an interest; and by degrees, largely owing to his own intelligent management, this business became very successful. "Nettlefold and Chamberlain" employed new methods of attracting customers, and judiciously amalgamated rival firms with their own so as to reduce competition, with the result that in 1874, after twenty-two years of commercial life, Mr Chamberlain was able to retire with an ample fortune. Meanwhile he had in 1861 married his first wife, Miss Harriet Kenrick (she died

in 1863), and had gradually come to take an increasingly important part in the municipal and political life of Birmingham. He was a constant speaker at the Birmingham and Edgbaston Debating Society; and when in 1868 the Birmingham Liberal Association was reorganized, he became one of its leading members. In 1869 he was elected chairman of the executive council of the new National Education League, the outcome of Mr George Dixon's movement for promoting the education of the children of the lower classes by paying their school fees and agitating for more accommodation and a better national system. In the same year he was elected a member of the town council, and married his second wife,—a cousin of his first,—Miss Florence Kenrick (d. 1875).

In 1870 he was elected a member of the first School Board for Birmingham; and for the next six years, and

JOSEPH CHAMBERLAIN.
(From a photograph by Russell and Sons, London.)

especially after 1873, when he became leader of a majority and chairman, he actively championed the Nonconformist opposition to denominationalism. He was then regarded as a Republican—the term signifying rather that he held advanced Radical opinions, which were construed by average men in the light of the current political developments in France, than that he really favoured Republican institutions. His programme was "free Church, free land, free schools, free labour." At the general election of 1874 he stood as a parliamentary candidate for Sheffield, but without success. Between 1869 and 1873 he was a prominent advocate in the Birmingham town council of the gospel of municipal reform preached by Mr Dawson, Dr Dale, and Mr Bunce (of the *Birmingham Post*); and in 1873 his party obtained a majority, and he was elected mayor, an office he retained until June 1876. As mayor he had to receive the Prince and Princess of Wales on their visit in June 1874, an occasion which excited some curiosity because of his reputation as a Republican; but those who looked for an exhibition of bad taste were disappointed, and the behaviour of the Radical mayor satisfied the requirements alike of the *Times* and of *Punch*. The period of his mayoralty was one of historic importance for Birmingham. New municipal buildings were erected, Highgate Park was opened as a place of recreation, the Free Library and Art Gallery were developed. But the great work carried through by Mr Chamberlain for Birmingham was the municipalization of the supply of gas and water, and the improvement scheme by which slums were cleared away and forty acres laid out in new streets and open spaces. The prosperity of modern Birmingham dates from 1875 and 1876, when these admirably administered reforms were initiated, and by his share in them Mr Chamberlain became famous. It may be added here that the interest taken by him in Birmingham remained undiminished during his later life, and he was largely instrumental in starting the Birmingham University (1900).

In 1876 Mr Dixon resigned his seat in Parliament, and Mr Chamberlain was returned for Birmingham in his place unopposed, as John Bright's colleague. He made his maiden speech in the House of Commons on 4th August 1876, on Lord Sandon's Education Bill. At this period, too, he paid much attention to the question of licensing reform, and in 1876 he examined the Gothenburg system in Sweden, and advocated a solution of the problem in England on similar lines. During 1877 the new federation of Liberal Associations which became known as the "Caucus," was started under Mr Chamberlain's influence in Birmingham,—its secretary, Mr Schnadhorst, quickly making himself felt as a wire-puller of exceptional ability; and the new organization had a remarkable effect in putting life into the Liberal party, which since Mr Gladstone's retirement in 1874 had been much in need of a stimulus. When the general election came in 1880 Mr Schnadhorst's powers were demonstrated in the successes won under his auspices. The Liberal party numbered 349, against 243 Conservatives and 60 Irish Nationalists; and the Radical section of the Liberal party, led by Mr Chamberlain and Sir Charles Dilke, was recognized by Mr Gladstone by his inclusion of the former in his Cabinet as President of the Board of Trade, and the appointment of the latter as Under Secretary for War. In his new capacity Mr Chamberlain was responsible for carrying such important measures as the Bankruptcy Act, 1887, and the Patents Act. Another Bill which he had much at heart, on Merchant Shipping, had to be abandoned, and a royal commission substituted, but the subsequent legislation in 1888-94 owed much to his efforts. The Franchise Act of 1884 was also one in which he took a leading part as a champion of the opinions of the labouring class. At this time he took the current advanced Radical views of both Irish and foreign policy, hating coercion, disliking the occupation of Egypt, and prominently defending the Transvaal settlement after Majuba. Both before and after the defeat of Mr Gladstone's Government on the Budget in June 1885, he associated himself with what was known as the "Unauthorized Programme," *i.e.*, free education, small holdings, graduated taxation, and local government. In June 1885 he made a speech at Birmingham, treating the reforms just mentioned as the "ransom" that property must pay to society for the security it enjoys—for which Lord Iddesleigh called him "Jack Cade"; and he continually urged the Liberal party to take up these Radical measures. At the general election of November 1885 Mr Chamberlain was returned for West Birmingham. The Liberal strength generally was, however, reduced to 335 members, though the Radical section held their own; and the Irish vote became necessary to Mr Gladstone if he was to command a majority. In December it was stated that Mr Gladstone intended to propose a Home Rule Bill, and in January Lord Salisbury's ministry was defeated on the Address, on an amendment moved by Mr Jesse Collings embodying

the "three acres and a cow" of the Radical programme. Unlike Lord Hartington and other Liberals, who declined to join Mr Gladstone in view of the altered attitude he was adopting towards Ireland, Mr Chamberlain entered the Cabinet as President of the Local Government Board, but on 15th March 1886 he resigned, explaining in the House of Commons (8th April) that, while he had always been in favour of the largest possible extension of local government to Ireland consistently with the integrity of the empire and the supremacy of Parliament, and had therefore joined Mr Gladstone when he believed that this was what was intended, he was unable to consider that the scheme communicated by Mr Gladstone to his colleagues maintained those limitations. At the same time he was not irreconcilable, and he invited Mr Gladstone even then to modify his Bill so as to remove the objections made to it. This indecisive attitude did not last long, and the split in the party rapidly widened. At Birmingham Mr Chamberlain was supported by the "Two Thousand," but deserted by the "Caucus" and Mr Schnadhorst. In May the Radicals who followed Mr Bright and Mr Chamberlain, and the Whigs who took their cue from Lord Hartington, decided to vote against the second reading of the Home Rule Bill, instead of allowing it to be taken and then pressing for modifications in committee, and on 7th June the Bill was defeated by 343 to 313, 94 Liberal Unionists—as they were generally called—voting against the Government. Mr Chamberlain was the object of the bitterest attacks from the Gladstonians for his share in this result; he was stigmatized as "Judas," and open war was proclaimed by the Home Rulers against the "dissentient Liberals"—the description used by Mr Gladstone. The general election, however, returned to Parliament 316 Conservatives, 78 Liberal Unionists, and only 276 Gladstonians and Nationalists, Birmingham returning seven Unionist members. When the House met in August, it was decided by the Liberal Unionists, under Lord Hartington's leadership, that their policy henceforth was essentially to combine with the Tories to keep Mr Gladstone out. The old Liberal feeling still prevailing among them was too strong, however, for their leaders to take office in a coalition ministry. It was enough for them to be able to tie down the Conservative Government to such measures as were not offensive to Liberal Unionist principles. It still seemed possible, moreover, that the Gladstonians might be brought to modify their Home Rule proposals, and in January 1887 a Round Table conference (suggested by Mr Chamberlain) was held between Mr Chamberlain, Sir G. Trevelyan, Sir William Harcourt, Mr Morley, and Lord Herschell. But no *rapprochement* was effected, and reconciliation became daily more and more difficult. The influence of Liberal Unionist views upon the domestic legislation of the Government was steadily bringing about a more complete union in the Unionist party, and destroying the old lines of political cleavage. Before 1892 Mr Chamberlain had the satisfaction of seeing Lord Salisbury's ministry pass such important Acts, from a progressive point of view, as those dealing with Coal Mines Regulation, Allotments, County Councils, Housing of the Working Classes, Free Education, and Agricultural Holdings, besides Irish legislation like the Ashbourne Act, the Land Act of 1891, and the Light Railways and Congested Districts Acts. In October 1887 Mr Chamberlain, Sir L. Sackville West, and Sir Charles Tupper were selected by the Government as British plenipotentiaries to discuss with the United States the Canadian fisheries dispute, and a treaty was arranged by them at Washington on 15th February 1888. The Senate refused to ratify it; but a protocol provided for a *modus vivendi* pending ratification, giving American fishing vessels similar advantages to those contemplated in the treaty; and on the whole Mr Chamberlain's mission to America was accepted as a successful one in maintaining satisfactory relations with the United States. He returned to England in March 1888, and was presented with the freedom of the borough of Birmingham. The visit also resulted, in November 1888, in his marriage with his third wife, Miss Endicott, daughter of the United States minister of war in President Cleveland's first administration.

At the general election of 1892 Mr Chamberlain was again returned, with an increased majority, for West Birmingham; but the Unionist party as a whole came back with only 315 members against 355 Home Rulers. In August Lord Salisbury's ministry was defeated; and on 13th February 1893 Mr Gladstone introduced his second Home Rule Bill, which was eventually read a third time on 1st September. During the eighty-two days' discussion in the House of Commons Mr Chamberlain was the life and soul of the opposition, and his criticisms had a vital influence upon the attitude of the country when the House of Lords summarily threw out the Bill. His chief contribution to the discussions during the later stages of the Gladstone and Rosebery ministries was in connexion with Mr Asquith's abortive Employers' Liability Bill, when he foreshadowed the method of dealing with this question afterwards carried out in the Compensation Act of 1897. Outside Parliament he was busy formulating proposals for Old Age Pensions, which had a prominent place in the Unionist programme of 1895. In that year, on the defeat of Lord Rosebery, the union of the Unionists was sealed by the inclusion of the Liberal Unionist leaders in Lord Salisbury's ministry; and Mr Chamberlain became Secretary of State for the Colonies. There had been much speculation as to what his post would be, and his nomination to the Colonial Office, then considered one of secondary rank, excited some surprise; but Mr Chamberlain himself realized how important that department had become. His influence in the Unionist Cabinet was soon visible in the Workmen's Compensation Act and other measures. This Act, though in Sir Matthew White Ridley's charge as Home Secretary, was universally and rightly associated with Mr Chamberlain; and its passage, in the face of much interested opposition from highly-placed old-fashioned Conservatives and capitalists on both sides, was principally due to his determined advocacy. Another "social" measure of less importance, which formed part of the Chamberlain programme, was the Small Houses Acquisition Act of 1899; but the problem of Old Age Pensions was less easily solved, and the subject was handed over first to a royal commission, and then to a departmental committee, both of which threw cold water on the schemes laid before them—a result which, galling enough to one who had made so much play with the question in the country, offered welcome material to his opponents for electioneering recrimination, as year by year went by between 1895 and 1900 and nothing resulted from all the confident talk on the subject in which Mr Chamberlain had indulged when out of office.

From January 1896 (the date of the Jameson Raid) onwards South Africa demanded the chief attention of the Colonial Secretary. It is too soon to estimate precisely the part played by Mr Chamberlain in the affairs which at last led to war with the Transvaal. But never has a statesman's personality been more bitterly associated by his political opponents with the developments they deplored. The report of the House of Commons committee (July 1897) definitely acquitted both Mr Chamberlain and the Colonial Office of any privity in the Raid, but Mr Chamberlain's detractors continued to assert the contrary. Opposition hostility reached such a pitch that in 1899

there was hardly an act of the Cabinet during the negotiations with President Kruger which was not attributed to the personal malignity and unscrupulousness of the Colonial Secretary. The elections of 1900 (when he was again returned, unopposed, for West Birmingham) turned upon the individuality of a single minister more than any since the days of Mr Gladstone's ascendancy, and Mr Chamberlain, never conspicuous for inclination to turn his other cheek to the smiter, was not slow to return the blows with interest.

Apart from South Africa, his most important work was the successful passing of the Australian Commonwealth Act (1900), in which both tact and firmness were needed to settle certain differences between the Imperial Government and the colonial delegates. Mr Chamberlain's tenure of the office of Colonial Secretary between 1895 and 1900 must always be regarded as a turning-point in the history of the relations between the British Colonies and the Mother Country. His accession to office was marked by speeches breathing a new spirit of imperial consolidation, embodied either in suggestions for commercial union, or in more immediately practicable proposals for improving the "imperial estate"; and at the Diamond Jubilee of 1897 the visits of the colonial Premiers to London emphasized and confirmed the new policy, the fruits of which were afterwards seen in the cordial support given by the colonies in the Boer war. Even in what Mr Chamberlain called his "Radical days" he had never supported the "Manchester" view of the value of a colonial empire; and during the Gladstone ministry of 1880-85 Mr Bright had remarked that the junior member for Birmingham was the only Jingo in the Cabinet—meaning, no doubt, that he objected to the policy of *laisser-faire* and the timidity of what was afterwards known as "Little Englandism." While he was still under Mr Gladstone's influence these opinions were kept in subordination, but Mr Chamberlain was always an imperial federationist, and from 1887 onwards he constantly gave expression to his views on the desirability of drawing the different parts of the empire closer together for purposes of defence and commerce. In 1895 the time for the realization of these views had come; and Mr Chamberlain's speeches, previously remarkable chiefly for debating power and directness of argument, were now dominated by a new note of constructive statesmanship, basing itself on the economic necessities of a world-wide empire. Not the least of the anxieties of the Colonial Office during this period was the situation in the West Indies, where the cane-sugar industry was being steadily undermined by the European bounties given to exports of Continental beet; and though the Government restricted themselves to attempts at removing the bounties by negotiation and to measures for palliating the worst effects in the West Indies, Mr Chamberlain made no secret of his repudiation of the Cobden Club view that retaliation would be contrary to the doctrines of free trade, and he did his utmost to educate public opinion at home into understanding that the responsibilities of the Mother Country are not merely to be construed according to the selfish interests of a nation of consumers. As regards foreign affairs, Mr Chamberlain more than once (and particularly at Leicester on 30th November 1899) indicated his leanings towards a closer understanding between the British Empire, the United States, and Germany,—a suggestion which did not save him from an extravagant outburst of German hostility during the Boer war. The unusually outspoken and pointed expression, however, of his disinclination to submit to Muscovite duplicity or to "pin-pricks" or "unmannerliness" from France, was criticized on the score of discretion by a wider circle than that of his political adversaries.

Mr Chamberlain is popularly known as indulging a hobby for orchid-growing at his house, "Highbury," near Birmingham. An orator of a straightforward, unrhetorical type, cool, alert in debate, and hard-hitting, his personality has always had a peculiarly irritating effect on his opponents; and his spare figure, incisive features, and single eyeglass have made him a favourite subject for the caricaturist. Among other public honours, he was made Lord Rector of Glasgow University in 1897, and delivered on that occasion an address on "Patriotism." His eldest son, Austen, has also made his mark in politics as a Civil Lord of the Admiralty, 1895-1900, and as financial secretary to the Treasury (1901).

Chamberlain, Sir Neville Bowles (1820-1902), British field-marshal (1900), third son of Sir Henry Chamberlain, first baronet, consul-general and chargé d'affaires in Brazil, was born at Rio on the 10th January 1820. He entered the Indian army in 1837, served as a subaltern in the first Afghan war (1839-42), and was wounded on six occasions (medal and clasps). He was attached to the Governor-General's bodyguard at the battle of Maharajpur, in the Gwalior campaign of 1843 (medal), was appointed military secretary to the governor of Bombay in 1846, and honorary aide-de-camp to the Governor-General of India in 1847. He served on the staff throughout the Punjab campaign of 1848-49 (medal and clasps and brevet majority). In 1850 he was appointed commandant of the Punjab military police, and in 1852 military secretary to the Punjab Government. Promoted lieut.-colonel in 1854, he was given the command of the Punjab Frontier Force with rank of brigadier-general, and commanded in several expeditions against the frontier tribes. In the Indian Mutiny he succeeded Colonel Chester as adjutant-general of the Indian army, and distinguished himself at the siege of Delhi, where he was severely wounded (medal, brevet-colonelcy, A.D.C. to the Queen, and C.B.). He was reappointed to the command of the Punjab Frontier Force in 1858, and commanded in the (1863) Umbeyla campaign, when he was severely wounded (medal, major-general for distinguished service, and K.C.B.). He was made K.C.S.I. in 1866, lieut.-general in 1872, G.C.S.I. in 1873, G.C.B. in 1875, and general in 1877. From 1876 to 1881 he was commander-in-chief of the Madras army, and in 1878 was sent on a mission to the Amir of Afghanistan, whose refusal to allow him to enter the country precipitated the second Afghan war. He was for some time acting military member of the Council of the Governor-General of India. He retired in 1886, and died 18th February 1902.

Chambers, William (1800-1883). The story of the brothers Chambers has been so fully told in the *Ency. Brit.* (vol. v.), that it is only necessary to add that William Chambers (born at Peebles, 16th April 1800) was the financial genius of the firm, and that, although possessing neither the literary abilities nor the attractive character of his brother, he laid the city of Edinburgh under the greatest obligations by his public spirit and munificence. As Lord Provost he procured the passing in 1867 of the Improvement Act, which led to the reconstruction of a great part of the Old Town, and at a later date he proposed and carried out, largely at his own expense, the restoration of the noble and then neglected church of St Giles, making it in a sense "the Westminster Abbey of Scotland." This service was fitly acknowledged by the offer of a baronetcy, which he did not live to receive, dying on 20th May 1883, three days before the reopening of the church. He was the author of a history of St Giles's, of a memoir of himself and his brother, and of many other useful publications.

Chambersburg, a borough of Pennsylvania, U.S.A., and capital of Franklin county, situated in the

Cumberland Valley, in the southern part of the state, at an altitude of 613 feet. It has three railways, the Cumberland Valley, the Western Maryland, and the Mont Alto. Population (1880), 6877; (1890), 7863; (1900), 8864, of whom 769 were negroes.

Chambon, Le, or LE CHAMBON-FEUGEROLLES, a town of France, department of Loire, in the arrondissement of St Etienne, and 5½ miles S.W. of that town by rail, on a tributary of the Loire. Coal is mined in the neighbourhood, and there are forges, steel works, manufacture of ironmongery, and silk mills. The ancient castle of Feugerolles is noteworthy. Population (1901), 11,528.

Chambord, Henri Charles Ferdinand Marie Dieudonné, COMTE DE (1820-1883), was born in Paris on 29th September 1820. His father was the duc de Berry, the elder son of the comte d'Artois (afterwards Charles X.); his mother was the Princess Marie Caroline of Naples. Born seven months after the assassination of his father, he was hailed as the "enfant du miracle," and was made the subject of one of Lamartine's most famous poems. He was created duc de Bordeaux, and in 1821, as the result of a subscription organized by the Government, received the château of Chambord.[1] He was educated by tutors inspired by detestation of the French Revolution and its principles, and from the duc de Damas in particular imbibed those ideas of divine right and of devotion to the Church to which he always remained true. After the revolution of July, Charles X. vainly endeavoured to save the Bourbon cause by abdicating in his favour and proclaiming him king under the title of Henry V. (2nd August 1830). The comte de Chambord accompanied his grandfather into exile, and resided successively at Holyrood, Prague, and Görz. In 1841, during an extensive tour through Europe, he broke his leg—an accident that resulted in permanent lameness. The death of his grandfather, Charles X., in 1836, and of his uncle, the duc d'Angoulême, in 1844, left him the last male representative of the elder branch of the Bourbon family; but his marriage with the Archduchess Maria Theresa, eldest daughter of the duke of Modena (7th November 1846), remained without issue. The title to the throne thus passed to the comte de Paris, as representative of the Orleans branch of the house of Bourbon, and the history of the comte de Chambord's life is largely an account of the efforts made to unite the Royalist party by effecting a reconciliation between the two princes. Though he continued to hold an informal court, both on his travels and at his castle of Frohsdorf, near Vienna, yet he allowed the revolution of 1848 and the *coup d'état* of 1851 to pass without any decisive assertion of his claims. It was the Italian war of 1859, with its menace to the Pope's independence, that roused him at last to activity. He declared himself ready "to pay with his blood for the triumph of a cause which was that of France, the Church, and God Himself." Making common cause with the Church, the Royalists now began an active campaign against the empire. On 9th December 1866 he addressed a manifesto to General Saint-Priest, in which he declared the cause of the Pope to be that of society and liberty, and held out promises of retrenchment, civil and religious liberty, "and above all honesty." Again, on 4th September 1870, after the fall of the empire, he invited Frenchmen to accept a government "whose basis was right and whose principle was honesty," and promised to drive the enemy from French soil. These vague phrases, offered as a panacea to a nation fighting for its life, showed conclusively his want of all political genius; they had as little effect on the French as his protest against the bombardment of Paris had on the Germans. Yet fortune favoured him. The elections placed the Republican party in a minority in the National Assembly; the abrogation of the law of exile against the royal family permitted him to return to his castle of Chambord; and it was thence that on 5th July 1871 he issued a proclamation, in which for the first time he publicly posed as king, and declared that he would never abandon the white standard of the Bourbons, "the flag of Henry IV., Francis I., and Joan of Arc," for the tricolour of the Revolution. He again quitted France, and answered the attempts to make him renounce his claims in favour of the comte de Paris by the declaration (25th January 1872) that he would never abdicate. In the following month he held a great gathering of his adherents at Antwerp, which was the cause of serious disturbances. A constitutional programme, signed by some 280 members of the National Assembly, was presented for his acceptance, but without result. The fall of Thiers in May 1873, however, offered an opportunity to the Royalists by which they hastened to profit. The comte de Paris and the prince de Joinville journeyed to Frohsdorf, and were formally reconciled with the head of the family (5th August). The Royalists were united, the premier (the duc de Broglie) an open adherent, the president (MacMahon) a benevolent neutral. MM. Lucien Brun and Chesnelong were sent to interview the comte de Chambord at Salzburg, and obtain the definite assurances that alone were wanting. They returned with the news that he accepted the principles of the French Revolution and the tricolour flag. But a letter to Chesnelong, dated Salzburg, 27th October, declared that he had been misunderstood: he would give no guarantees; he would not inaugurate his reign by an act of weakness, nor become "le roi légitime de la Révolution." "Je suis le pilot nécessaire," he added, "le seul capable de conduire le navire au port, parce que j'ai mission et autorité pour cela." This outspoken adherence to the principle of divine right did credit to his honesty, but it cost him the crown. The duc de Broglie carried the septennate, and the Republic steadily established itself in popular favour. A last effort was made in the National Assembly in June 1874 by the duc de la Rochefoucauld-Bisaccia, who formally moved the restoration of the monarchy. The comte de Chambord on 2nd July issued a fresh manifesto, which added nothing to his former declarations. The motion was rejected by 272 to 79, and on 25th February 1875 the Assembly definitely adopted the Republic as the national form of government. From this time the comte de Chambord, though continuing to publish letters on political affairs, made no further effort to regain the throne. He died at Frohsdorf on 24th August 1883.

See *Manifestes et programmes politiques de M. le comte de Chambord*, 1843-73 (1873), and *Correspondance de la famille royale et principalement de Mgr. le comte de Chambord avec le comte de Bouillé* (1884). Of the enormous literature relating to him, mention may be made of *Henri V. et la monarchie traditionnelle* (1871), *Le Comte de Chambord étudié dans ses voyages et sa correspondance* (1880), and *Henri de France*, by H. DE PÈNE (1885).

(H. SY.)

Champaign, a city of Champaign county, Illinois, U.S.A., situated in the eastern part of the state, on Embarras river, at an altitude of 740 feet. It is the seat of the state university, which had in 1898 a staff of

[1] This château is in the arrondissement of Blois, department of Loir-et-Cher, France, 10 miles E.S.E. of Blois. The park covers an area of 13,000 acres, of which 11,000 are under wood. The work of reinstating the castle was undertaken by the comte de Chambord, continued till his death in 1883, and subsequently carried on by his successor, prince John of Parma. Only the northern portion is considered. It comprises two square blocks. The castle has 440 apartments, and the stables are said to have stalls for 1200 horses.

professors and instructors numbering 183, and was attended by 1582 students, including 245 women. Its property was valued at $1,544,000, and it had an income of $355,000. The city is on the Illinois Central, the Wabash, and the Cleveland, Cincinnati, Chicago and St Louis railways. Population (1880), 5103; (1890), 6021; (1900), 9098 (973 foreign-born and 404 negroes).

Champáran, or CHUMPARUN, a district of British India, in the Patna division of Bengal, occupies the north-west corner of Behar, lying between the two rivers Gandak and Baghmati and the Nepal hills. It has an area of 3531 square miles. Population (1881), 1,721,608; (1891), 1,859,465, showing an increase of 8 per cent.; average density, 527 persons per square mile. Classified according to religion, Hindus in 1891 numbered 1,590,044; Mahommedans, 267,319; Christians, 2100, of whom 140 were Europeans; "others," 2. In 1901 the population was 1,791,026, showing a decrease of 4 per cent. The land revenue and rates are Rs.8,45,224; the number of police is 385; the number of boys at school (1896-97) is 16,062, being 12·3 per cent. of the male population of school-going age, the lowest rate in the whole province; the registered death-rate (1897) is 34·79 per thousand. The adminstrative headquarters are at Motihari (population, 13,108); Bettia is the centre of a very large estate; Segowlie, still a small military station, was the scene of a massacre during the Mutiny. Champáran is the chief seat of indigo planting in Behar. There are 18 concerns with 42 outworks, employing 37,000 hands, and producing an out-turn valued at Rs.22,00,000. There are also 44 saltpetre refineries, with an out-turn valued at Rs.3,09,000. The district suffered severely from drought in 1866 and 1874, and again in 1897. In the last year a small Government canal irrigated 11,000 acres, for which no water-rates are charged; and a canal from the Gandak will irrigate 85,000 acres. The district is traversed almost throughout its length to Bettia by the Tirhut state railway. A considerable trade is conducted with Nepal.

Champigny, a town in the arrondissement of Sceaux, department of Seine, France, 7½ miles E.S.E. of Paris by rail, on the river Marne. There is a chapel in the early Renaissance style with fine stained glass. The town has manufactures of embroideries and piano-keys; and market-gardening is carried on in the vicinity. It was the scene, in 1870, of two battles during the Franco-Prussian war. A handsome monument, with crypt containing the remains of those who fell, both French and German, has been erected on the neighbouring height of Cœuilly. Population (1901), 6578.

Chancellorsville, a village of Spottsylvania county, Virginia, U.S.A., situated almost midway between Washington and Richmond, Virginia. It was the central point of one of the greatest battles of the Civil War, 2nd and 3rd May 1863, between the Union "army of the Potomac" under General Hooker, and the Confederate "army of Northern Virginia" under General Lee. The former, numbering about 120,000 men, crossed Rappahannock river and advanced upon the Confederates, who numbered about 60,000. After two days of severe fighting, in which the Union army lost 18,000 men and the Confederates 13,000, Hooker retreated with his army across the Rappahannock, his forward movement having been checked. Among the killed on the Confederate side was General "Stonewall" Jackson.

Chanda, a town and district of British India, in the Nagpur division of the Central Provinces. In 1881 the population of the town was 16,137, and in 1891 it was 16,175. Chanda was the capital of an ancient Gond kingdom, and is still surrounded by a stone wall 5½ miles in circuit. It has several old temples and tombs. There are manufactures of cotton, silk, brass-ware, and leather slippers, and a considerable local trade.

The district of CHANDA has an area of 10,749 square miles. The population in 1881 was 649,146, and in 1891 was 697,610, showing an increase of 8 per cent. and an average density of 65 per square mile. In 1901 the population was 589,399, showing a decrease of 15 per cent. The land revenue and rates were Rs.3,34,441, the incidence of assessment being Rs.0:2:9 per acre; the cultivated area in 1897-98 was 818,434 acres, of which 157,307 were irrigated almost entirely from tanks or artificial lakes; the number of police was 531; boys at school in 1896-97 numbered 7356, being 13·9 per cent. of the male population of school-going age; the registered death-rate in 1897 was 41·71 per thousand. The principal crops are rice, millet, pulse, wheat, oil-seeds, and cotton. The district contains the coal-field of Warora, which is connected by a branch with the Nagpur line of the Great Indian Peninsula railway. The mine, which is worked by Government, employs about 1400 hands. In 1897-98 the output was 115,682 tons, and the gross receipts were Rs.5,40,759, yielding a return of 7·7 per cent. on the capital. There is a fireclay industry under the same management. The district suffered severely from famine in 1900, when in April the number of persons relieved rose to 90,000.

Chandausi, a town of British India, in the Moradabad district of the North-West Provinces, 28 miles S. of Moradabad. Its population in 1891 was 28,111, and its municipal income in 1897-98 was Rs.21,837. It is an important station on the Oudh and Rohilkhand railway, with a junction for Aligarh. Its chief exports are of cotton, sugar, and stone. There is a factory for pressing cotton.

Changarnier, Nicolas-Anne-Théodule (1793-1877), French general, was born at Autun, Saône-et-Loire, on 26th April 1793. Educated at St Cyr, he served for a short time in one of the privileged companies of the bodyguard of Louis XVIII., and entered the 60th regiment of the line as a lieutenant in January 1815. He achieved distinction in the Spanish campaign of 1823, and became a captain in October 1825. In 1830 he entered the Royal Guard and was sent to Africa, where he took part in the Mascara expedition. Promoted major in 1835, he distinguished himself under Marshal Clausel in the campaign against Achmet Bey, and became a lieutenant-colonel in 1837. The part he took in the expedition of Portes-de-Fer gained him a colonelcy, and his success against the Hadjoutes and Kabyles the cross of the Legion of Honour. Three more years of brilliant service in Africa, during which he assisted in subjugating the tribes near Tenes, and was wounded at Medeah, won for him the rank of lieutenant-general of division in 1843, and the Algiers divisional command in 1847. He visited France early in 1848, assisted the provisional Government to establish order, and returned to Africa in May to succeed General Cavaignac in the government of Algeria. He was speedily recalled on his election to the General Assembly for the department of the Seine, and received the command of the National Guard of Paris, to which was added soon afterwards that of the troops in Paris, altogether nearly 100,000 men. He held a high place and exercised great influence in the complicated politics of the next two years (grand cross of the Legion of Honour, 5th April 1849). An avowed enemy of republican institutions, he held a unique position in upholding the power of the President; but in January 1851 he opposed Louis Napoleon's policy, was in consequence deprived of

his double command, and, at the *coup d'état* in December, was arrested and sent to Mazas, until his banishment from France by the decree of the 9th January 1852. He returned to France after the general amnesty, and resided on his estate in the department of Saône-et-Loire. During the Franco-Prussian war he served with the emperor of the French, and afterwards with Bazaine, until he became a prisoner of war on the capitulation of Metz. At the armistice he returned to Paris, and in 1871 was elected to the National Assembly by four departments, and sat for the Somme. He took an active part in politics, and served on the committee which elaborated the monarchical constitution, and, when the comte de Chambord refused the compromise, moved the resolution to extend the executive power for ten years to Marshal MacMahon. He was elected a life senator in 1875. He died in Paris on 14th February 1877, the funeral rites being celebrated at the church of the Invalides. (R. H. V.)

Changra, or KANKARI (ancient *Gangra*, and *Germanicopolis*), altitude 2500 feet, the chief town of a sanjak of the Kastamúri viláyet in Asia Minor, situated in a rich, well-watered valley. The ground is impregnated with salt, and the town is unhealthy. Population 13,000, of whom 500 are Christians. Gangra, the capital of the kingdom of Deiotarus, son of Castor, was taken into the Roman province of Galatia in 7 B.C., and was later the metropolitan see of Paphlagonia.

Channel Islands, a group of islands in the English Channel, consisting of Jersey, Guernsey, Alderney, Sark, Herm, and one or two smaller islets which lie in the bay of St Michael, off the coast of Normandy, 15 miles W. from Cotentin and 88 miles S. by E. from Portland Bill. Their total area is about 75 square miles, of which 45 square miles belong to Jersey, 25 to Guernsey, and 3 to Alderney. Officially they are comprised in the English county of Hampshire and the diocese of Winchester. The islands of Alderney, Sark, Herm, and others are administratively counted as part of Guernsey.

JERSEY—*Agriculture.*—Between 1880 and 1899 the area of land under crops increased from 18,950 acres (65·9 per cent. of total area) to 19,361 acres (67·4 per cent.). The largest area was occupied by pasture and meadow land, namely, 8446 acres, or 29·4 per cent. of the total, in 1880, and 8253, or 28·7 per cent., in 1899; and potatoes, 4671 acres, or 16·9 per cent., in 1880, and 8484 acres, or 29·5 per cent., in 1899. All the cereals together (86·4 per cent. being wheat) only covered 2920 acres, or 10·1 per cent., in 1880; and 1868 acres, or 6·7 per cent., in 1899 (58·6 per cent. being wheat). Turnips, mangold, and other green crops are also grown in small quantities. The area devoted to orchards and market gardens (tomatoes, &c.) was 1569 acres in 1880 and 1209 acres in 1899. The live-stock statistics show a slight increase in the numbers of horses, cattle, and pigs in 1899 as compared with 1880, but a slight decrease in sheep. The figures for the year 1899 were 2447 horses, 12,559 cattle (of which 6964 were cows or heifers in milk or in calf), 298 sheep, and 7991 pigs. The area farmed by tenant occupiers increased from 11,289 acres in 1890 to 12,934 acres in 1899; and the area farmed by owners decreased from 8677 acres in 1890 to 6427 acres in 1899.

Climate.—According to Rev. H. W. Yorke,[1] the annual mean temperature for a period of 20 years was 51·7° Fahr., the mean of January 42·1° and of August 63°. The mean temperature of the sea-water ranges from 40° in December to 60° in August. The annual mean rainfall (25 years) is 34·2 inches. The average amount of sunshine was 1930 hours annually for the 15 years ending 1888, or 5 per cent. more than is recorded at the sunniest spot on the south coast of England; and 1980 hours for the years since 1888.

St Helier possesses good educational facilities in a ladies' college, a high school for girls, and Victoria College, and numerous private schools; also a public library (1736), which contains some Elzevirs, Plantins, &c., and the Beresford library. Since its formation in 1873 the Société Jersaise has excavated and examined most of the remaining megalithic monuments of the island known as *hougues* or *pouquelayes*. The harbour (40 acres) has 30 feet of water at ordinary spring tides, but is dry at low water. Prynne, the Puritan divine, was imprisoned in the (Norman) Orgueil Castle from 1637 to 1640.

The *population* of Jersey was 52,445 in 1881, 54,518 in 1891 (showing a density of 1211 inhabitants to the square mile), and 52,796 in 1901. In 1891 the birth-rate was 25·1; the death-rate, 20·9. In 1899 the ports of Jersey and Guernsey were cleared by 413 vessels of 52,227 tons; Jersey alone owned 95 vessels of 5532 tons, also 126 fishing boats of 391 tons.

GUERNSEY AND ITS DEPENDENT ISLANDS—*Agriculture.*—Between 1880 and 1899 the area under crops increased from 11,123 acres, or 56·7 per cent. of the total area, to 11,663, or 59·5 per cent. The largest area was occupied by pasture and hay—namely, 6055 acres, or 30·8 per cent., in 1880, and 7162 acres, or 36·5 per cent., in 1899, or an increase of 1107 acres. Green crops covered 3256 acres, or 16·6 per cent., in 1880, and 2922, or 14·9 per cent., in 1899. The area under orchards and market gardens decreased from 683 acres in 1880 to 480 acres in 1899. The principal crops are oats, potatoes (741 acres in 1899), wheat, barley, mangold, and tares. Between 1880 and 1899 there was a slight increase in the number of horses, a slight decrease in cattle and pigs, and a large decrease (from 1013 to 328) in sheep; the figures for the latter year being 1645 horses, 7172 cattle (of which 3609 were cows and heifers in milk or in calf), and 4741 pigs. The total area farmed by tenants amounted to 5050 acres in 1899, and the area farmed by the owners to 6613 acres.

Climate.—The mean temperature of February, computed from a period of 40 years, is 43° Fahr., and of July, 60·6°. The rainfall gives an annual mean of 37½ inches. The amount of sunshine annually is about 2 per cent. less than in Jersey, or about 1890 hours in the year.

Population, &c.—Guernsey possesses two libraries, one with a museum attached; also a ladies' college and a lunatic asylum. The harbour of St Peter Port is 14 to 42 feet deep at ordinary spring tides, and 6 to 32 feet at ordinary neap tides, and possesses a floating dock and shipbuilding yards. In 1899 Guernsey owned 60 vessels of 6526 tons and 99 fishing boats of 349 tons. Victor Hugo spent several years of exile in Guernsey, the house which he occupied in St Peter Port being still in possession of his family. The population of Guernsey increased from 32,600 in 1881 to 35,243 in 1891 (showing a density of 1410 inhabitants to the square mile), and 40,477 in 1901. The birth-rate in 1891 was 23·3; the death-rate, 19·7. Population of Alderney, Sark, &c., 2657 in 1881, 2473 in 1891, and 2568 in 1901.

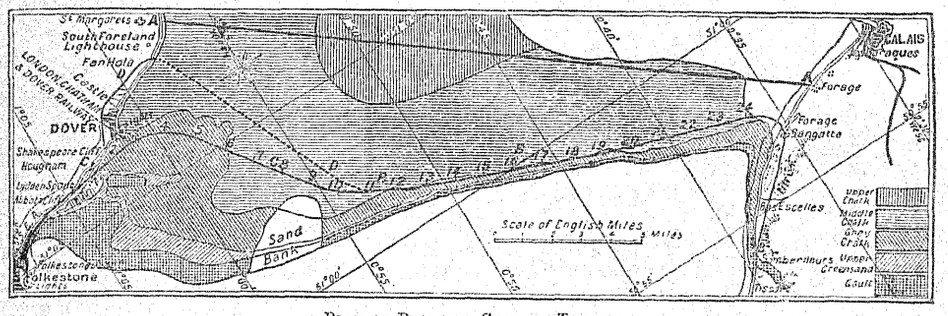
See G. G. CHISHOLM in *Scot. Geog. Mag.* 1886.

Channel Tunnel.—The scheme for uniting England with France by means of a tunnel was first put upon a practical basis in 1856 by an eminent French engineer, M. Thomé de Gamond. His plans were exhibited at the Universal Exhibition of 1867. At the same time English engineers were also working at the same idea. Mr Low conceived the idea of connecting the railway systems of France and England, and selected on the English shore Fan Hole (see D on plan), a spot about

[1] *Quarterly Journ.* of Meteorological Soc., No. 111. 1899.

half a mile west of the South Foreland Light, and on the French shore Sangatte, about four miles to the west of Calais, as the ends of the tunnel. Between these two points he considered galleries could be made entirely through the Dover Grey Chalk, which, owing to its comparative freedom from water and the general absence of cracks and fissures, offered exceptional facilities for work. Mr Low laid his plans before the Emperor of the French in 1867. Sir John Hawkshaw had also considered the question of a tunnel, and decided to make two borings at the ends of the line which seemed approximately the best position, and to examine the bottom of the Channel for some distance on each side of that line.

In the year 1866 borings were begun at St Margaret's Bay and near Sangatte (see A on plan); these proved that



Plan of Proposed Channel Tunnel.

the same strata of chalk which plunge under the sea in England reappear in the cliffs of France, and their continuity underneath the Channel was shown by samples obtained from the bed of the sea. The next step was the appointment of an international committee, which concluded that there was a reasonable prospect that the work could be done, and saw no reason to assume that its cost would exceed ten millions sterling. The French Government, accepting the scheme, in 1870 made a formal application for the views of the British Government, but the negotiations were broken off by the Franco-German war. They were renewed in 1871, and as a result the British Government intimated that it had "no objection in principle" to the tunnel. After some further communications between the two Governments in 1874, settling the basis on which the enterprise should be allowed to proceed, a joint commission was appointed to arrange details relating to jurisdiction, the right of blocking the tunnel, &c., and this commission's report was accepted by the Treasury as a basis of an agreement between the two Governments. In consequence of these negotiations two companies were formed. The French company received its concession in 1875, and the English Channel Tunnel Company, which had applied to Parliament for leave to construct preliminary works at St Margaret's, obtained its Act in the same year. The French Submarine Railway Company at once undertook costly preliminary operations, obtaining over 3000 samples of the bottom of the sea in the Strait, and taking more than 7000 soundings, which have rendered it possible to map the range of the chalk of the sea bottom with the same accuracy as in the cliffs. The shaft at Sangatte was sunk and the heading begun, in faith in the understanding arrived at between the two Governments. The English company was unable to obtain the necessary capital, owing to commercial depression, and its powers lapsed in 1880. The South-Eastern Railway had obtained powers in 1874 to sink experimental shafts on their property between Dover and Folkestone, and in 1881 to acquire lands, including the beach and foreshore, in that area for experimental works in connexion with the construction of a Channel tunnel. These resulted, in 1882, in the formation of the Submarine Continental Railway Company, and, since at the same time the Channel Tunnel Company was resuscitated and made an application to Parliament, there were two rival schemes for making a tunnel from the English shore to join the French company in the middle of the Channel. The Submarine Railway Company proposed that its tunnel should start from the west of Dover, close to Shakespeare Cliff, and the Channel Tunnel Company selected Fan Hole for its starting-point instead of St Margaret's, as in its former scheme. The whole question was then widely discussed from various points of view and considered by several committees, the last of which—a joint select committee of the House of Lords and House of Commons—in 1883 expressed the opinion, although not unanimously, that it was "not expedient that Parliamentary sanction should be given to a submarine communication between England and France." This decision prevented the carrying out of the enterprise by the English companies, and led to the formation of an amalgamated Channel Tunnel Company, which is still in existence and ready to act should opportunity occur. The operations of the French company were also stopped, and it too awaits a reconsideration of the question by Parliament.

The physical characters of the rocks on both sides of the Strait are singularly well adapted for a tunnel from an engineering point of view.

The rocks exposed in the cliffs between Folkestone and St Margaret's, measured for the purposes of the proposed tunnel, are as follow, in descending order:—

		Thickness. English Feet.
Upper.	VI. St Margaret's Chalk	280
	V. Nodular Chalk with flints	100
	IV. Chalk with few flints	100
Middle.	III. Lower White Chalk with nodular layers, without flints	145
Lower.	II. Grey Chalk and Chalk Marl (No. II. of Price)	225
	I. Glauconitic Marl (No. I. of Price)	3
Gault		120

The Gault, a stiff blue impervious clay, forms a low line of cliffs on the west side of Eastwear Bay, and disappears beneath low-water mark, opposite the western end of the Abbotscliffe. It occurs in St Margaret's Bay at a depth of 536 feet below O.D. The Glauconitic Marl, No. I., a clayey calcareous eposit, generally impervious, but sometimes so full of grains of glauconite and sand as to be pervious, overlies the Gault and passes into the Chalk Marl underlying the Lower Grey Chalk, No. II. This sets in in the cliff traversed by the Folkestone tunnel at 360 feet above O.D., and descends to Ordnance datum a little to the east of Shakespeare Cliff. It constitutes the base of the cliff from Abbotscliffe as far as that point. From this as far as the west base of Eastcliffe, the cliffs are composed of the Middle Chalk Nodular, and White, No. III., rising on the west to 490 + O.D., and plunging down to the east to a depth of −180 O.D. at St Margaret's. At its base is a hard nodular iron-stained layer, the Grit-bed of Price (the Melbourne Rock of the English Geological Survey), forming a conspicuous band in the English and French cliffs. The three upper members of the section constitute the Upper Chalk, out of which the cliffs between Dover and St Margaret's have been carved. All these strata dip steadily to the east at an inclination of about 1 in 72. On the French side, in the cliffs between St Pot and Sangatte, the Lower and Middle Chalk of the English section emerge from the sea with physical characters the same, and the thickness practically also the same. They dip also to the east, but at an angle of 1 in 46. The French survey of the sea bottom in the Strait for the purposes of the proposed tunnel proves that the Lower and Middle Chalk are perfectly continuous and constitute the sea floor; the

sea in the line of the tunnel being 210 feet in depth at the deepest point. It is obvious that a tunnel can be driven which would descend at an inclination of 1 in 70 or 80 on the English, sweep under the Channel, and rise with the strata on the French side, if it can be made in an impervious stratum which cannot be traversed by the sea-water under high pressure. The only stratum satisfying this condition is the Lower Grey Chalk, and especially the lower and more clayey horizon overlying the Glauconitic Marl.

Of the three English schemes, the first (Scheme A), proposed by Sir John Hawkshaw, starting from St Margaret's Bay, and the modification of it (Scheme D) starting from Fan Hole, present serious engineering difficulties because of the great volumes of water in the Upper and Middle Chalk. The third (Scheme C) provides for a tunnel in the same impervious stratum throughout the whole of its length. The general question as to danger from the influx of water either from the sea or from the land is also satisfactorily answered. The water which percolates in enormous volumes through the chalk from the land into the sea, as may be observed between Dover and St Margaret's, does not descend lower than the top of the Lower Grey Chalk, and an examination of the cliffs on both sides of the Strait proves that even where these lower rocks are traversed by faults, the water does not descend to the bottom of the series. There are no springs at this horizon in either the French or English cliffs. These considerations led to the selection of the sites at the Shakespeare Cliff and at Sangatte for the experimental shafts, and to the placing of the experimental drift-way under the Strait twenty-two miles long in the lowest stratum of the chalk. The selection is amply justified by the experience gained in the course of the work.

The works executed on the English side, under the superintendence of Mr Brady, by the Submarine Continental Railway Company, Sir Frederick Bramwell being the consulting engineer, and Professor Boyd Dawkins scientific adviser, consist of two shafts of small importance, and a third on the west side of the Shakespeare Cliff, sunk into the Chalk Marl down to a depth of 164 feet from the surface. From the bottom of this a drift-way, 7 feet in diameter, has been driven to a distance of about 2300 yards. This passes below low-water mark at a distance of 1350 yards from the shaft, leaving the shore diagonally in the direction of the head of the Admiralty Pier, and, running eastwards under the sea at an inclination of 1 in 72, it maintains the same position in the rocks throughout, being within a few feet of the Gault clay. Had it not been stopped by order of the Government in 1884, there is every reason to suppose that it would have been carried easily and without mishap across to the other side. The length already made proves that no danger need be apprehended from faults. It has cut through all those visible in the Shakespeare Cliff, and although at the time of driving there was a slight weeping of salt water through them to the amount of 3·3 gallons per minute, they gradually became blocked up and water-tight. When it was last examined by the writer of this article, after standing for five years, it was as dry as any similar drift-way could be, and the marks of the boring machine on the polished surface of the chalk were as distinct as on the day when they were made. On the French side the French Submarine Railway Company sank a shaft at Sangatte 18 feet in diameter to a depth of 226 feet. Unfortunately it intersected a fault in the upper strata which was in communication with the sea, and consequently let the water down to the area of work, which was at the same horizon in the rocks as on the English side, a few feet above the Gault. Two drift-ways had therefore to be made, the upper for the excavation and the lower for the drainage of the water descending the shaft towards the working face. The former, which was cut by Beaumont's English machine, was 7 feet in diameter. It was carried to a distance of about one mile from the bottom of the shaft, underneath the bed of the sea, and traversed in its course several faults, which, like those on the English side, were perfectly water-tight.

AUTHORITIES.—*Blue-book Correspondence respecting the proposed Channel Tunnel and Railway, presented to both Houses of Parliament*, 1875 (Commercial, No. 6).—*Blue-book Correspondence with reference to the proposed construction of a Channel Tunnel, presented to the Houses of Parliament*, 1882 (C. 3358).—*Blue-book Report from the Joint Select Committee of House of Lords and House of Commons on the Channel Tunnel, together with the Proceedings of the Committee, Minutes of Evidence, and Appendix*, 1883 (47).—*Channel Tunnel*, 1869, *Statement by Executive Committee, with Engineers' Report and Diagram*, &c. London, 8vo.—BRAMWELL. "The Making and Working of a Channel Tunnel," *Royal Inst. Proc.*, 19th May 1882.—CRAMPTON. "Creusement du Tunnel sous-marin entre Calais et Douvres suivant un système hydraulique proposé par M. Crampton," *Mem. Soc. Ingén. Civil.*, 4me sér., 6me vol.—TYLDEN WRIGHT. "The Channel Tunnel," *North of England Institute of Mining and Mech. Engin.* vol. xxii., 1882.—BOYD DAWKINS. "The Channel Tunnel," *Manch. Geol. Soc.*, 2nd May 1882; *Brit. Assoc. Reports, Section C*, 1882, 1899.

(W. B. D.)

Chantabun, the principal town of a province of Siam of the same name, situated on the east side of the Gulf of Siam, in 102° 6′ E. long. and 12° 38′ N. lat. The town lies about 12 miles from the sea, on the banks of a river which is navigable for small boats. Inside the bar which protects the entrance to the river a wide estuary offers secure and commodious anchorage for coasters. The town has now a population of about 5000. About 900 tons of white pepper is produced per annum, and sent to Bangkok for trans-shipment to Europe. Coffee, which has been grown on a small scale, has given good results. The ruby mines are scattered over an area about 15 miles square in the district of Krat. There are now fewer than 500 men working at these diggings. The sapphires exported from Chantabun come exclusively from Païin on the east or Battambong side of the Patat, where some 2000 Shâns, mostly British subjects, and about 2000 Lao from the lower Mekong valley are employed at the diggings. Some £350,000 worth of rubies and sapphires is exported annually.

In 1893 the town of Chantabun was occupied by a small French force, about 400 strong, consisting mainly of Annamite tirailleurs. This occupation was effected under Act 6 of the Convention of the 3rd of October in that year, agreed to between the French and Siamese Governments, and was to last until the execution of the stipulations of the Convention, and more especially until the complete evacuation and pacification of the left bank of the Mekong and of the zones in which, by the treaty of the same date, the Siamese Government had to withdraw all armed forces. The occupation, which has in no way affected the trade or administration of the province, still continued in 1901, notwithstanding both the assurances made to the British Government in 1893 that it would only last a month and the repeated representations made on the subject by the Siamese Government.

Chantilly, a French town in the arrondissement of Senlis, department of Oise, 24 miles in direct line S.E. of Beauvais, on railway from Paris to Creil. The manufacture of lace and blonde is a decayed industry. A magnificent castle was erected, 1876-85, in Chantilly Park by the duc d'Aumale, on the foundations of the ancient château and in the style of the châtelet, the only remnant of the ancient pile of the Montmorencys. On the terrace is a bronze statue of Anne de Montmorency, and, opposite to the court of the châtelet, the pleasure ground known as Voltaire's Parterre. The whole is surrounded by fosses supplied with water from the Nonette. The duc d'Aumale installed in the castle a valuable library, specially rich in incunabula and 16th-century editions of classic authors, and a collection of the paintings of the great masters, besides many other objects

of art. By a public act in 1886 the duc gave the park and château with its superb collections to the Institute of France, in trust for the nation, reserving to himself only a life interest. He died in 1897, and the Institute then acquired full possession of the property. Population of town (1881), 3896; (1896), 3787; (comm.), 4093; (1901), 4791.

Chanzy, Antoine Eugène Alfred (1823-1883), French general, was born at Nouart, Ardennes, on 18th March 1823. The son of a cavalry officer, he was educated at the Naval School at Brest, but enlisted in the artillery, and subsequently passing through St Cyr, was commissioned in the Zouaves in 1843. He saw a good deal of fighting in Algeria, and was promoted captain in 1851 (Legion of Honour). As major of the 23rd Foot he served in the Lombardy campaign of 1859, and was present at Magenta and Solferino. He took part in the Syrian campaign of 1860 as a lieut.-colonel (Officer, Legion of Honour); and as colonel commanded the 48th regiment at Rome in 1864. He returned to Algeria as general of brigade, assisted to quell the Arab insurrection, and commanded the subdivisions of Bel Abbes and Tlemcen in 1868 (Commander, Legion of Honour). Although he had acquired some professional reputation, he was in bad odour at the War Office on account of suspected contributions to the press, and of the publication of some jobbery in the supply of stores which he had discovered. At the outbreak of the Franco-German war he was curtly refused a brigade command; but, after the revolution, the government of national defence made him a general of division and gave him command of the 16th corps of the army of the Loire, with which he took a brilliant part in the battles of Coulmiers and Patay. On 5th December 1870 he was made commander-in-chief of the 2nd army of the Loire. He fought stubbornly against Von der Tann, the grand-duke of Mecklenburg, and the Red Prince, and showed conspicuous ability and military talent in the fighting from Beaugency to the Loire (6th to 11th December), in his retreat to Le Mans, where he re-formed his army in the final struggle in January, and, after the defeat of Le Mans, in the six days' fight in retiring to Laval behind the Mayenne to reconstruct his shattered forces, when the armistice stopped further operations. As Gambetta was the soul, Chanzy was the strong right arm of French resistance to the invader. He was made a Grand Officer of the Legion of Honour for his services. He represented the Ardennes in the National Assembly, and narrowly escaped capture by the Communists. In 1872 he became a member of the Committee of Defence and commander of the 7th army corps, and in 1873 was appointed governor of Algeria, where he remained for six years. In 1875 he was elected a life senator, in 1878 he received the Grand Cross of the Legion of Honour, and in 1879, without his consent, he was nominated for the presidency of the Republic, and received a third of the total votes. For two years he was ambassador at St Petersburg. He died suddenly at Châlons-sur-Marne, on 4th January 1883, only a few days after Gambetta, and his remains received a State funeral. He was the author of *La deuxième armée de la Loire*, published in 1872. (R. H. V.)

Chapra, or Chuprá, a town of British India, the administrative headquarters of Saran district in the Behar province of Bengal, on the left bank of the river Gogra, just above its confluence with the Ganges; with a railway station on the Bengal and North-Western line towards Oudh. Population (1881), 51,670; (1891), 57,352; (1901), 45,392, showing a decrease of 21 per cent. There are a Government high school, a German Lutheran mission, three printing-presses, and a public library endowed by the late Maharaja of Hatwa. Chapra is the centre of trade in indigo and saltpetre, and conducts a large business by water as well as by rail.

Charcot, Jean Martin (1825-1893), French physician, was born in Paris on 29th November 1825. In 1853 he graduated as M.D. of Paris University, and three years later was appointed physician of the Central Hospital Bureau. In 1860 he became a professor in the University, and in 1862 began that famous connexion with the Salpêtrière which lasted to the end of his life. He was elected to the Academy of Medicine in 1873, and ten years afterwards became a member of the Institute. His death occurred suddenly on 16th August 1893 at Morvan, where he had gone for a holiday. Charcot, who was a good linguist and well acquainted with the literature of his own as well as of other countries, excelled as a clinical observer and a pathologist. His work at the Salpêtrière exerted a great influence on the development of the science of neurology, and his classical *Leçons sur les maladies du système nerveux*, the first series of which was published in 1873, represents an enormous advance in the knowledge and discrimination of nervous diseases. He also devoted much attention to the study of obscure morbid conditions like hysteria, especially in relation to hypnotism; indeed, it is in connexion with his investigation into the phenomena and results of the latter that his name is popularly known. In addition to his labours on neurological and even physiological problems he made many contributions to other branches of medicine, his published works dealing, among other topics, with liver and kidney diseases, gout, and pulmonary phthisis. As a teacher he was remarkably successful, and always commanded an enthusiastic band of followers.

Chard, a municipal borough (extended 1892) and market town in the Southern parliamentary division of Somersetshire, England, 13 miles S.S.E. of Taunton by rail. It has manufactures of linen collars and lace. Population of borough (70 acres) (1881), 2411; (1891), 2575; (1891) on the extended area (403 acres), 4315; (1901), 4437.

Charente, a department in the west of France, nowhere rising to any remarkable elevation, watered by the Charente.

Area, 2306 square miles, with 29 cantons and 426 communes. The population was 366,408 in 1886, but only 344,376 in 1901. In 1899 the births were 6610, of which 343 were illegitimate; the deaths, 7144; and the marriages, 2753. Angoulême, the capital, had a population of 37,650 in 1901. In 1896 there were 921 schools with 48,000 pupils, the illiterate composing 7 per cent. of the population. The area under cultivation in 1896 comprised 1,307,234 acres, of which 845,130 acres were plough-land and 44,480 acres in vines. In 1899 the wheat crop gave a return of the value of £1,074,000. The green crop and grass lands, in which Charente takes a prominent place among the departments of France, produced nearly £1,000,000 in value. The yield of the vineyards amounted to the value of £438,000. Cognac is the centre of the distillation of brandy, to which the town gives its name, the annual production during the years 1886-1896 averaging 396,168 gallons. The live stock in 1899 included 31,320 horses, 92,960 cattle, 258,100 sheep, and 97,500 pigs. The paper made at Angoulême is much esteemed.

Charente Inférieure, a department in the west of France, bordering on the Atlantic Ocean and watered by the Charente.

Area, 2792 square miles, with 40 cantons and 480 communes. The population had dropped to 462,803 in 1886 and to 446,294 in 1901. Births in 1899, 8227, of which 393 illegitimate; deaths, 9136; marriages, 3273. La Rochelle, the capital, had a population in 1901 of 31,318. The department had in 1896, 1032 schools with 57,000 pupils, and 3 per cent. of the population was illiterate. The area under cultivation in 1896 comprised 1,492,570 acres, 968,698 acres of which were plough-land and 79,076 acres in vines.

In 1899 the wheat crop yielded the value of £1,462,120, and the produce of the vines exceeded £1,284,000. There is a considerable distillation of alcohol, amounting to 1,320,000 gallons in 1898. The live stock in 1899 included 38,090 horses, 155,580 cattle, 213,140 sheep, and 78,690 pigs. Among the mineral productions must be noted stone, clay, and sea-salt, the production of which last, however, amounted in 1898 to only 8500 metric tons.

CHARITY AND CHARITIES.

THE word "charity," or love, represents the principle of the good life. It stands for a mood or habit of mind and an endeavour. From it, as a habit of mind, springs the social and personal endeavour which in the widest sense we may call charity. The two correspond. Where the habit of mind has not been gained, the endeavour fluctuates and is relatively purposeless. In so far as it has been gained, the endeavour is founded on an intelligent scrutiny of social conditions and guided by a definite purpose. In the one case it is realized that some social theory must be found by us, if our action is to be right and consistent; in the other case no need of such a theory is felt. This article is based on the assumption that there are principles in charity or charitable work, and that these can be ascertained by a study of the development of social conditions and their relation to prevalent social aims and religious or philosophic conceptions. It is assumed also that the charity of the religious life, if rightly understood, cannot be inconsistent with that of the social life.

Perhaps some closer definition of charity is necessary. The words that signify goodwill towards the community and its members are primarily words expressive of the affections of family life in the relations existing between parents, and between parent and child. As will be seen, the analogies underlying such phrases as "God the Father," "children of God," "brethren," have played a great part in the development of charitable thought in pre-Christian as well as in Christian days. The germ, if we may say so, of the words *philia*, *agape*, *amor*, love; *amicitia*, friendship, is the sexual or the parental relation. With the realization of the larger life in man the meaning of the word expands. *Caritas*, or charity, strikes another note—high price, and thus dearness. It is charity, indeed, expressed in mercantile metaphor; and it would seem that it was associated in thought with the word *charis*, which has also a commercial meaning, but signifies as well favour, gratitude, grace, kindness. Partly thus, perhaps, it assumed and suggested a nobler conception; and sometimes, as, for instance, in English ecclesiastical documents, it was spelt *charitas*. *Agape*, which in the Authorized Version of the Bible is translated charity, was used by St Paul as a translation of the Hebrew word *chesed*, which in the Old Testament is in the same version translated "mercy"—as in Hosea vi. 6, "I desired mercy, and not sacrifice." This word represents the charity of kindness and goodness, as distinguished from almsgiving. Almsgiving, *tzedaka*, is translated by the word *eleemosyna* in the Septuagint, and in the Authorized Version by the word "righteousness." It represents the deed or the gift which is due—done or made, not spontaneously, but under a sense of religious obligation. In the earlier Christian period the word almsgiving has this meaning, and was in that sense applied to a wide range of actions and contracts, from a gift to a beggar at a church door to a grant and a tenure of land. It also, in the word almoner, represented the fulfilment of the religious obligation with the aid of an agent or delegate. The words charity or love (*caritas* or *agape*), on the other hand, without losing the tone with which the thought of parental or family love inspires them, assume a higher meaning. In religious thought they imply an ideal life, as represented by such expressions as "love (*agape*) of God." This on the one side; and on the other an ideal social relation, in such words as "love of man." Thus in the word "charity" religious and social associations meet; and thus regarded the word means a disciplined and habitual mood in which the mind is considerate of the welfare of others individually and generally, and devises what is for their real good, and in which the intelligence and the will strive to fulfil the mind's purpose. Charity thus has no necessary relation to relief or alms. To give a lecture, or to nurse a sick man who is not in want or "poor," may be equally a deed of charity; though in fact charity concerns itself largely with the classes usually called "the poor," and with problems of distress and relief. Relief, however, is not an essential part of charity or charitable work. It is one of many means at its disposal. If the world were so poor that no one could make a gift, or so wealthy that no one needed it, charity—the charity of life and of deeds—would remain.

The history of charity is a history of many social and religious theories, influences, and endeavours, that have left their mark alike upon the popular and the cultivated thought of the present day. The inconsistencies of charitable effort and argument may thus in part be accounted for. To understand the problem of charity we have therefore (1) to consider the stages of charitable thought—the primitive, pagan, Greek and Roman, Jewish and Christian elements, that make up the modern consciousness in regard to charity, and also the growth of the habit of "charity" as representing a gradually educated social instinct. (2) We have also to consider in their relation to charity the results of recent investigations of the conditions of social life. (3) At each stage we have to note the corresponding stage of practical administration in public relief and private effort—for the division between public or "poor-law" relief and charity which now prevails in England is, comparatively speaking, a novelty, and, generally speaking, the work of charity can hardly be appreciated or understood if it be considered without reference to public relief. (4) As to the present day, we have to consider practical suggestions in regard to such subjects as charity and economic thought, charity organization, friendly visiting and almonership, co-operation with the poor-law, charity and thrift, parochial management, hospitals and medical relief, exceptional distress and the "unemployed," the utilization of endowments and their supervision, and their adaptation to new needs and emergencies. (5) We have also throughout to consider charitable help in relation to classes of dependants, who appear early in the history of the question—widows and orphans, the sick and the aged, vagrants and wayfarers.

First in the series come the charities of the family and of hospitality; then the wider charities of religion, the charities of the community, and of individual donors and of mutual help. These gradually assumed importance in communities which consisted originally of self-supporting classes, within which widows and orphans, for instance, would be rather provided for, in accordance with recognized class obligations, than relieved. Then come habitual almsgiving, the charitable endowment, and the modern charitable institution and association. But throughout the test of progress or decadence appears to be the condition of the family. The family is the source, the home, and the hearthstone of charity. It has been created but slowly, and there is naturally a constant tendency to break away from its obligations and to ignore and depreciate its utility. Yet the family, as we now have it, is itself the outcome of infinite thought working through social instinct, and has at each stage of its development indicated a general advance. To it, therefore, constant reference must be made.

Part I.—Primitive Charity.

The study of early communities has brought to light the history of the development of the family. "Marriage in its lowest phases is by no means a matter of affection or companionship"; and only very slowly has the position of both parents been recognized as implying different but correlative responsibilities towards their child. Only very slowly, also, has the morality necessary to the making of

the family been won. Charity is hardly recognized as a virtue, nor infanticide as an evil. Hospitality—the beginning of a larger social life—is non-existent. The self-support of the community is secured by marriage, and when relations fail marriage becomes a provision against poverty. Then by the tribal system is created another safeguard against want. Apart also from these methods of maintenance, at a very early stage there is charitable relief. The festivals of the solstices and equinoxes, and of the seasons, are the occasions for sacrifice and relief; and, as Christmas customs prove, the instinct to give help or alms at such festival periods still remains. Charity is concerned primarily with certain elemental forces of social life; the relation between these primitive instincts and impulses that still influence charity should not, therefore, be overlooked. The basis of social life is also the basis of charitable thought and action.

The savage is the civilized man in the rough. "The lowest races have," Lord Avebury writes, "no institution of marriage." Many have no word for "dear" or "beloved." The child belongs to the tribe rather than to the parent. In these circumstances a problem of charity such as the following may arise:—"Am I to starve, while my sister has children whom she can sell?" a question asked of Burton by a negro. From the point of view of the tribe, an able-bodied man would be more valuable than dependent children, and the relationship of the larger family of brothers and sisters would be a truer claim to help than that of mother and child. Subsequently the child is recognized as related, not to the father, but to the mother, and there is "a kind of bond which lasts for life between mother and child, although the father is a stranger to it." Slowly only is the relative position of both parents, with different but correlative responsibilities, recognized. The first two steps of charity have then been made: the social value of the bond between the mother, and then between the father, and the child has been recognized. Until this point is reached the morality necessary to the making of the family is wanting, and for a long time afterwards it is hardly won. The virtue of chastity—the condition precedent to the higher family life—is unrecognized. Indeed, the set of such religious thought as there may be is against it. Abstract conceptions, even in the nobler races, are lacking. The religion of life is vaguely struggling with its animality, and that which it at last learns to rule it at first worships. In these circumstances there is little charity for the child and little for the stranger. "There is," Dr Schweinfurth wrote in his *Heart of Africa*, "an utter want of wholesome intercourse between race and race. For any member of a tribe that speaks one dialect to cross the borders of a tribe that speaks another is to make a venture at the hazard of his life." The religious obligations that fostered and sanctified family life among the Greeks and Romans and Jews are unknown. Much later in development comes charity for the child, with the abhorrence of infanticide—against which the Jewish-Christian charity of 2000 years ago uttered its most vigorous protests. If the child belonged primarily to the tribe or state, its maintenance or destruction was a common concern. This motive influenced the Greeks, who are historically nearer the earlier forms of social life than ourselves. For the common good they exposed the deformed child; but also "where there were too many, for in our state population has a limit," as Aristotle says, "the babe or unborn child was destroyed." And so, to lighten their own responsibilities, parents were wont to do in the slow years of the degradation of the Roman Empire, though the interest of the state then required a contrary policy. The transition to our present feeling of responsibility for child-life has been very gradual and uncertain, through the Middle Ages and even till the 18th century. Strictly it may be said that all penitentiaries and other similar institutions are concrete protests on behalf of a better family life. The movement for the care of children in the 18th century naturally and instinctively allied itself with the penitentiary movement. The want of regard for child-life, when it becomes a source of economic pressure, suggests how in earlier stages of civilization all that charitable apparatus for the assistance of children becomes unnecessary, even if the need, so far as it does arise, is not adequately met by the recognized obligations of the clan-family or brotherhood.

In the case of barbarous races charity and self-support may be considered from some other points of view. Self-support is secured in two ways—by marriage and by slavery. "For a man or woman to be unmarried after the age of thirty is unheard of" (T. H. Lewin, *Wild Races of South-East India*). On the other hand, if any one is without a father, mother, or other relative, and destitute of the necessaries of life, he may sell himself and become a slave. Thus slavery becomes a provision for poverty when relations fail. The clan-family may serve the same purpose. David Livingstone describes the formation of the clan-family among the Bakuena. "Each man, by virtue of paternity, is chief of his own children. They build huts round his. . . . Near the centre of each circle of huts is a spot called a 'kotla,' with a fireplace; here they work, eat, &c. A poor man attaches himself to the 'kotla' of a rich one, and is considered a child of the latter." Thus the clan-family is also a poor-relief association.

Studies in folk-lore bring to light many relations between the charity of the old world and that of our own day.

The early community.

In regard to the charity of the early community, we may take the 8th century B.C. as the point of departure. The *Odyssey* (about 800 B.C.) and Hesiod (about 700 B.C.) are roughly parallel with Amos (816-775), and represent two streams of thought that meet in the early Christian period. The period covered by the *Odyssey* seems to merge into that of Hesiod. We take the former first, dealing with the clan-family and the phratry, which are together the self-maintaining unit of society, with the general relief of the poor, with hospitality, and with vagrancy. In Hesiod we find the customary law of charity in the earlier community definitely stated, and indications of the normal methods of neighbourly help which were in force in country districts. First of the family and brotherhood, or phratry. The family (*Od.* viii. 582) included alike the wife's father and the daughter's husband. It was thus a clanlike family. Out of this was developed the phratry or brotherhood, in which were included alike noble families, peasants, and craftsmen, united by a common worship and responsibilities and a common customary law (*themis*). Zeus, the god of social life, was worshipped by the phratry. He was the father of the law (*themis*). He was god of host and guest. Society was thus based on law, the brotherhood, and the family. The irresponsible man, the man worthy of no respect or consideration, was one who belonged to no brotherhood, was subject to no customary law, and had no hearth or family. The phratry was, and became afterwards still more, "a natural guild." Outside the self-sustaining phratry was the stranger, including the wayfarer and the vagrant; and partly merged in these classes was the beggar, the recognized recipient of the alms of the community. To change one's abode and to travel was assumed to be a cause of reproach (*Il.* ix. 648). The "land-louper" was naturally suspected. On the other hand, a stranger's first thought in a new country was whether the inhabitants were wild or social (*dikaioi*), hospitable and God-fearing (*Od.* xiii. 201). Hospitality thus became the first public charity; Zeus sent all strangers and beggars, and it was against all law (*themis*) to slight them. Out of this feeling—a kind of glorified almsgiving—grew up the system of hospitality in Greek states and also in the Roman world. The host greeted the stranger (or the suppliant). An oath of friendship was taken by the stranger, who was then received with the greeting, Welcome (*Chaire*), and water was provided for ablution, and food and shelter. In the larger house there was a guests' table. In the hut he shared the peasant's meal. The custom bound alike the rich and poor. On parting presents were given, usually food for the onward journey, sometimes costly gifts. The obligation was mutual, that the host should give hospitality and that the guest should not abuse it. From early times tallies were exchanged between them as evidence of this formal relationship, which each could claim again of the other by the production of the token. And further, the relationship on either side became hereditary. Thus individuals and families and tribes remained linked in friendship and in the interchange of hospitalities.

Under the same patronage of Zeus and the same laws of hospitality were the vagrants and beggars. The vagrant

and loafer are sketched in the *Odyssey*—the vagrant who lies glibly that he may get entertainment, and the loafer who prefers begging to work on a farm. These and the winter idlers, whom Hesiod pictures—a group known to modern life—prefer at that season to spend their time in the warmth of the village smithy, or at a house of common resort (*lesche*)—a common lodging-house, we might say—where they would pass the night. Apparently, as in modern times, the vagrants had organized their own system of entertainment, and, supported by the public, were a class for whom it was worth while to cater. The local or public beggars formed a still more definite class. Their begging was recognized as their means of maintenance; it was a part of the method of poor relief. Thus of Penelope it was said that, if Ulysses' tale were true, she would give him better clothes, and then he might beg his bread throughout the country-side. Feasts too and almsgiving were nearly allied, and feasts have always been one resource for the relief of the poor. Thus naturally the beggars frequented feasts, and were apparently a recognized and yet inevitable nuisance. They wore, as part of their dress, scrips or wallets in which they carried away the food they received (as later the Roman clients carried away portions of food in baskets (*sportula*) from their patron's dinner). Ulysses, when he dresses up as a beggar, puts on a wallet as part of his costume. Thus we find a system of voluntary relief in force based on a recognition of the duty of almsgiving as complete and peremptory as that which we shall notice later among the Jews and the early Christians. We are concerned with country districts, and not with towns, and, as social conditions that are similar produce similar methods of administration, so we find here a general plan of relief similar to that which was in vogue in Scotland till the Scottish Poor Law Act of 1845.

In Hesiod the fundamental conceptions of charity are more clearly expressed. He has, if not his ten, at least his four commandments, for disobedience to which Zeus will punish the offender. They are: Thou shalt do no evil to suppliant or guest; thou shalt not dishonour any woman of the family; thou shalt not sin against the orphan; thou shalt not be unkind to aged parents.

The laws of social life are thus duty to one's guest and duty to one's family; and chastity has its true place in that relation, as the later Greeks, who so often quote Hesiod (cf. the so-called *Economics* of Aristotle), fully realized. Also the family charities due to the orphan, whose lot is deplored in the *Iliad* (xxii. 490), and to the aged are now clearly enunciated. But there is also in Hesiod the duty to one's neighbour, not according to the "perfection" of "Cristes lore," but according to a law of honourable reciprocity in act and intent. "Love him who loves thee, and cleave to him who cleaveth to thee: to him who would have given, give; to him who would not have given, give not." The groundwork of Hesiod's charity outside the family is neighbourly help (such as formed no small part of old Scottish charity in the country districts); and he put his argument thus: Competition, which is a kind of strife, "lies in the roots of the world and in men." It is good, and rouses the idle "handless" man to work. On one side are social duty (*dikê*) and work, done briskly at the right season of the year, which brings a full barn. On the other side are unthrift and hunger, and relief with the disgrace of begging; and the relief, when the family can do no more, must come from neighbours, to whose house the beggar has to go with his wife and children to ask for victual. Once they may be helped, or twice, and then they will be refused. It is better, Hesiod tells his brother, to work and so pay off his debts and avoid hunger (see *Erga*, 391, &c., and elsewhere). Here indeed is a problem of to-day as it appeared to an early Greek. The alternatives before the idler—so far as his own community is concerned—are labour with neighbourly help to a limited extent, or hunger.

Hesiod was a farmer in Boeotia. Some 530 years afterwards a pupil of Aristotle thus describes the district and its community of manners. "They are," he says, "well to do, but simple in their way of life. They practise justice, good faith, and hospitality. To foreign invasion and vagabonds they give freely of their substance; for meanness and covetousness are unknown to them." The charitable method of Homeric and Hesiodic days still continued.

Part II.—Charity among the Greeks.

Society in a Greek state was divided into two parts, citizens and slaves. The citizens required leisure for education, war, and government. The slaves were their ministers and servants to enable them to secure this leisure. We have therefore to consider, on the one hand, the position of the family and the clan-family, and the maintenance of the citizen from public funds and by public and private charities; and on the other hand the condition of the slaves, and the relation between slavery and charity. *The Greek state.*

The slaves formed the larger part of the population. The census of Attica made between 317 and 307 B.C. gives their numbers at 400,000 out of a population of about 500,000; and even if this be considered excessive, the proportion of slaves to citizens would certainly be very large. The citizens with their wives and children formed some 12 per cent. of the community. Thus, apart from the resident aliens, returned in the census at 10,000, and their wives and children, we have two divisions of society: the citizens, with their own organization of relief and charities; and the slaves, permanently maintained by reason of their dependence on individual members of the civic class. Thus, the only poverty is that of the poor citizens. Poverty is limited to them. The slaves—that is to say, the bulk of the labouring population—are provided for.

From times relatively near to Hesiod's we may trace the growth and influence of the clan-family as the centre of customary charity within the community, the gradual increase of a class of poor either outside the clan-family or eventually independent of it, and the development of a new organization of relief introduced by the state to meet newer demands. We picture the early state as a group of families, each of which tends to form in time a separate group or clan. At each expansion from the family to the clan the members of the clan retain rights and have to fulfil duties which are the same as, or similar to, those which prevailed in the family. Thus, in Attica the clan-families (*genos*) and the brotherhoods (*phratria*) were "the only basis of legal rights and obligations over and above the natural family." The clan-family was "a natural guild," consisting of rich and poor members—the well-born or noble and the craftsman alike. Originally it would seem that the land was divided among the families of the clan by lot and was inalienable. Thus with the family was combined the means of supporting the family. On the other hand, every youth was registered in his phratry, and the phratry remained till the reforms of Cleisthenes (509 B.C.) a political, and even after that time a social, organization of importance.

First, as to the family—the mother and wife, and the father. Already before the age of Plato and Xenophon (450-350 B.C.) we find that the family has suffered a slow decline. The wife, according to later Greek usage, was married as a child, hardly educated, and confined to the house, except at some festival or funeral. But with the decline came criticism and a nobler conception of family life. "First, then, come laws regarding the wife," writes the author of the so-called *Economics* of Aristotle, and the law, "thou shalt do no wrong; for, if we do no wrong, we shall not be wronged." This is the "common law," as the Pythagoreans say, "and it implies that we must not wrong the wife in the least, but treat her with the reverence due to a suppliant, or one taken from the altar." The sanctity of marriage is thus placed among the "com-

mandments" of Hesiod, beside the duty towards the stranger and the orphan. These and other references to the Pythagoreans suggest that they, possibly in common with other mystics, preached the higher religion of marriage and social life, and thus inspired a deeper social feeling, which eventually allied itself with the Christian movement.

Next, as to parents and children: the son was under an obligation to support his father, subject, after Solon's time, to the condition that he had taught him a trade; and after Solon's time the father had no claim for support from an illegitimate son. "The possession of children," it was said (Arist. *Econ.*)," is not by nature for the public good only, but also for private advantage. For what the strong may gain by their toil for the weak, the weak in their old age receive from the strong. . . . Thus is the nature of each, the man and the woman, prearranged by the Divine Being for a life in common." Honour to parents is "the first and greatest and oldest of all debts" (Plato, *Laws*, 717). The child has to care for the parent in his old age. "Nemesis, the minister of justice (*dike*), is appointed to watch over all these things." And "if a man fail to adorn the sepulchre of his dead parents, the magistrates take note of it and inquire" (Xen. *Mem.* ii. 14). The heightened conception of marriage implies a fuller interpretation of the mutual relations of parent and child as well; both become sacred.

Then as to orphans. Before Solon's time (594 B.C.) the property of any member of the clan-family who died without children went to the clan; and after his time, when citizens were permitted to leave their property by will, the property of an intestate fell to the clan. This arrangement carried with it corresponding duties. Through the clan-family provision was made for orphans. Any member of the clan had the legal right to claim an orphan member in marriage; and, if the nearest agnate did not marry her, he had to give her a dowry proportionate to the amount of his own property. Later, there is evidence of a growing sense of responsibility in regard to orphans. Hippodamus (about 443 B.C.), in his scheme of the perfected state (Arist. *Pol.* 1268), suggested that there should be public magistrates to deal with the affairs of orphans (and strangers); and Plato, his contemporary, writes of the duty of the state and of the guardian towards them very fully. Orphans, he proposes (*Laws*, 927), should be placed under the care of public guardians. "Men should have a fear of the loneliness of orphans . . . and of the souls of the departed, who by nature take a special care of their own children. . . . A man should love the unfortunate orphan (boy or girl) of whom he is guardian as if he were his own child; he should be as careful and diligent in the management of the orphan's property as of his own—or even more careful still."

To relieve the poverty of citizens and to preserve the citizenhood were objects of public policy and of charity. In Crete and Sparta the citizens were wholly supported out of the public resources. In Attica the system was different. The citizens were aided in various ways, in which, as often happens, legal or official and voluntary or private methods worked on parallel lines. The means were (1) legal enactment for release of debts; (2) emigration; (3) the supply of corn; (4) poor relief for the infirm, and relief for the children of those fallen in war; (5) emoluments; (6) voluntary public service, separate gifts and liberality; (7) loan societies.

(1) In 594 B.C. the labouring class in Attica were overwhelmed with debts and mortgages, and their persons pledged as security. Only by a sharp reform was it possible to preserve them from slavery. This Solon effected. He annulled their obligations, abolished the pledge of the person, and gave the labourers the franchise. And, in addition to this, besides the laws above mentioned, he gave power to the Areopagus to inquire from what sources each man obtained the necessaries of life, and to punish those who did not work. His action and that of his successor, Peisistratus (560 B.C.), suggests that the class of poor (*aporoi*) was increasing, and that by the efforts of these two men the social decline of the people was avoided or at least postponed. Peisistratus lent the poor money that they might maintain themselves in husbandry. He wished, it is said (Arist. *Ath. Pol.* xvi.), to enable them to earn a moderate living, that they might be occupied with their own affairs, instead of spending their time in the city or neglecting their work in order to visit it. As rent for their land they paid a tenth of the produce.

(2) Akin to this policy was that of emigration. Athenians, selected in some instances from the two lowest political classes, emigrated, though still retaining their rights of citizenship. In 570-565 B.C. Salamis was annexed and divided into lots and settled, and later Pericles settled more than 2750 citizens in the Chersonese and elsewhere—practically a considerable section of the whole body of citizens. "By this means," says Plutarch, "he relieved the state of numerous idle agitators and assisted the necessitous." In other states this expedient was frequently adopted.

(3) A third method was the supply of corn at reduced rates—a method similar to that adopted, as we shall see, at Rome, Constantinople, and elsewhere. The maintenance of the mass of the people depended on the corn fleets. There were public granaries, where large stores were laid up at the public expense. A portion of all cargoes of corn was retained at Athens and in other ways importation was promoted. Exportation was forbidden. Public donations and distributions of corn were frequent, and in times of scarcity rich citizens made large contributions with that object. The distributions were made to adult citizens of eighteen years of age and upwards, whose names were on the registers.

(4) In addition to this there was a system of public relief for those who were unable to earn a livelihood on account of bodily defects and infirmities. The qualification was a property test. The property of the applicant had to be shown to be of a value of not more than three minas (say £12). Socrates, it may be noted, adopts the same method of estimating his comparative poverty (Xen. *Econ.* ii. 6), saying that his goods would realize about five minæ (or about twenty guineas). The senate examined the case, and the ecclesia awarded the bounty, which amounted to 1 or 2 obols a day, rather more than 1½d. or 3d.—out-door relief, as we might say, amounting at most to about 1s. 9d. a week. There was also a fund for the maintenance of the children of those who had fallen in war, up to the age of eighteen.

(5) But the main source of support was the receipt of emoluments for various public services. This was not relief, though it produced in the course of time the effect of relief. It was rather the Athenian method of supporting a governing class of citizens.

The inner political history of Athens is the history of the extension of the franchise to the lower classes of citizens, with the privileges of holding office and receiving emoluments. About 650 B.C., at a time when trade was increasing, the citizens were classified on the basis of property. The rich retained the franchise and the right of holding office; the middle classes obtained the franchise; the fourth or labouring class gained neither. By the reforms of Cleisthenes (509 B.C.) the clan-family and the phratry were set aside for the *deme* or parish, a geographical division superseding the social. Finally, about 478 B.C., when all had acquired the franchise, the right to hold office also was obtained by the fourth class. These changes coincided with a period of economic progress. The rate of interest was high, usually 12 per cent.; and in trading and bottomry the returns were much higher. A small capital at this interest soon produced comparative wealth; and simultaneously prices were falling. Then came the reaction. "After the Peloponnesian war" (432 to 404 B.C.), writes Professor Jebb, "the wealth of the country ceased to grow, as population had ceased to grow about 50 years sooner. The rich went on accumulating; the poor, having no means of enriching themselves by enterprise, were for the most part occupied in watching for some chance of snatching a larger share of the stationary total." Thus the poorer classes in a time of prosperity had won the power which they were able to turn to their own account afterwards. A period of economic pressure followed, coupled with a decline in the population; no return to the land was feasible, nor was emigration; the people had become town-folk inadaptable to new uses; decreasing vitality and energy were marked by a new temper, the "pauper" temper, unsettled, idle, and grasping, and political power was utilized to obtain relief. The relief was forthcoming, but it was of no avail to stop the general decline. The state, it might almost be said, in giving scope to the assertion of the spirit of dependence, had ruined the self-regarding energy on which both family and state alike depended. The emoluments were diverse. The number of citizens was not large; the functions in which citizens could take part were numerous; and when payment was forthcoming the poorer citizens pressed in to exercise their rights (cf. Arist. *Pol.* 1293A). All Athenian citizens could attend the public

assembly or *ecclesia*. Probably the attendance at it varied from a few hundred to 5000 persons. In 395 B.C. the payment for attendance was fixed at 3 obols, or little more than 4½d. a day—for the system of payment had probably been introduced a few years before (cf. Daremberg, *Dict. des Antiq.*). A juror or *dikast* would receive the same sum for attendance, and the courts or juries would often consist of 500 persons. If the estimate (Böckh., *Public Economy of Athens*, Eng. trans., pp. 109, 117) holds good that in the age of Demosthenes (384-323 B.C.) the member of a poor family of four free persons could live (including rent) on about 3·3d. or between 2 and 3 obols a day, the pay of the citizen attending the assembly or the court would at least cover the expenses of subsistence. On the other hand, it would be less than the pay of a day labourer, which was probably about 4 obols or 6d. a day. In any case many citizens—they numbered in all about 20,000—in return for their participation in political duties would receive considerable pecuniary assistance. Attending a great public festival also, the citizen would receive 2 obols or 3d. a day during the festival days; and there were besides frequent public sacrifices, with the meal or feast which accompanied them. But besides this there were confiscations of private property, which produced a surplus revenue divisible among the poorer citizens. (Some hold that there were confiscations in other Greek states, but not in Athens.) In these circumstances it is not to be wondered that men like Isocrates should regret that the influence of the Areopagus, the old court of morals and justice in Athens, had disappeared, for it "maintained a sort of censorial police over the lives and habits of the citizens; and it professed to enforce a tutelary and paternal discipline, beyond that which the strict letter of the law could mark out, over the indolent, the prodigal, the undutiful, and the deserters of old rite and custom."

(6) In addition to public emoluments and relief there was much private liberality and charity. Many expensive public services were undertaken honorarily by the citizens under a kind of civic compulsion. Thus in a trial about 425 B.C. (Lysias, *Or.* 19. 57) a citizen submitted evidence that his father expended more than £2000 during his life in paying the expenses of choruses at festivals, fitting out seven triremes for the navy, and meeting levies of income tax to meet emergencies. Besides this he had helped poor citizens by portioning their daughters and sisters, had ransomed some, and paid the funeral expenses of others (cf. for other instances Plutarch's *Cimon*, Theophras. *Eth.*, and Xen. *Econ.*).

(7) There were also mutual help societies (*eranoi*). Those for relief would appear to have been loan societies (cf. Theoph. *Eth.*), one of whose members would beat up contributions to help a friend, who would afterwards repay the advance.

The criticisms of Aristotle (384-322 B.C.) suggest the direction to which he looked for reform. He (*Pol.* 1320A) passes a very unfavourable judgment on the distribution of public money to the poorer citizens. The demagogues (he does not speak of Athens particularly) distributed the surplus revenues to the poor, who received them all at the same time; and then they were in want again. It was only, he argued, like pouring water through a sieve. It were better to see to it that the greater number were not so entirely destitute, for the depravity of a democratic government was due to this. The problem was to contrive how plenty (*euporia*, not poverty, *aporia*) should become permanent. His proposals are adequate aid and voluntary charity. Public relief should, he urges, be given in large amounts so as to help people to acquire small farms or start in business, and the well-to-do (*euporoi*) should in the meantime subscribe to pay the poor for their attendance at the public assemblies. (This proves, indeed, how the payments had become poor relief.) He mentions also how the Carthaginian notables divided the destitute amongst them and gave them the means of setting to work, and the Tarentines (*koina poiountes*) shared their property with the poor. (The Rhodians also might be mentioned (Strabo, xiv. c. 652), amongst whom the well-to-do undertook the relief of the poor voluntarily.) The later word for charitable distribution was a sharing (*koinonia*, Ep. Rom. xv. 26), which would seem to indicate that after Aristotle's time popular thought had turned in that direction. But the chief service rendered by Aristotle—a service which covered indeed the whole ground of social progress—was to show that unless the purpose of civil and social life was carefully considered and clearly realized by those who desired to improve its conditions, no change for the better could result from individual or associated action.

Two forms of charity have still to be mentioned: charity to the stranger and to the sick. It will be convenient to consider both in relation to the whole classical period.

With the growth of towns the administration of hospitality was elaborated.

(1) There was hospitality between members of families bound by the rites of host and guest. The guest received as a right only shelter and fire. Usually he dined with the host the first day, and if afterwards he was fed, provisions were supplied to him. There were large guest chambers (*xenon*) or small guest houses, completely isolated on the right or left of the principal house; and here the guest was lodged. (2) There were also, *e.g.*, at Hieropolis (Prof. W. M. Ramsay's *Phrygia*, ii. 97), brotherhoods of hospitality (*xenoi tekmorioi*, bearers of the sign), which made hospitality a duty, and had a common chest and Apollo as their tutelary god. (3) There were inns or resting-places (*katagogion*) for strangers at temples (Thuc. iii. 68; Plato, *Laws*, 953A) and places of resort (*lesche*) at or near the temples for the entertainment of strangers—for instance, at a temple of Asklepios at Epidaurus (Pausanias, ii. 174); and Pausanias argues that they were common throughout the country. Probably also at the temples hospitable provision was made for strangers. The evidence at present is not perhaps sufficiently complete, but, so far as it goes, it tends to the conclusion that in pre-Christian times hospitality was provided to passers-by and strangers in the temple buildings, as later it was furnished in the monasteries and churches. (3) There were also in towns houses for strangers (*xenon*) provided at the public cost. This was so at Megara; and in Crete strangers had a place at the public meals and a dormitory. Xenophon suggested that it would be profitable for the Athenian state to establish inns for traders (*katagogia demosia*) at Athens. Thus, apart from the official hospitality of the proxenus or "consul," who had charge of the affairs of foreigners, and the hospitality which was shown to persons of distinction by states or private individuals, there was in Greece a large provision for strangers, wayfarers, and vagrants based on the charitable sentiment of hospitality. Among the Romans similar customs of private and public hospitality prevailed; and throughout the empire the older system was altered, probably very slowly. In Christian times (cf. Ramsay above) Pagan temples were (about A.D. 408) utilized for other purposes, including that of hospitality to strangers.

The stranger.

Round the temples, at first probably village temples, the organization of medical relief grew up. Primitive medicine is connected with dreams, worship, and liturgical "pollution," punishment and penitence, and an experimental practice. Finally, systematic observation and science (with no knowledge of chemistry and little of physiology) assert themselves, and a secular administration is created by the side of the older religious organization.

The sick.

Sickness among primitive races is conceived to be a material substance to be extracted, or an evil spirit to be driven away by incantation. Religion and medicine are thus at the beginning almost one and the same thing. In Anatolia, in the groups of villages (cf. Ramsay as above, i. 101) under the theocratic government of a central *hieron* or temple, the god, Men Karou, was the physician and saviour (*soter* and *sozon*) of his people. Priests, prophets, and physicians were his ministers. He punished wrongdoing by diseases which he taught the penitent to cure. So elsewhere pollution, physical or moral, was chastened by disease and loss of property or children, and further ills were avoided by sacrifice and expiation and public warning. In the temple and out of this phase of thought grew up schools of medicine, in whose practice dreams and religious ritual retained a place. The newer gods, Asklepios and Apollo, succeeded the older local divinities; and the "sons" of Asklepios became a profession, and the temple with its adjacent buildings a kind of hospital. There were many temples of Asklepios in Greece and elsewhere, placed generally in high and salubrious positions. After ablution the patient offered sacrifices, repeating himself the words of the hymn that was chanted. Then, when night came on, he slept in the temple. In the early dawn he was to dream "the heavenly dream" which would suggest his cure; but if he did not dream, relations and others—officials at the temple—might dream for him. At dawn the priests or sons of Asklepios came into the temple and visited the sick, so that, in a kind of drama, where reality and appearance seemed to meet, the patients believed that they saw the god himself. The next morning the prescription and treatment were settled. At hand in the inn or guest chambers of the temple the patient could remain, sleeping again in the temple, if necessary, and carrying out the required regimen. In the temple were votive tablets of cases, popular and awe-inspiring, and records and prescriptions, which later found their way into the medical works of Galen and others. At the temple of Asklepios at Epidaurus was an inn (*katagogion*) with four courts and colonnades, and in all 160 rooms. (Cf. Pausanias, ii. 171; and *Report, Archæol. in Greece*, R. C. Bosanquet, 1899, 1900.)

At three centres more particularly, Rhodes, Cnidos, and Cos, were the medical schools of the Asklepiads. If one may judge from an inscription at Athens, priests of Asklepios attended the poor gratuitously. And years afterwards, in the 11th century, when there was a revival of medicine, we find at Salerno the Christian priest as doctor, a simple and less palatable pharmacy for the poor, and gratuitous medical relief.

Besides the temple schools and hospitals there was a secular organization of medical aid and relief. States appointed trained medical men as physicians, and provided for them medical establishments (*iatreia*, "large houses with large doors full of light") for the reception of the sick, and for operations there were provided beds, instruments, medicines, &c. At these places also pupils were taught. A lower degree of medical establishment was to be found at the barbers' shops. Out-patients were seen at the *iatreia*. They were also visited at home. There were doctors' assistants and slave doctors. The latter, apparently, attended only slaves (Plato, *Leg.* iv. 720); they do "a great service to the master of the house, who in this manner is relieved of the care of his slaves." It was a precept of Hippocrates, that if a physician came to a town where there were sick poor, he should make it his first duty to attend to them; and the state physician attended gratuitously any one who applied to him. There were also travelling physicians going rounds to heal children and the poor. These methods continued, probably all of them, to Christian times.

In Rome there were consulting-rooms and dispensaries, and houses in which the sick were received. Hospitals are mentioned by Roman writers in the 1st century A.D. There were infirmaries—detached buildings—for sick slaves; and in Rome, as at Athens, there were slaves skilled in medicine. In Rome also for each *regio* there was a chief physician who attended to the poorer people.

Slavery was so large a factor in pre-Christian and early Christian society that a word should be said on its relation to charity. Indirectly it was a cause of poverty and social degradation. Thus in the case of Athens, with the achievement of maritime supremacy the number of slaves increased greatly. Manual arts were despised as unbecoming to a citizen, and the slaves carried on the larger part of the agricultural and industrial work of the community; and for a time—until after the Peloponnesian war (404 B.C.)—slavery was an economic success. But by degrees the slave, it would seem, dispossessed the citizen and rendered him unfit for competition. The position of the free artisan thus became akin to that of the slave (Arist. *Pol.* 1260A, &c.), and slavery became the industrial method of the country. Though Greeks, Romans, Jews, and Christians spent money in ransoming individual slaves and also enfranchised many, no general abolition of slavery was possible. At last through economic changes the new status of *coloni*, who paid as rent part of the produce of the land they tilled, superseded the status of slavery. But this result was only achieved much later, when a new society was being created, when the slaves from the slave prisons (*ergastula*) of Italy joined its invaders, and the slave-owner or master, as one may suppose, unable any longer to work the gangs, let them become *coloni*.

Slavery

In Greece the feeling towards the slave became constantly more humane. Real slavery, Aristotle said, was a cast of mind, not a condition of life. The slave was not to be ordered about, but to be commanded and persuaded like a child. The master was under the strongest obligation to promote his welfare. In Rome, on the other hand, slavery continued to the end a massive, brutal, industrial force—a standing danger to the state. But alike in Greece and Rome the influence of slavery on the family was pernicious. The pompous array of domestic slaves, the transfer of motherly duties to slave nurses, the loss of that homely education which for most people comes only from the practical details of life—all this in later Greece and Italy, and far into Christian times, prevented that permanent invigoration and reform of family life which Jewish and Christian influences might otherwise have produced.

Part III.—Charity in Roman Times.

As from the point of view of charity the well-being of the community depends upon the vigour of the deep-laid elemental life within it, so in passing to Roman times we consider the family first. The Roman family was unique in its completeness, and by some of its conditions the world has long been bound. The father alone had independent authority (*sui juris*), and so long as he lived all who were under his power—his wife, his sons, and their wives and children, and his unmarried daughters—could not acquire any property of their own. Failing father or husband, the unmarried daughters were placed under the guardianship of the nearest male members of the family. Thus the family, in the narrower sense in which we commonly use the word, as meaning descendants of a common father or grandfather, was, as it were, a single point of growth in a larger organism, the *gens*, which consisted of all those who shared a common ancestry.

Roman times.

The wife, though in law the property of her husband, held a position of honour and influence higher than that of the Greek wife, at least in historic times. She seems to come nearer to the ideal of Xenophon: "the goodwife should be the mistress of everything within the house." "A house of his own and the blessing of children appeared to the Roman citizen as the end and essence of life" (Mommsen, *Hist. Rome*). The obligation of the father to the sons was strongly felt. The family, past, present, and future, was conceived as one and indivisible. Each succeeding generation had a right to the care of its predecessor in mind, body, and estate. The training of the sons was distinctively a home and not a school training. Brought up by the father and constantly at his side, they learnt spontaneously the habits and traditions of the family. The home was their school. By their father they were introduced into public life, and though still remaining under his power during his lifetime, they became citizens, and their relation to the state was direct. The nation was a nation of yeomen. Only agriculture and warfare were considered honourable employments. The father and sons worked outdoors on the farm, employing little or no slave labour; the wife and daughters indoors at spinning and weaving. The drudgery of the household was done by domestic slaves. The father was the working head of a toiling household. Their chief gods were the same as those of early Greece—Zeus-Diovis and Hestia-Vesta, the goddess of the hearth and home. Out of this solid, compact family Roman society was built, and so long as the family was strong attachment to the service of the state was intense. The *res publica*, the common weal, the phrase and the thought, meet one at every turn; and never were citizens more patient and tenacious combatants on their country's behalf. The men were soldiers in an unpaid militia and were constantly engaged in wars with the rivals of Rome, leaving home and family for their campaigns and returning to them in the winter. With a hardness and closeness inconsistent with—indeed, opposed to—the charitable spirit, they combined the strength of character and sense of justice without which charity becomes sentimental and unsocial. In the development of the family, and thus, indirectly, of charity, they stand for settled obligation and unrelenting duty.

Under the protection of the head of the family "in dependent freedom" lived the clients. They were in a middle position between the freemen and the slaves. The relation between patron and client lasted for several generations; and there were many clients. Their number increased as state after state was conquered, and they formed the *plebs*, in Rome the *plebs urbana*, the lower orders of the city.

In relation to our subject the important factors are the family, the *plebs*, and slavery.

Two processes were at work from an early date, before the first agrarian law (486 B.C.): the impoverishment of the *plebs*, and the increase of slavery. The former led to the *annona civica*, or the free supply of corn to the citizens, and to the *sportula*, or the organized food-supply for poor clients, and ultimately to the *alimentarii pueri*, the maintenance of children of citizens by voluntary and imperial bounty. The latter (slavery) was the standing witness that, as self-support was undermined, the task of relief became hopeless, and the impoverished citizen, as the generations passed, became in turn dependant, beggar, pauper, and slave.

The great patrician families—"an oligarchy of warriors and slaveholders"—did not themselves engage in trade, but, entering on large speculations, employed as their agents their clients, *libertini* or freedmen, and, later, their slaves. The constant wars, for which the soldiers of a local militia were eventually retained in permanent service, broke up the yeomanry and very greatly reduced their number. Whole families of citizens became impoverished, and their lands were in consequence sold to the large patrician families, members of which had acquired lucrative posts, or prospered in their speculations, and assumed possession of the larger part of the land, the *ager publicus*, acquired by the state through conquest. The city had always been the centre of the patrician families, the patrons of the trading *libertini* and other dependants. To it now flocked as well the *metoeci*, the resident aliens from the conquered states, and the poorer citizens, landless and unable for social reasons to turn to trade. There was thus in Rome a growing multitude of aliens, dispossessed yeomen, and dependent clients. Simultaneously slavery increased very largely after the second Punic war (202 B.C.). Every conquest brought slaves into the market, for whom ready purchasers were found. The slaves took the place of the freemen upon the old family estates, and the free country people became extinct. Husbandry gave place to shepherding. The estates were thrown into large domains (*latifundia*), managed by bailiffs and worked by slaves, often fettered or bound by chains, lodged in cells in houses of labour (*ergastula*), and sometimes cared for when ill in infirmaries (*valetudinaria*). In Crete and Sparta the slaves toiled that the mass of citizens might have means and leisure. In Rome the slave class was organized for private and not for common ends. In Athens the citizens were paid for their services; at Rome no offices were paid. Thus the citizen at Rome was, one might almost say, forced into a dependence on the public corn, for as the large properties swallowed up the smaller, and the slave dispossessed the citizen, a population grew up unfit for rural toil, disinclined to live by methods that pride considered sordid, unstable and pleasure-loving, and yet a serious political factor, as dependent on the rich for their enjoyments as they were on their patrons or the prefect of the corn in the city for their food.

It is estimated, from extremely difficult and uncertain data, that the population of Rome in the time of Augustus was about 1,200,000 or 1,500,000. At that time the *plebs urbana* numbered 320,000. If this be multiplied by three, to give a low average of dependants, wives, and children, this section of the population would number 960,000. The remainder of the 1,500,000, 540,000, would consist of (*a*) slaves, and (*b*) those, the comparatively few, who would be members of the great clan-families (*gentes*). Proportionately to Attica this seems to allow too small a population of slaves. But however this be, we may picture the population of Rome as consisting chiefly of a few patrician families ministered to by a very large number of slaves, and a populace of needy citizens, in whose ranks it was profitable for an outsider to find a place in order that he might participate in the advantages of state maintenance.

In Rome the clan-family became the dominant political factor. The family, as in England and elsewhere in the Middle Ages, and even in later times, in these circumstances assumes an influence which is out of harmony with the common good. The social advantage of the family lies in its self-maintenance, its home charities, and its moral and educational force, but if its separate interests are made supreme, it becomes uncharitable and unsocial. In Rome this was the line of development. The stronger clan-families crushed the weaker, and became the "oligarchy of warriors and slaveholders." In the same spirit they possessed themselves of the *ager publicus*. The land obtained by the Romans by right of conquest was public. It belonged to the state, and to a yeoman state it was the most valuable acquisition. At first part of it was sold and part was distributed to citizens without property and destitute (cf. Plutarch, *Tib. Gracchus*). At a very early date, however, the patrician families acquired possession of much of it and held it at a low rental, and thus the natural outlet for a conquering farmer race was monopolized by one class, the richer clan-families. This injustice was in part remedied by the establishment of colonies, in which the emigrant citizens received sufficient portions of land. But the colonies were comparatively few, and after each conquest the rich families made large purchases, while the smaller proprietors, whose services as soldiers were constantly required, were unable to attend to their lands or to retain possession of them. To prevent this (367 B.C.) the Licinian law was passed, by which ownership in land was limited to 500 *jugera*, about 312 acres. It was ignored, however, and more than two centuries later the evil, the double evil of the dispossession of the citizen farmer and of slavery, reached a crisis. The slave war broke out (134 B.C.), and (133 B.C.) Tiberius Gracchus made his attempt to re-endow the Roman citizens with the lands which they had acquired by conquest. He undertook what was essentially a charitable or philanthropic movement, which was set on foot too late. He had passed through Tuscany, and seen with resentment and pity the deserted country where the foreign slaves and barbarians were now the only shepherds and cultivators. He had been brought up under the influence of Greek Stoical thought, with which, almost in spite of itself, there was always associated an element of pity. The problem which he desired to solve, though larger in scale, was essentially the same as that with which Solon and Peisistratus had dealt successfully. At bottom the issue lay between private property, considered as the basis of family life for the great bulk of the community, with personal independence, and pauperism, with the *annona* or slavery. In 133 B.C. Tiberius Gracchus became tribune. To expand society on the lines of private property, he proposed the enforcement of "the Licinian Rogations"; the rich were to give up all beyond their rightful 312 acres, and the remainder was to be distributed amongst the poor (*penes*). The measure was carried by the use of arbitrary powers, and followed by the death of Tiberius at the hands of the patricians, the dominant clan-families. In 132 B.C. Caius Gracchus took up his brother's quarrel, and proposed measures for emigration and for relief. The former failed; the latter apparently were acceptable to all parties, and continued in force long after C. Gracchus had been slain (121 B.C.). By the *lex frumentaria* he gave the citizens—those who had the Roman franchise—the right to purchase corn every month from the public stores at rather more than half-price, 6⅓ *asses*, or about 3·3d., the peck. This, the fatal alternative, was accepted, and henceforth there was no possibility of a reversion to better social conditions.

The annona civica.

The provisioning of Rome was, like that of Athens, a public service. There were public granaries (267 B.C.),

and there was a quæstor to supervise the transit of the corn from Sicily and, later, from Spain and Africa, and an elaborate administration for collecting and conveying it. The *lex frumentaria* of Caius was followed by the *lex Octavia*, restricting the monthly sale to citizens settled in Rome, and to 5 *modii* ($1\frac{1}{4}$ bushels). According to Polybius, the amount required for the maintenance of a slave was 5 *modii* a month, and of a soldier 4. Hence the allowance, if continued at this rate, was practically a maintenance. The *lex Clodia* (58 B.C.) made the corn gratuitous to the *plebs urbana*.

Julius Cæsar (5 B.C.) found the number of recipients to be 320,000, and reduced them to 150,000. In Augustus's time they rose to 200,000. There seems, however, to be some confusion as to the numbers. From the *Ancyranum Monumentum* it appears that the *plebs urbana* who received Augustus's dole of 60 *denarii* (37*s.* 6*d.*) in his eighth consulship numbered 320,000. And (Suet. *Cæs.* 41) it seems likely that in Cæsar's time the lists of the recipients were settled by lot; further, probably only those whose property was worth less than 400,000 *sesterces* (£3541) were placed on the lists. It is probable, therefore, that 320,000 represents a maximum, reduced for purposes of administration to a smaller number (*a*) by a property test, and (*b*) by some kind of scrutiny. The names of those certified to receive the corn were exposed on bronze tablets. They were then called *cerarii*. They had tickets (*tesseræ*) for purposes of identification, and they received the corn or bread in the time of the republic at the temple of Ceres, and afterwards at steps in the several (14) regions or wards of Rome. Hence the bread was called *panis gradilis*. In the middle of the 2nd century there were state bakeries, and wheaten loaves were baked for the people perhaps two or three times a week. In Aurelian's time (A.D. 270) the flour was of the best, and the weight of the loaf (one *uncia*) was doubled. To the gifts of bread were added pork, oil, and possibly wine; clothes also—white tunics with long sleeves—were distributed. In the period after Constantine (cf. Theod. *Code*, xiv. 15) three classes received the bread—the palace people (*palatini*), soldiers (*militares*), and the populace (*populares*). No distribution was permitted except at the steps. Each class had its own steps in the several wards. The bread at one step could not be transferred to another step. Each class had its own supply. There were arrangements for the exchange of stale loaves. Against misappropriation there were (law of Valentinian and Valens) severe penalties. If a public prosecutor (*actor*), a collector of the revenue (*procurator*), or the slave of a senator obtained bread with the cognizance of the clerk, or by bribery, the slave, if his master was not a party to the offence, had to serve in the state bakehouse in chains. If the master were involved, his house was confiscated. If others who had not the right obtained the bread, they and their property were placed at the service of the bakery (*pistrini exercitio subjugari*). If they were poor (*pauperes*) they were enslaved, and the delinquent client was to be put to death.

The right to relief was dependent on the right of citizenship. Hence it became hereditary and passed from father to son. It was thus in the nature of a continuous endowed charity, like the well-known family charity of Smith, for instance, in which a large property was left to the testator's descendants, of whom it was said that as a result no Smith of that family could fail to be poor. But the *annona civica* was an endowed charity, affecting not a single family, but the whole population. Later, when Constantinople was founded, the right to relief was attached to new houses as a premium on building operations. Thus it belonged not to persons only, but also to houses, and became a species of "immovable" property, passing to the purchaser of the house or property, as would the adscript slaves. The bread followed the house (*ædes sequantur annonæ*). If, on the transfer of a house, bread claims were lost owing to the absence of claimants, they were transferred to the treasury (*fisci viribus vindicentur*). But the savage law of Valentinian, referred to above, shows to what lengths such a system was pushed. Early in its history the *annona civica* attracted many to Rome in the hope of living there without working. For the 400 years since the *lex Clodia* was enacted constant injury had been done by it, and now (A.D. 364) people had to be kept off the civic bounty as if they were birds of prey, and the very poor man (*pauperrimus*), who had no civic title to the food, if he obtained it by fraud, was enslaved. Thus, in spite of the abundant state relief, there had grown up a class of the very poor, the Gentiles of the state, who were outside the sphere of its ministrations. The *annona civica* was introduced not only into Constantinople, but also into Alexandria, with baleful results, and into Antioch. When Constantinople was founded the corn-ships of Africa sailed there instead of to Rome. On charitable relief, as we shall see, the *annona* has had a long-continued and fatal influence.

(1) If the Government considers itself responsible for provisioning the people it must fix the price of necessaries, and to meet distress or popular clamour it will lower the price. It becomes thus a large relief society for the supply of corn. In a time of distress, when the corn laws were a matter of moment in England, a similar system was adopted in the well-known Speenhamland scale (1795), by which a larger or lesser allowance was given to a family according to its size and the prevailing price of corn. A maintenance was thus provided for the able-bodied and their families, at least in part, without any equivalent in labour; though in England labour was demanded of the applicant, and work was done more or less perfunctorily. In amount the Roman dole seems to have been equivalent to the allowance provided for a slave, but the citizen received it without having to do any labour task. He received it as a statutory right. There could hardly be a more effective method for degrading his manhood and denaturalizing his family. He was also a voter, and the alms appealed to his weakness and indolence; and the fear of displeasing him and losing his vote kept him, socially, master of the situation, to his own ruin. If in England now relief were given to able-bodied persons who retained their votes, this evil would also attach to it.

(2) The system obliged the hardworking to maintain the idlers, while it continually increased their number. The needy teacher in Juvenal, instead of a fee, is put off with a *tessera*, to which, not being a citizen, he has no right. "The foreign reapers," it was said, "filled Rome's belly and left Rome free for the stage and the circus." The freeman had become a slave—"stupid and drowsy, to whom days of ease had become habitual, the games, the circus, the theatre, dice, eating-houses, and brothels." Here are all the marks of a degraded pauperism.

(3) The system led the way to an ever more extensive slavery. The man who could not live on his dole and other scrapings had the alternative of becoming a slave. "Better have a good master than live so distressfully"; and "If I were free I should live at my own risk; now I live at yours," are expressions suggestive of the natural temptations of slavery in these conditions. The escaped slaves returned to "their manger." The *annona* did not prevent destitution. It was a half-way house to slavery.

(4) The effect on agriculture, and proportionally on commerce generally, was ruinous. The largest corn-market, Rome, was withdrawn from the trade—the market to which all the necessaries of life would naturally have gravitated; and the supply of corn was placed in the hands of producers at a few centres where it could be grown most cheaply—Sicily, Spain, and Africa. The Italian farmer had to turn his attention to other produce—the cultivation of the olive and the vine, and cattle and pig rearing. The greater the extension of the system the more impossible was the regeneration of Rome. The Roman citizen might well say that he was out of work, for, so far as the land was concerned, the means of obtaining a living were placed out of his reach. While not yet unfitted for the country by life in the town, he at least could not "return to the land."

(5) The method was the outcome of distress and political hopelessness. Yet the rich also adopted it in distributing their private largess. Cicero (*De Off.* ii. 16) writes as though he recognized its evil; but though he expresses his disapprobation of the popular shows upon which the *ædiles* spent large sums, he argues that something must be done, "if the people demand it, and if good men, though they do not wish it, assent to it." Thus in a guarded manner he approves a distribution of food—a free breakfast in the streets of Rome. One bad result of the *annona* was that it encouraged a special and ruinous form of charitable munificence.

The sportula.

The *sportula* was a form of charity corresponding to the *annona civica*. Charity and poor relief run on parallel lines, and when the one is administered without discrimination, little discrimination will usually be exercised in the other. It was the charity of the patron—of the chiefs of the clan-families to their clients.

Between them it was natural that a relation, partly hospitable, partly charitable, should grow up. The clients who attended the patron at his house were invited to dine at his table. The patron, as Juvenal describes him, dined luxuriously and in solitary grandeur, while the guests put up with what they could get; or, as was usual under the empire, instead of the dinner (*cœna recta*) a present of food was given at the outer vestibule of the house to clients who brought with them baskets (*sportula*) to carry off their food, or even charcoal stoves to keep it warm. There was endless trickery. The patron (or almoner who acted for him) tried to identify the applicant, fearing lest he might get the dole under a false name; and at each mansion was kept a list of persons, male and female, entitled to receive the allowance. "The pilferer grabs the dole" (*sportulam furunculus captat*) was a proverb. The *sportula* was a charity sufficiently important for state regulation. Nero (A.D. 54) reduced it to a payment in money (100 *quadrantes*, about 1s.). Domitian (A.D. 81) restored the custom of giving food. Subsequently both practices—gifts in money and in food—appear to have been continued.

In these conditions the Roman family steadily decayed. Its "old discipline" was neglected; and Tacitus (A.D. 75), in his dialogue on Oratory, wrote (c. xxviii.) what might be called its epitaph. Of the general decline the laws of Cæsar and Augustus to encourage marriage and to reward the parents of large families are sufficient evidence.

The destruction of the working-class family must have been finally achieved by the imperial control of the *collegia*.

The collegia.

In old Rome there were corporations of craftsmen for common worship and for the maintenance of the traditions of the craft. These corporations were ruined by slave labour, and becoming secret societies, in the time of Augustus were suppressed. Subsequently they were reorganized, and gave scope for much of the kindly charity of mutual help. They often existed in connexion with some great house, whose chief was their patron and whose household gods they worshipped. The guilds of the poor, or rather of the lower orders (*collegia tenuiorum*), consisted of artisans and others, and slaves also, who paid monthly contributions to a common fund to meet the expenses of worship, common meals, and funerals. Under Severus (A.D. 192) the *collegia* were extended, and more closely organized as industrial bodies. They were protected and controlled, as in England in the 15th century the municipalities affected the cause of the craft guilds and ended by controlling them. Industrial disorder was thus prevented; the Government were able to provide the supplies required in Rome and the large cities with less risk and uncertainty; and the workmen employed in trade, especially the carrying trade, became almost slaves. In the 2nd century, and until the invasions, there were three groups of *collegia*: (1) those engaged in various state manufactures; (2) those engaged in the provision trade; and (3) the free trades, which gradually lapsed into a kind of slavery. If the members of these guilds fled they were brought back by force. Parents had to keep to the trade to which they belonged; their children had to succeed them in it. A slave caste indeed had been formed of the once free workmen.

Pueri alimentarii.

As a charitable protest against the destruction of children, in the midst of a broken family life, and increasing dependence and poverty, a special institution was founded (to use the Scottish word) for the "alimentation" of the children of citizens, at first by voluntary charity, and afterwards by imperial bounty.

Nerva and Trajan adopted the plan. Pliny (*Ep.* vii. 18) refers to it. There was a desire to give more lasting and certain help than an allotment of food to parents. A list of children, whose names were on the relief tables at Rome, was accordingly drawn up, and a special service for their maintenance established. Two instances are recorded in inscriptions—one at Veleia, one at Beneventum. The emperor lent money for the purpose at a low percentage—2½ or 5 per cent., as against the usual 10 or 12. At Veleia the loan amounted to 1,044,000 *sesterces*—about £8156, and 51 of the local landed proprietors mortgaged land, valued at 13 or 14 million *sesterces*, as security for the debt. The interest on the emperor's money at 5 per cent. was paid into the municipal treasury, and out of it the children were relieved. The figures seem small; at Veleia 300 children were assisted, of whom 36 were girls. The annual interest amounted to nearly £204, which divided among 300 gives about 13·6s. a head. The figures suggest that the money served as a charitable supplementation of the citizens' relief in direct aid of the children. Apparently the scheme was widely adopted. Curators of high position were the patrons; procurators acted as inspectors over large areas; and *quæstores alimentarii* undertook the local management. Antoninus Pius (A.D. 138), and Marcus Aurelius (A.D. 160), and subsequently Severus (A.D. 192), established these bursaries for children in the names of their wives. In the 3rd century the system fell into disorder. There were large arrears of payments, and in the military anarchy that ensued it came to an end. It is of special interest, as indicating a new feeling of responsibility towards children akin to the humane Stoicism of the Antonines, and an attempt to found, apart from temples or *collegia*, what was in the nature of a public endowed charity.

Part IV.—Jewish and Christian Charity.

With Christianity two elements come into fusion, the Jewish and the Greco-Roman. To trace this fusion and its results it is necessary to describe the Jewish system of charity, and to compare it with that of the early Christian church, to note the theory of charity in Aristotle as representing Greek, and in St Paul as representing Christian thought, and to mark the Roman influences which moulded the administration of Ambrose and Gregory and Western Christianity generally.

Hebrew charity.

In the early history of the Hebrews we find the family, clan-family, and tribe. With the Exodus (probably about 1390 B.C.) comes the law of Moses (cf. Kittel, *Hist. of the Hebrews*, Eng. trans., i. 244), the central and permanent element of Jewish thought. We may compare it to the "commandments" of Hesiod. There is the recognition of the family and its obligations: "Honour thy father and mother"; and honour included help and support. There is also the law essential to family unity: "Thou shalt not commit adultery"; and as to property there is imposed the regulation of desire: "Thou shalt not covet thy neighbour's house." Maimonides (A.D. 1135), true to the old conception of the family (x. 16), calls the support of adult children, "after one is exempt from supporting them," and the support of a father or mother by a child, "great acts of charity; since kindred are entitled to the first consideration." To relief of the stranger the Decalogue makes no reference, but in the law it is constantly pressed; while the Levitical law (xix. 18) first applies a new standard to social life: "Thou shalt love thy neighbour as thyself." This thought is the outcome of a deep ethical fervour—the element which the Jews brought into the work of charity. In Judges and Joshua, the "Homeric" books of the Old Testament, the Hebrews appear as a passionately fierce and cruel people. Subsequently against their oppression of the poor the prophets protested with a vehemence as great as the evil was intense; and their denunciations remained part of the national literature, a standing argument that life without charity is nothing worth. Thus schooled and afterwards tutored into discipline by the tribulation of the exile (587 B.C.), they turned their fierceness into a zeal, which, as their literature shows, was as fervent in ethics as it was in religion and ceremonial. In the services at the synagogues, which supplemented and afterwards took the place of the Temple, the Commandments were constantly repeated and the Law and the Prophets read; and as the Jews of the Dispersion increased in number, and especially after the destruction of Jerusalem, the synagogues became centres of social and charitable co-operation. Thus rightly would a Jewish rabbi say, "On three things the world is stayed: on the Thorah, and on worship, and on the bestowal of kindness." Also

there was on the charitable side an indefinite power of expansion. Rigid in its ceremonial, there it was free. Within the nation, as the Prophets, and after the exile, as the Psalms show, there was the hope of a universal religion, and with it of a universally recognized charity. St Paul accentuated the prohibitive side of the law and protested against it; but, even while he was so doing, stimulated by the Jewish discipline, he was moving unfettered towards new conceptions of charity and life—charity as the central word of the Christian life, and life as a participation in a higher existence—the "body of Christ."

To mark the line of development, we would compare—1. The family among the Jews and in the early Christian Church; 2. The sources of relief and the tithe, the treatment of the poor and their aid, and the assistance of special classes of poor; 3. The care of strangers; and, lastly, we would consider the theory of almsgiving, friendship or love, and charity.

1. As elsewhere, property is the basis of the family. Wife and children are the property of the father. But the wife is held in high respect. In the post-exilian period the virtuous wife is represented as laborious as a Roman matron, a "lady bountiful" to the poor, and to her husband wife and friend alike. Monogamy without concubinage is now the rule—is taken for granted as right. There is no "exposure of children." The slaves are kindly treated, as servants rather than slaves—though in Roman times and afterwards the Jews were great slave-traders. The household is not allowed to eat the bread of idleness. "Six days," it was said, "*must* [not *mayest*] thou work." "Labour, if poor; but find work, if rich." "Whoever does not teach his son business or work, teaches him robbery." In Job xxxi., a chapter which has been called "an inventory of late Old Testament morality," we find the family life developed side by side with the life of charity. In turn are mentioned the relief of the widow, the fatherless, and the stranger—the classification of dependants in the Christian Church; and the whole chapter is a justification of the homely charities of a good family. "The Jewish religion, more especially in the old and orthodox form, is essentially a family religion" (C. G. Montefiore, *Religion of Ancient Hebrews*).

In the early documents of the Church the fifth commandment is made the basis of family life (cf. Eph. vi. 1; *Apost. Const.* ii. 32, iv. 11—if we take the first six books of the *Apost. Const.* as a composite production before A.D. 300, representing Judæo-Christian or Eastern Church thought). But two points are prominent. Duties are insisted on as reciprocal (cf. especially St Paul's Epistles), as, *e.g.*, between husband and wife, parent and child, master and servant. Charity is mutual; the family is a circle of reciprocal duties and charities. This implies a principle of the greatest importance in relation to the social utility of charity. Further reference will be made to it later. Next the "thou shalt love thy neighbour" is translated from its position as one amongst many sayings to the chief place as a rule of life. In the *Teaching of the Twelve Apostles* (Jewish-Christian, early 1st cent. A.D.) the first commandment in "the way of life" is adapted from St Matthew's Gospel thus: "First, thou shalt love God who made thee; secondly, thy neighbour as thyself; and all things whatsoever thou wouldst not have done to thee, neither do thou to another." A principle is thus applied which touches all social relations in which the "self" can be made the standard of judgment. Of this also later. To touch on other points of comparison: the earlier documents seem to ring with a reiterated cry for a purer family life (cf. the second, the negative, group of commandments in the *Teaching*, and the judgment of the apocalyptic writings, such as the Revelations of Peter, &c.); and sharing the Jewish feeling, the riper conscience of the Christian community formulates and accepts the injunction to preserve infant life at every stage. It advocates, indeed, the Jewish purity of family life with a missionary fervour, and it makes of it a condition of church membership. The Jewish rule of labour is enforced (*Ap. Const.* ii. 63). If a stranger settle (*Teaching*, xii. 3) among the brotherhood, "let him work and eat." And the father (*Constit.* iv. 11) is to teach the children "such trades as are agreeable and suitable to their need." And the charities to the widow, the fatherless, are organized on Jewish lines.

2. The sources of relief among the Jews were the three gifts of corn: (1) the corners of the field (cf. Lev. xix. &c.), amounting to a sixtieth part of it; (2) the gleanings, a definite minimum dropped in the process of reaping (Maimonides, *Laws of the Hebrews relating to the Poor*, iv. 1); (3) corn overlooked and left behind. So it was with the grapes and with all crops that were harvested, as opposed, *e.g.*, to figs, that were gathered from time to time. These gifts were divisible three times in the day, so as to suit the convenience of the poor (Maim. ii. 17), and the poor had a right to them. They are indeed a poor-rate paid in kind such as in early times would naturally spring up among an agricultural people. Another gift "out of the seed of the earth" is the tithe. In the post-exilian period the septenniad was in force. Each year a fiftieth part of the produce (Maim. vi. 2, and Deut. xviii. 4) was given to the priest (the class which in the Jewish state was supported by the community). Of the remainder one-tenth went to the Levite, and one-tenth in three years of the septennium was retained for pilgrimage to Jerusalem, in two given to the poor. In the seventh year "all things were in common." Supplementing these gifts were alms to all who asked; "and he who gave less than a tenth of his means was a man of evil eye" (Maim. vii. 5). All were to give alms, even the poor themselves who were in receipt of relief. Refusal might be punished with stripes at the hand of the Sanhedrim. At the Temple alms for distribution to the worthy poor were placed by worshippers in the cell of silence; and it is said that in Palestine at meal times the table was open to all comers. As the synagogues extended, and possibly after the fall of Jerusalem (A.D. 70), the collection of alms was further systematized. There were two collections. In each city alms of the box or chest (*kupha*) were collected for the poor of the city on each Sabbath eve (later, monthly or thrice a year), and distributed in money or food for seven days. Two collected, three distributed. Three others gathered and distributed daily alms of the basket (*tamchui*). These were for strangers and wayfarers—casual relief "for the poor of the whole world." In the Jewish synagogue community from early times the president (*parnass*) and treasurer were elected annually with seven heads of the congregation (see Abrahams's *Jewish Life in the Middle Ages*, p. 54), and sometimes special officers for the care of the poor. A staff of almoners was thus forthcoming. In addition to these collections were the *pruta* given to the poor before prayers (Maim. x. 15), and moneys gathered to help particular cases (cf. *Jewish Life*, p. 322) by circular letter. There were also gifts at marriages and funerals; and fines imposed for breach of the communal ordinances were reserved for the poor. The distinctive feature of the Jewish charity was the belief that "the poor would not cease out of the land," and that therefore on charitable grounds a permanent provision should be made for them—a poor-rate, in fact, subject to stripes and distraint, if necessary (Maim. vii. 10).

If we compare this with the early Church we find the following sources of relief: (1) The Eucharistic offerings, some consumed at the time, some carried home, some reserved for the absent (see Hatch, *Early Church*, p. 40). The ministration, like the Eucharist, was connected with the love feast, and was at first daily (Acts ii. 42, vi. 1, and the *Teaching*). (2) Freewill offerings and first fruits and voluntary tithes (*Ap. Con.* ii. 25) brought to the bishop and used for the poor—orphans, widows, the afflicted and strangers in distress, and for the clergy, deaconesses, &c. (3) Collections in churches on Sundays and week-days, alms-boxes, and gifts to the poor by worshippers as they entered church; also collections for special purposes (cf. for Christians at Jerusalem). Apart from "the corners," &c., the sources of relief in the Christian and Jewish Churches are the same. The separate Jewish tithe for the poor, which (Maim. vi. 11, 13) might be used in part by the donor as personal charity, disappears. A voluntary tithe remains, in part used for the poor. We do not hear of stripes and distraint, but in both bodies there is a penitential system and excommunication (cf. *Jewish Life*, p. 52), and in both a settlement of disputes within the body (Clem. *Hom.* iii. 67). In both, too, there is the abundant alms provided in the belief of the permanence of

poverty and the duty of giving to all who ask. As to administration in the early Church (Acts vi. 3), we find seven deacons, the number of the local Jewish council; and later there were in Rome seven ecclesiastical relief districts, each in charge of a deacon. The deacon acted as the minister of the bishop (*Ep.* Clem. to Jam. xii.), reporting to him and giving as he dictated (*Ap. Con.* ii. 30, 31). He at first combined disciplinary powers with charitable. The presbyters also (Polycarp *Ad Phil.* 6 (A.D. 69-155)), forming (Hatch, p. 69) a kind of bishop's council, visited the sick, &c. The bishop was president and treasurer. The bishop was thus the trustee of the poor. By reason of the churches' care of orphans responsibilities of trusteeship also devolved on him. The temples were in pagan times depositories of money. Probably the churches were also.

3. Great stress is laid by the Jews on the duty of gentleness to the poor (Maim. x. 5). The woman was to have first attention (Maim. vi. 13). If the applicant was hungry he was to be fed, and then examined to learn whether he was a deceiver (Maim. vii. 6). Assistance was to be given according to the want—clothes, household things, a wife, or a husband—and according to the poor man's station in life. For widows and orphans the "gleanings" were left. Both are the recognized objects of charity (Maim. x. 16, 17). "The poor and the orphan were to be employed in domestic affairs in preference to servants." The dower was a constant form of help. The ransoming of slaves took precedence of relief to the poor. The highest degree of alms deed (Maim. x. 7) was "to yield support to him who is cast down, either by means of gifts, or by loan, or by commerce, or by procuring for him traffic with others. Thus his hand becometh strengthened, exempt from the necessity of soliciting succour from any created being."

If we compare the Christian methods we find but slight difference. The absoluteness of "Give to him that asketh" is in the *Teaching* checked by the "Woe to him that receives: for if any receives having need, he shall be guiltless, but he that has no need shall give account, . . . and coming into distress . . . he shall not come out thence till he hath paid the last farthing." It is the duty of the bishop to know who is most worthy of assistance (*Ap. Con.* ii. 3, 4); and "if any one is in want by gluttony, drunkenness, or idleness, he does not deserve assistance, or to be esteemed a member of the church." The widow assumes the position not only of a recipient of alms, but a church worker. Some were a private charge, some were maintained by the church. The recognized "widow" was to be sixty years of age (cf. 1 Tim. v. 9 and *Ap. Con.* iii. 1), a bedeswoman and gossipy pauper often, if one may judge from the texts. Remarriage was not approved, and so that resource, which would have been adopted in an English manor court, was not available for self-support, and charity had to take its place. Orphans were provided for by members of the churches. The virgins formed another class, as, contrary to the earlier feeling, marriage came to be held a state of lesser sanctity. They too seem to have been also, in part at least, church workers. Thus round the churches grew up new groups of recognized dependants; but the older theory of charity was broad and practical—akin to that of Maimonides. "Love all your brethren, performing to orphans the part of parents, to widows that of husbands, affording them sustenance with all kindliness, arranging marriages for those who are in their prime, and for those who are without a profession the means of necessary support through employment: giving work to the artificer and alms to the incapable" (*Ep.* Clem. to James viii.).

4. The Jews in pre-Christian and Talmudic times supported the stranger or wayfarer by the distribution of food (*tamchui*), and strangers were lodged in private houses; and there were inns provided at which no money was taken (cf. *Jewish Life*, p. 314). Subsequently, besides these methods, special societies were formed "for the entertainment of the resident poor and of strangers." There were commendatory letters also. These conditions prevailed in the Christian Church also. The *Xenodocheion* was the first form of Christian hospital both for the stranger and for the sect. In the Christian community the endowment charity comes into existence in the 4th century, among the Jews not till the 13th. The charities of the synagogue without separate societies sufficed.

We may now compare the conceptions of Jews and Christians on charity with those of the Greeks. There are two chief exponents of the diverse views—Aristotle and St Paul; for to simplify the issues we refer to them only. Thoughts such as Aristotle's recast by the Stoic Panætius (185-112 B.C.), and used by Cicero in his *De Officiis*, became in the hands of St Ambrose arguments for the direction of the clergy in the founding of the mediæval Church; and in the 13th century Aristotle reasserts his influence through such leaders of mediæval thought as St Thomas Aquinas. St Paul's chapters on charity, but little appreciated and understood, one is inclined to think, have perhaps, more than any other words, prevented an absolute lapse into the materialism of almsgiving. After him we think of St Francis, the greatest of a group of men who, seeking reality in life, revived charity; but to the theory of charity it might almost be said that since Aristotle and St Paul nothing has been added until we come to the economic and moral issues which Dr Chalmers explained and illustrated.

Greek, Jewish, and Christian thought.

The problem turns on the conception (1) of purpose, (2) of the self, and (3) of charity, love, or friendship as an active force in social life. To the Greek, or at least to Greek philosophic thought, purpose was the measure of goodness. To have no purpose was, so far as the particular act was concerned, to be simply irrational; and the less definite the purpose the more irrational the act. This conception of purpose was the touchstone of family and social life, and of the civic life also. In no sphere could goodness be irrational. To say that it was without purpose was to say that it was without reality. So far as the actor was concerned, the main purpose of right action was the good of the soul (*psyche*); and by the soul was meant the better self, "the ruling part" acting in harmony with every faculty and function of the man. With faculties constantly trained and developed, a higher life was gradually developed in the soul. We are thus, it might be said, what we become. The gates of the higher life are within us. The issue is whether we will open them and pass in.

Consistent with this is the social purpose. Love or friendship is not conceived by Aristotle except in relation to social life. Society is based on an interchange of services. This interchange in one series of acts we call justice; in another friendship or love. A man cannot be just unless he has acquired a certain character or habit of mind; and hence no just man will act without knowledge, previous deliberation, and definite purpose. So also will a friend fulfil these conditions in his acts of love or friendship. In the love existing between good men there is continuance and equality of service; but in the case of benefactor and benefited, in deeds of charity, in fact, there is no such equality. The satisfaction is on one side, but often not on the other. (The dilemma is one that is pressed, though not satisfactorily, in Cicero and Seneca.) The reason for this will be found, Aristotle suggests, in the feeling of satisfaction which men experience in action. We realize ourselves in our deeds—throw ourselves into them, as people say; and this is happiness. What we make we like: it is part of us. On the other hand, in the person benefited there may be no corresponding action, and in so far as there is not, there is no exchange of service or the contentment that arises from it. The "self" of the recipient is not drawn out. On the contrary, he may be made

worse, and feel the uneasiness and discontent that result from this. In truth, to complete Aristotle's argument, the good deed on one side, as it represents the best self of the benefactor, should on the other side draw out the best self of the person benefited. And where there is not ultimately this result, there is not effective friendship or charity, and consequently there is no personal or social satisfaction. The point may be pushed somewhat further. In recent developments of charitable work the term "friendly visitor" is applied to persons who endeavour to help families in distress on the lines of associated charity. It represents the work of charity in one definite light. So far as the relation is mutual, it cannot at the outset be said to exist. The charitable friend wishes to befriend another; but at first there may be no reciprocal feeling of friendship on the other's part—indeed, such a feeling may never be created. The effort to reciprocate kindness by becoming what the friend desires may be too painful to make. Or the two may be on different planes, one not really befriending, but giving without intelligence, the other not really endeavouring to change his nature, but receiving help solely with a view to immediate advantage. The would-be befriender may begin "despairing of no man," expecting nothing in return; but if, in fact, there is never any kind of return, the friendship actually fails of its purpose, and the "friend's" satisfaction is lost, except in that he may "have loved much." In any case, according to this theory friendship, love, and charity represent the mood from which spring social acts, the value of which will depend on the knowledge, deliberation, and purpose with which they are done, and accordingly as they acquire value on this account will they give lasting satisfaction to both parties.

St Paul's position is different. He seems at first sight to ignore the state and social life. He lays stress on motive force rather than on purpose. He speaks as an outsider to the state, though technically a citizen. His mind assumes towards it the external Judaic position, as though he belonged to a society of settlers (*paroikoi*). Also, as he expects the millennium, social life and its needs are not uppermost in his thoughts. He considers charity in relation to a community of fellow-believers—drawn together in congregations. His theory springs from this social base, though it over-arches life itself. He is intent on creating a spiritual association. He conceives of the spirit (*pneuma*) as "an immaterial personality." It transcends the soul (*psyche*), and is the Christ life, the ideal and spiritual life. Christians participate in it, and they thus become part of "the body of Christ," which exists by virtue of love—love akin to the ideal life, *agape*. The word represents the love that is instinct with reverence, and not love (*philia*) which may have in it some quality of passion. This love is the life of "the body of Christ." Therefore no act done without it is a living act—but, on the contrary, must be dead—an act in which no part of the ideal life is blended. On the individual act or the purpose no stress is laid. It is assumed that love, because it is of this intense and exalted type, will find the true purpose in the particular act. And, when the expectation of the millennium passed away, the theory of this ideal charity remained as a motive force available for whatever new conditions, spiritual or social, might arise. Nevertheless, no sooner does this charity touch social conditions, than the necessity asserts itself of submitting to the limitations which knowledge, deliberation, and purpose impose. This view has been depreciated or ignored by Christians, who have been content to rely upon the strength of their motives, or perhaps have not realized what the Greeks understood, that society was a natural organism (Arist. *Pol.* 1253A), which develops, fails, or prospers in accordance with definite laws. Hence endless failure in spite of some success. For love, whether we idealize it as *agape* or consider it a social instinct as *philia*, cannot be love at all unless it quickens the intelligence as much as it animates the will. It cannot, except by some confusion of thought, be held to justify the indulgence of emotion irrespective of moral and social results. Yet, though this fatal error may have dominated thought for a long time, it is hardly possible to attribute it to St Paul's theory of charity when the very practical nature of Judaism and early Christianity is considered. In his view the misunderstanding could not arise. And to create a world or "body" of men and women linked together by love, even though it be outside the normal life of the community, was to create a new form of religious organization, and to achieve for it (so far as it was achieved) what, *mutatis mutandis*, Aristotle held to be the indispensable condition of social life, friendship (*philia*), "the greatest good of states," for "Socrates and all the world declare," he wrote, that "the unity of the state" is "created by friendship" (Arist. *Pol.* ii. 1262B).

It should, however, be considered to what extent charity in the Christian Church was devoid of social purpose. (1) The Jewish conceptions of charity passed, one might almost say, in their completeness into the Christian Church. Prayer, the petition and the purging of the mind, fasting, the humiliation of the body, and alms, as part of the same discipline, the submissive renunciation of possessions—all these formed part of the discipline that was to create the religious mood. Alms henceforth become a definite part of the religious discipline and service. Humility and poverty hereafter appear as yoked virtues, and many problems of charity are raised in regard to them. The non-Christian no less than the Christian world appreciated more and more the need of self-discipline (*askesis*); and it seems as though in the first two centuries A.D., if any thought of reinvigorating society, they searched for the remedy rather in the preaching and practice of temperance than in the application of ideas that were the outcome of the observation of social or economic conditions. Having no object of this kind as its mark, almsgiving took the place of charity, and, as Christianity triumphed, the family life, instead of reviving, continued to decay, while the virtues of the discipline of the body, considered apart from social life, became an end in themselves, and it was desired rather to annihilate instinct than to control it. Possibly this was a necessary phase in a movement of progress, but however that be, charity, as St Paul understood it, had in it no part. (2) But the evil went farther. Jewish religious philosophy is not elaborated as a consistent whole by any one writer. It is rather a miscellany of maxims; and again and again, as in much religious thought, side issues assume the principal place. The direct effect of the charitable act, or almsgiving, is ignored. Many thoughts and motives are blended. The Jews spoke of the poor as the means of the rich man's salvation. St Chrysostom emphasizes this: "If there were no poor, the greater part of your sins would not be removed: they are the healers of your wounds" (*Hom.* xiv., Timothy, &c.). Alms are the medicine of sin. And the same thought is worked into the penitential system. Augustine speaks of "penance such as fasting, almsgiving, and prayer for breaches of the Decalogue" (Reichel, *Manual of Canon Law*, p. 23); and many other references might be cited. "Pecuniary penances (*Ib.* 154), in so far as they were relaxations of or substitutes for bodily penances, were permitted because of the greater good thereby accruing to others" (and in this case they were—A.D. 1284—legally enforceable under English statute law). The penitential system takes for granted that the almsgiving is good for

others and puts a premium on it, even though in fact it were done, not with any definite object, but really for the good of the penitent. Thus almsgiving becomes detached from charity on the one side and from social good on the other. Still further is it vulgarized by another confusion of thought. It is considered that the alms are paid to the credit of the giver, and are realized as such by him in the after-world; or even that by alms present prosperity may be obtained, or at least evil accident avoided. Thus motives were blended, as indeed they now are, with the result that the gift assumed a greater importance than the charity, by which alone the gift should have been sanctified, and its actual effect was habitually overlooked or treated as only partially relevant.

(3) The Christian maxim of "loving (*agape*) one's neighbour as one's self" sets a standard of charity. Its relations are idealized according as the "self" is understood; and thus the good self becomes the measure of charity. In this sense, the nobler the self the completer the charity; and the charity of the best men, men who love (and understand) their neighbours best, having regard to their chief good, is the best, the most effectual charity. Further, if in what we consider "best" we give but a lesser place to social purpose, or even allow it no place at all, our "self" will have no sufficient social aim and our charity little or no social result. For this "self," however, religion has substituted not St Paul's conception of the spirit (*pneuma*), but a soul, conceived as endowed with a substantial nature, able to enjoy and suffer quasi-material rewards and punishments in the after-life; and in so far as the safeguard of this soul by good deeds or almsgiving has become a paramount object, the purpose of charitable action has been translated from the actual world to another sphere. Thus, as we have seen, the aid of the poor has been considered not an object in itself, but as a means by which the almsgiver effects his own ulterior purpose and "makes God his debtor." The problem thus handled raises the question of reward and also of punishment. Properly, from the point of view of charity, both are excluded. We may indeed act from a complexity of motives and expect a complexity of rewards, and undoubtedly a good act does refresh the "self," and may as a result, though not as a reward, win approval. But in reality reward, if the word be used at all, is according to purpose; and the only reward of a deed lies in the fulfilment of its purpose. In the theory of almsgiving which we are discussing, however, act and reward are on different planes. The reward is on that of a future life; the act relates to a distressed person here and now. The interest in the act on the doer's part lies in its post-mortal consequences to himself, and not either wholly or chiefly in the act itself. Nor, as the interest ends with the act —the giving—can the intelligence be quickened by it. The questions "How? by whom? with what object? on what plan? with what result?" receive no detailed consideration at all. Two general results follow. In so far as it is thus practised, almsgiving is out of sympathy with social progress. It is indeed alien to it. Next also the self-contained, self-sustained poverty that will have no relief and does without it, is outside the range of its thought and understanding. On the other hand, this almsgiving is equally incapable of influencing the weak and the vicious; and those who are suffering from illness or trouble it has not the width of vision to understand nor the moral energy to support so that they shall not fall out of the ranks of the self-supporting. It believes that "the poor" will not cease out of the land. And indeed, however great might be the economic progress of the people, it is not likely that the poor will cease, if the alms given in this spirit be large enough in amount to affect social conditions seriously one way or the other. When we measure the effects of charity, this inheritance of divided thought and inconsistent counsels must be given its full weight.

The sub-apostolic church was a congregation, like a synagogue, the centre of a system of voluntary and personal relief, connected with the congregational meals (or *agapai*) and the Eucharist, and under the supervision of no single officer or bishop. Out of this was developed a system of relief controlled by a bishop, who was assisted chiefly by deacons or presbyters, while the *agapai*, consisting of offerings laid before the altar, still remained. Subsequently the meal was separated from the sacrament, and became a dole of food, or poor people's meal—*e.g.*, in St Augustine's time in Western Africa—and it was not allowed to be served in churches (A.D. 391). As religious asceticism became dominant, the sacrament was taken fasting; it appeared unseemly that men and women should meet together for such purposes, and the *agapai* fell out of repute. Simultaneously it would seem that the parish (*paroichia*) became from a congregational settlement a geographical area.

The organization of the parish and endowed charities.

The organization of relief at Rome illustrates both a type of administration and a transition. St Gregory's reforms (A.D. 590) largely developed it. The parochial system had been adopted probably about the middle of the 3rd century, but the diaconate probably remained centralized. At the end of the 4th century Pope Anastasius had founded deaconries in Rome, and endowed them largely "to meet the frequent demands of the diaconate." Gregory two hundred years later reorganized the system. He divided the fourteen old "regions" into seven ecclesiastical districts and thirty "titles" (or parishes). The parishes were under the charge of sixty-six priests; the districts were eleemosynary divisions. Each was placed under the charge of a deacon, not (Greg. *Ep.* xi. and xxviii.) under the priests (*presbyteri titularii*). Over the deacons was an archdeacon. It was the duty of the deacons to care for the poor, widows, orphans, wards, and old people of their several districts. They inquired in regard to those who were relieved, and drew up under the guidance of the bishop the register of poor (*matricula*). Only these received regular relief. In each district was an hospital or office for alms, of which the deacon had charge, assisted by a steward (or *œconomus*). Here food was given and meals were taken, the sick and poor were maintained, and orphan or foundling children lodged. The churches of Rome and of other large towns possessed considerable estates, "the patrimony of the patron saints," and to Rome belonged estates in Sicily which had not been ravaged by the invaders, and they continued to pay to it their tenth of corn, as they had done since Sicily was conquered. Four times a year (Milman, *Lat. Christ.* ii. 117) the shares of the (1) clergy and papal officers, (2) churches and monasteries, and (3) "hospitals, deaconries, and ecclesiastical wards for the poor," were calculated in money and distributed; and the first day in every month St Gregory distributed to the poor in kind corn, wine, cheese, vegetables, bacon, meal, fish, and oil. The sick and infirm were superintended by persons appointed to inspect every street. Before the pope sat down to his own meal a portion was separated and sent out to the hungry at his door. The Roman *plebs* had thus become the poor of Christ (*pauperes Christi*), and under that title were being fed by *civica annona* and *sportula* as their ancestors had been; and the deaconries had superseded the "regions" and the "steps" from which the corn had been distributed. The *hospitium* was now part of a common organization of relief, and the sick were visited according to Jewish and early

Christian precedent. How far kindly Romans visited the sick of their day we do not know. Alms and the *annona* were now, it would seem, administered concurrently; and there was a system of poor relief independently of the churches and their alms (unless these, organized, as in Scottish towns, on the ancient ecclesiastical lines, were paid wholly or in part to a central diaconate fund). Much had changed, but in much Roman thought still prevailed. On this model (see below) the organization of poor relief in the Middle Ages was framed. On the one hand the officers of the Church (Charlemagne's *Capit.* 779)—bishops, abbots, and abbesses—were expected to give according to their means a definite sum for the relief of the poor, or to maintain a certain number of families during the winter; and, on the other hand, the citizens of the cathedral city and its neighbouring parishes were to support their own poor.

The change in sentiment and method could hardly be more strongly marked than by a comparison of "the *Teaching*" with St Ambrose's (334-397) "Duties of the Clergy" (*De Officiis Ministrorum*). For the old instinctive obedience to a command there is now an endeavour to find a reasoned basis for charitable action. Pauperism is recognized. "Never was the greed of beggars greater than it is now. . . . They want to empty the purses of the poor, to deprive them of the means of support. Not content with a little, they ask for more. . . . With lies about their lives they ask for further sums of money." "A method in giving is necessary." But in the suggestions made there is little consistency. Liberality is urged as a means of gaining the love of the people; a new and a false issue is thus raised. The relief is neither to be "too freely given to those who are unsuitable, nor too sparingly bestowed upon the needy." Everywhere there is a doctrine of the mean reflected through Cicero's *De Officiis*, the doctrine falsely stated, as though it were a mean of quantity, and not that rightly tempered mean which is the harmony of opposing moods. The poor are not to be sent away empty. Those rejected by the Church are not to be left to the "outer darkness" of an earlier Christianity. They must be supplied if they are in want. The methodic giver is "hard towards none, but is free towards all." Consequently none are refused, and no account is taken of the regeneration that may spring up in a man from the effort towards self-help which refusal may originate. Thus after all it appears that method means no more than this—to give sometimes more, sometimes less, to all needy people. In the small congregational church of early Christianity, each member of which was admitted on the conditions of strictest discipline, the common alms of the faithful could hardly have done much harm within the body, even though outside they created and kept alive a horde of vagrant alms-seekers and pretenders. Now in this department at least the Church had become the state, and discipline and a close knowledge of one's fellow-Christians no longer safeguarded the alms. From Cicero is borrowed the thought of "active help," which "is often grander and more noble," but the thought is not worked out. From the social side the problem is not understood or even stated, and hence no principle of charity or of charitable administration is brought to light in the investigation. Still there are rudiments of the economics of charity in the praise of Joseph, who made the people *buy* the corn, for otherwise "they would have given up cultivating the soil; for he who has the use of what is another's often neglects his own." Perhaps, as St Augustine inspired the theology of the Middle Ages, we may say that St Ambrose, in the mingled motives, indefiniteness, and kindliness of this book, stands for the charity of the Middle Ages, except in so far as the movement which culminated in the brotherhood of St Francis awakened the intelligence of the world to wider issues.

In Constantinople the pauperism seems to have been extreme. The corn supplies of Africa were diverted there in great part when it became the capital of the empire. This must have left to Rome a larger scope for the development of the civic-religious administration of relief. St Chrysostom's sermons give no impression of the rise of any new administrative force, alike sagacious and dominant. The appeal to give alms is constant, but the positive counsel on charitable work is *nil*. The people had the *annona civica*, and imperial gifts, corn, allowances (*salaria*) from the treasury granted for the poor and needy, and an annual gift of 50 gold pounds (rather more than £1400) for funerals. Besides these there were many institutions, and the begging and the almsgiving at the church doors. "The land could not support the lazy and valiant beggars." There were public works provided for them; if they refused to work on them they were to be driven away. The sick might visit the capital, but must be registered and sent back (A.D. 382); the sturdy beggar was condemned to slavery. So little did alms effect. And in the East monasticism seems to have produced no firmness of purpose such as led to the organization of the Church and of charitable relief under St Gregory.

Another movement of the Byzantine period was the establishment of the endowed charity. The Jewish synagogue long served as a place for the reception of strangers—a religious *xenodocheion*. Probably the strangers referred to in "the *Teaching*" were so entertained. The table of the bishop and a room in his house served as the guest chamber, for which afterwards a separate building was instituted. In the East the Jewish charitable inn first appears, and there took place the earliest extension of institutions. There was probably a demand for an elaboration of institutions as social changes made themselves felt in the churches. We have seen this in the case of the *agape*. Similar changes would affect other branches of charitable work. The hospital (*hospitalium*, *xenodocheion*) is defined as a "house of God in which strangers who lack hospitality are received" (*Suicer: Thesaur.*), a home separated from the church; and round the church, from the primitive *xenodocheion* of early Christian times and the entertainment of strangers at the houses of members of the community, would grow up other similar charities. In A.D. 321 license was given by Constantine to leave property to the Church. The churches were thus placed in the same position as pagan temples, and though subsequently Valentinian (A.D. 379) withdrew the permission on account of the shameless legacy-hunting of the clergy, in that period much must have been done to endow Church and charitable institutions. In the same period grew to its height the passion for monasticism. This affected the parish and the endowed charity alike. Under its influence the deacon as an almoner tends to disappear, except where, as in Rome, there is an elaborate system of relief. Nor does it seem that deaconesses, widows, and virgins continued to occupy their old position as church workers and alms-receivers. Naturally when marriage was considered "in itself an evil, perhaps to be tolerated, but still degrading to human nature," and (A.D. 385) the marriage of the clergy was prohibited, men, except those in charge of parishes, and women would join regular monastic bodies; the deacon, as almoner, would disappear, and the "widows" and virgins would become nuns. Thus there would grow up a large body of men and women living segregated in institutions, and forming a leisured class able to superintend institutional charities. And now two new officers appear, the *eleemosynarius* or almoner and the *œconomus* or steward (already an assistant treasurer to the bishop), who superintend and distribute the alms and manage the property of the institution. (In the first six books of the *Apost. Constit.* A.D. 300 these officers are not mentioned.) In these circumstances the *hospitium* or hospital (*xenon*, *katagogion*) assumes a new character. It becomes in St Basil's hands (A.D. 330-379) a resort not only for those who "visit it from time to time as they pass by, but also for those who need some treatment in illness." And round St Basil at Cæsarea there springs up a colony of institutions. Four kinds principally are mentioned in the Theodosian code: (1) the guest houses (*xenodocheia*); (2) the poor-houses (*ptocheia*), where the poor (*mendici*) were housed and maintained (the *ptocheion* was a general term also applied to all houses for the poor, the aged, orphans, and sick); (3) there were orphanages (*orphanotropheia*) for

orphans and wards; and (4) there were houses for infant children (*brephotropheia*). Thus a large number of endowed charities had grown up. This new movement it is necessary to consider in connexion with the law relating to religious property and bequests, in its bearing on the rule of the monasteries, and in its effect on the family.

The sacred property (*res sacra*) of Roman law consisted of things dedicated to the gods by the pontiff with the authority of the civil authority, in turn, the people, the senate, and the emperor. Things so consecrated were inalienable. Apart from this in the empire, the municipalities as they grew up were considered "juristic persons" who were entitled to receive and hold property. In a similar position were authorized *collegia*, amongst which were the mutual aid societies referred to above. Christians associated in these societies would leave legacies to them. Thus (W. M. Ramsay, *Cities and Bishopries of Phrygia*, I. i. 119), an inscription mentions a bequest (possibly by a Christian) to the council (*synedrion*) of the presidents of the dyers in purple for a ceremonial, on the condition that, if the ceremony be neglected, the legacy shall become the property of the guild for the care of nurslings; and in the same way a bequest is left in Rome (*Orelli*, 4420) for a memorial sacrifice, on the condition that, if it be not performed, double the cost be paid to the treasury of the corn-supply (*fisco stationis annonæ*). No unauthorized *collegia* could receive a legacy. "The law recognized no freedom of association." Nor could any private individual create a foundation with separate property of its own. Property could only be left to an authorized juristic person, being a municipality or a *collegium*. But as the problem of poverty was considered from a broader standpoint, there was a desire to deal with it in a more permanent manner than by the *annona civica*. The *pueri alimentarii* (see above) were considered to hold their property as part of the *fiscus* or property of the state. Pliny (*Ep.* vii. 18), seeking a method of endowment, transferred property in land to the steward of public property, and then took it back again subject to a permanent charge for the aid of children of freemen. By the law of Constantine and subsequent laws no such devices were necessary. Widows or deaconesses, or virgins dedicated to God, or nuns (A.D. 455), could leave bequests to a church or memorial church (*martyrum*), or to a priest or a monk, or to the poor in any shape or form, in writing or without it. Later (A.D. 475) donations of every kind, "to the person of any martyr, or apostle, or prophet, or the holy angels," for building an oratory were made valid, even if the building were promised only and not begun; and the same rule applied to infirmaries (*nosocomia*) and poor-houses (*ptocheia*)—the bishop or steward being competent to appear as plaintiff in such cases. Later, again, (A.D. 528) contributions of 50 solidi (say about £19:10s.) to a church, hostel (*xenodocheion*), &c., were made legal, though not registered; while larger sums, if registered, were also legalized. So (A.D. 529) property might be given for "churches, hostels, poor-houses, infant and orphan homes, and homes for the aged, or any such community" (*consortium*), even though not registered, and such property was free from taxation. The next year (530) it was enacted that prescription even for 100 years did not alienate Church and charitable property. The broadest interpretation was allowed. If by will a share of an estate was left "to Christ our Lord," the church of the city or other locality might receive it as heir; "let these, the law says, belong to the holy churches, so that they may become the alimony of the poor." It was sufficient to leave property to the poor (*Corpus Juris Civilis*, ed. Krueger, 1877, ii. 25). The bequest was legal. It went to the legal representative of the poor—the Church. Charitable property was thus Church property. The word "alms" covered both. It was given to pious uses, and as a kind of public institution "shared that corporate capacity which belonged to all ecclesiastical institutions by virtue of a general rule of law." On a *pia causa* it was not necessary to confer a juristic personality. Other laws preserved or regulated alienation (A.D. 477, A.D. 530), and checked negligence or fraud in management. The clergy had thus become the owners of large properties, with the *coloni* and slaves upon the estates and the allowances of civic corn (*annona civica*); and (A.D. 357) it was stipulated that whatever they acquired by thrift or trading should be used for the service of the poor and needy, though what they acquired from the labour of their slaves in the labour houses (*ergastula*) or inns (*tabernæ*) might be considered a profit of religion (*religionis lucrum*).

Thus grew up the system of endowed charities, which with certain modifications continued throughout the Middle Ages, and, though it assumed different forms in connexion with guilds and municipalities, in England it still retains, partially at least, its relation to the Church. It remained the system of institutional relief parallel to the more personal almsgiving of the parish.

Monasticism, in acting on men of strong character, endowed them with a double strength of will, and to men like St Gregory it seemed to give back with administrative power the relentless firmness of the Roman. In the East it produced the turbulent soldiery of the Church, in the West its missionaries; and each mission-monastery was a centre of relief.

In Benedictine monasteries, on the east side (see Smith's *Dict. Christian Antiq.*) of the quadrangle, separated from the rest of the house (cf. the guest arrangements) were the dormitory and kitchen of the strangers. A *hospitularius* attended to their needs and novices waited on them. Guests who were laymen might stay on, either taking the vow, or working in return for board and lodging. Usually the almonry was at the gate. (Cf. Dugdale, ii. 43, &c.) Also the monasteries were centres of local relief: thus, for instance (cf. Rule; St Dunst. *Cant. Archep.* p. xlii. Dugdale), every day three of those who were continuously fed in the monastery were selected to share the food of the brothers.

But whatever the services monasticism rendered, it can hardly be said to have furthered true charity from the social standpoint, even if we include its institutional work.

The movement was necessarily anti-parochial, and thus out of sympathy with the charities of the parish, where personal relations with the poor at their homes count for most. In later times, not unfrequently, property and tithe which belonged to a parish and supported its church and priest were diverted to a monastery; and the clergy of the church first becoming *canonici*, or bound by rule, and then assuming the collegiate or monastic character, introduced the hybrid system of parochial management by monastic bodies. How far this was beneficial to the parish and the life and charities of the family is very doubtful. The good and evil may be weighed. Monasticism working through St Augustine helped the world to realize the mood of love as the real or eternal life. Of the natural life of the world and its responsibilities, through which that mood would have borne its completest fruit, it took but little heed, except in so far as, by creating a class possessed of leisure, it created able scholars, lawyers, and administrators, and disciplined the will of strong men. It had no power to stay the social evils of the day. Unlike the friars, at their best the monks were a class apart, not a class mixed up with the people. So were their charities. The belief in poverty as a fixed condition—irretrievable and ever to be alleviated without any regard to science or observation, subjected charity to a perpetual stagnation. Charity requires belief in growth, in the sharing of life, in the utility and nobility of what is done here and now for the hereafter of this present world. Monasticism had no thought of this. It was based on a belief in the evil of matter; and from that root could spring no social charity. Economic difficulties also fostered monasticism. Gold was appreciated in value, and necessaries were expensive, and the cost of maintaining a family was great. It was an economy to force a son or a brother into the Church. The population was decreasing; and in spite of Church feeling Marjorian (A.D. 461) had to forbid women from taking the veil before forty, and to require the remarriage of widows, subject to a large forfeit of property (Hodgkin, *Italy and her Invaders*, ii. 420). Monasticism was inconsistent with the social good. As to the family—like the moderns who depreciate thrift and are careless of the life of the family, the monks, believing that marriage was a lower form of morality, if not indeed, as would at times appear, hardly moral at all, could feel hardly any enthusiasm for what is socially the very source of the health of the community and the well-spring of all charitable feeling. By the sacerdotal-monastic movement the moralizing force of Christianity was denaturalized. The falsity of its position revealed itself in unrecognized and degrading relations between men and women. But, worse than all, it pushed charity from its pivot. For this no monasteries or institutions, no domination of religious belief, could atone. The Church that had fostered chastity and marriage was betraying its trust. It was out of touch with the primal unit of social life, the child-school of dawning habits and the loving economy of the home. It produced no treatise on economy in the older Greek sense of the word. The home was nothing to it; and the popular worship of the family, the Holy Family, marks the reaction, expressing itself in the only way through which it could find an effective and untrammelled outlet, in a popular cult, which was, strictly speaking, inconsistent with the later tenets of the religion with which it could not but remain associated.

We may ask, then, What were the results of charity at the close of the period which ends with St Gregory and the

founding of the mediæval Church?—for if the charity is reflected in the social good, the results should be manifest. Economic and social conditions were adverse. With lessened trade the middle class was decaying (Dill, *Roman Society in the Last Century of the Western Empire*, p. 204) and a selfish aristocracy rising up. Municipal responsibility had been taxed to extinction. The public service was corrupt. The rich evaded taxation, the poor were oppressed by it. There were laws upon laws, endeavours to underpin the framework of a decaying society. Society was bankrupt of skill—and the skill of a generation has a close bearing on its charitable administration. While hospitals increased medicine was unprogressive. There were miserable years of famine and pestilence, and constant wars. The care of the poorer classes, and ultimately of the people, was the charge of the Church. The Church strengthened the feeling of kindness for those in want, widows, orphans, and the sick. It lessened the degradation of the "actresses," and, co-operating with Stoic opinion, abolished the slaughter of the gladiatorial shows. It created a popular "dogmatic system and moral discipline," which paganism failed to do; but it was unable to draw a new strength out of the patriotism of the Roman. It produced no prophet of charity, such as enlarged the moral imagination of the Jews. It ransomed slaves, as did paganism also, but it did not abolish slavery. Large economic causes produced one great reform. The serf attached to the soil took the place of the slave. The almsgiving of the Church by degrees took the place of *annona* and *sportula*, and it may have created pauperism. But dependence on almsgiving was at least an advance on dependence founded on a civic and hereditary right to relief. As the *colonus* stood higher than the slave, so did the pauper, socially at any rate, free to support himself, exceed the *colonus*. Bad economic conditions and traditions, and a bad system of almsgiving, might enthral him. But the way, at least, was open; and thus it became possible that charity, working in alliance with good economic traditions, should in the end accomplish the self-support of society, the independence of the whole people.

Part V.—Mediæval Charity and its Development.

It remains to trace the history of thought and administration in relation to (1) the development of charitable responsibility in the parish, and the use of tithe and Church property for poor relief; and (2) the revision of the theory of charity, with which are associated the names of St Augustine (354-430), St Benedict (480-542), St Bernard (1091-1153), St Francis (1182-1226), and St Thomas Aquinas (1225-1274). (3) There follows, in reference chiefly to England, a sketch of the dependence of the poor under feudalism, the charities of the parish, the monastery, and the hospital—the mediæval system of endowed charity; the rise of guild and municipal charities; the decadence at the close of the 15th century, and the statutory endeavours to cope with economic difficulties which, in the 16th century, led to the establishment of statutory serfdom and the poor-laws. New elements affect the problem of charity in the 17th and 18th centuries; but it is not too much to say that almost all these headings represent phases of thought or institutions which in later forms are interwoven with the charitable thought and endeavours of the present day.

The parish and charitable relief.

Naturally, two methods of relief have usually been prominent: relief administered locally, chiefly to residents in their own homes, and relief administered in an institution. At the time of Charlemagne (742-814) the system of relief was parochial, consisting principally of assistance at the home. After that time, except probably in England, the institutional method appears to have predominated, and the monastery or hospital in one form or another gradually encroached on the parish.

The system of parochial charity was the outcome, apparently, of three conditions: the position and influence of the bishop, the eleemosynary nature of the church funds, and the need of some responsible organization of relief. It resulted in what might almost be called an ecclesiastical poor-law. The affairs of a local church or congregation were superintended by a bishop. To deal with outlying districts he detached priests for religious work and, as in Rome and (774) Strasburg, deacons also for the administration of relief. Originally all the income of the church or congregation was paid into one fund only, of which the bishop had charge, and this fund was available primarily for charitable purposes. Church property was the patrimony of the poor. In the 4th century (IV. Council of Carthage, 398) the names of the clergy were entered on a list (*matricula* or *canon*), as were also the names of the poor, and both received from the church their daily portion (cf. Ratzinger, *Geschichte der Kirchlichen Armenpflege*, p. 117). There were no expenses for building. Before the reign of Constantine (306) very few churches were built (Ratzinger, p. 120). Thus the early Church, as has been said, was chiefly a charitable society. By degrees the property of the Church was very largely increased by gifts and bequests, and in the West before St Gregory's time the division of it for four separate purposes—the support of the bishop, of the clergy, and of the poor, and for church buildings—still further promoted decentralization. Apart from any special gifts, there was thus created a separate fund for almsgiving, supervised by the bishop, consisting of a fourth of the church property, the oblations (mostly used for the poor), and the tithe, which at first was used for the poor solely. The cathedral city, or *civitas*, became the parish of the mother church—the bishop's parish; and there he attended to the poor personally. Around grew up neighbour parishes, of which the bishop had the supervision, and which were at first, or in some measure, supported from his funds, but which acquired by degrees tithe and property of their own. These parishes were endowed by Charlemagne. The priests were required to relieve the poor; and their "manses" were, as the word shows, halting-places where they had to provide food and lodging for strangers. The method was indeed elaborated and became, like the Jewish, that contradiction in terms—a compulsory system of charitable relief. The payment of tithe was enforced by Charlemagne, and it became a legal due (Counc. Francfort. 794; Arelat. 794). On the other hand, on the cathedral city (*civitas*) and the neighbouring priests (*vicani presbyteri*) was placed the obligation of relieving their own poor, so that they should not stray into other cities (II. Counc. Tours, 567). At the same time two other conditions were enforced. Each person (*unusquisque fidelium nostrorum* or *omnes cives*) was to keep his own family, *i.e.*, all dependent on him—all, that is, upon his freehold estate (*allodium*); and all beggars were to be set to work. No one was to presume to give them relief (Charlem. *Capit.* v. 10). Thus we find here the germ of a poor-law system. As in the times of the *annona civica*, slavery, feudalism, or statutory serfdom, the burthen of the maintenance of the poor fell only in part on charity. Only those who could not be maintained as members of some "family" were properly entitled to relief—and in these circumstances the officially recognized clients of the Church consisted of the gradually decreasing number of free poor and those who were tenants of Church lands.

Since 817 there has been no universally binding decision of the Church respecting the care of the poor (Ratzinger, p. 236). So long ago did laicization commence in charity. In the wars and confusion of the 9th and 10th centuries the poorer freemen lapsed still further into slavery, or became *coloni* or bond servants; and later they passed under the feudal rule. Thus the Church's duty to relieve them became the masters' obligation to maintain them. Simultaneously the activity of the clergy, regular and secular alike, dwindled. They were exhorted to increase their alms. The revenues and property of "the poor" were largely turned to private or partly ecclesiastical purposes, or secularized. Legacies went wholly to the clergy, but only the tithe of the produce of their own lands was used for relief; and of the general tithe, only a third or fourth part was so applied. Eventually to a large extent, but more elsewhere than in England (Ratzinger, pp. 246, 269) the tithe itself was appropriated by nobles or even by the monasteries; and thus during and after the 10th century a new organization of charity was created on non-parochial methods of relief. Alms, with prayer and fasting, had always been connected with penance. But the character of the penitential system had altered. By the 7th century private penance had superseded the public and congregational penance of the earlier Church (*Dict. Christian Antiquities*, art. Penitence). To the penalties of exclusion from the sacraments or from the services of the Church or from its communion was coupled, with other penitential discipline, an elaborate

penitential system, in which about the 7th century the redemption of sin by the "sacrifice" of property, payments of money fines, &c., was introduced. (Cf. for instance Conc. Elberti:—Labbeus, i. 969 (A.D. 305), with Conc. Berghamstedense, Wilkins, Conc. p. 60 (A.D. 696), and the Penitential (p. 115) and Canons (A.D. 960), p. 236.) The same sin committed by an overseer (*praepositus paganus*) was compensated by a fine of 100 *solidi*; in the case of a *colonus* by a fine of 50. So amongst the ways of penitence were entered in the above-mentioned Canons, to erect a church, and if means allowed, add to it land . . . to repair the public roads . . . "to distribute," to help poor widows, orphans, and strangers, redeem slaves, fast, &c.—a combination of "good deeds" which suggests a line of thought such as ultimately found expression in the definition of charities in the Charities Act of Queen Elizabeth. The confessor, too, was "spiritualis medicus," and much that from the point of view of counsel would now be the work of charity would in his hands be dealt with in that capacity. For lesser sins (cf. Bede (673-735), *Hom.* 34, quoted by Ratzinger) the penalty was prayer, fasting, and alms; for the greater sins—murder, adultery, and idolatry—to give up all. Thus while half-converted barbarians may have been kept in moral subjection by material penances, the Church was enriched by their gifts; and these tended to support the monastic and institutional methods which were in favour, and to which, on the revival of religious earnestness in the 11th century, the world looked for the reform of social life.

To understand mediæval charity it is necessary to return to St Augustine. According to him, the motive of man in his legitimate effort to assert himself in life was love or desire (*amor* or *cupido*). "All impulses were only evolutions of this typical characteristic" (Harnack, *History of Dogma* (trans.), v. iii.); and this was so alike in the spiritual and the sensuous life. Happiness thus depended on desire; and desire in turn depended on the regulation of the will; but the will was regulated only by grace. God was the *spiritualis substantia*; and freedom was the identity of the will with the omnipotent unchanging nature. This highest Being was "holiness working on the will in the form of omnipotent love." This love was grace—"grace imparting itself in love." Love (*caritas*—charity) is identified with justice; and the will, the goodwill, is love. The identity of the will with the will of God was attained by communion with Him. The after-life consummated by sight this communion, which was here reached only by faith. Such a method of thought was entirely introspective, and it turned the mind "wholly to hope, asceticism, and the contemplation of God in worship." "Where St Augustine indulges in the exposition of practical piety he has no theory at all of Christ's work." To charity on that side he added nothing. In the 11th century there was a revival of piety, which had amongst its objects the restoration of discipline in the monasteries and a monastic training for the secular clergy. To this Augustinian thought led the way. "Christianity was asceticism and the city of God" (Harnack vi. 6). A new religious feeling took possession of the general mind, a regard and adoration of the actual, the historic Christ. Of this St Bernard was the expositor. "Beside the sacramental Christ the image of the historical took its place,—majesty in humility, innocence in penal suffering, life in death." The spiritual and the sensuous were intermingled. Dogmatic formulæ fell into the background. The picture of the historic Christ led to the realization of the Christ according to the spirit (*kata pneuma*). Thus St Bernard carried forward Augustinian thought; and the historic Christ became the "sinless man, approved by suffering, to whom the divine grace, by which He lives, has lent such power that His image takes shape in other men and incites them to corresponding humility and love."

Mediæval revision of the theory of charity.

Humility and poverty represented the conditions under which alone this spirit could be realized; and the poverty must be spiritual, and therefore self-imposed ("wilful," as it was afterwards called). This led to practical results. Poverty was not a social state, but a spiritual; and consequently the poor generally were not the *pauperes Christi*, but those who, like the monks, had taken vows of poverty. From these premisses followed later the doctrine that gifts to the Church were not gifts to the poor, as once they had been, but to the religious bodies. The Church was not the Church of the poor, but of the poor in spirit. But the immediate effect was the belief for a time, apparently almost universal, that the salvation of society would come from the monastic orders. By their aid, backed by the general opinion, the secular clergy were brought back to celibacy and the monasteries newly disciplined. But charity could not thus regain its touch of life and be a means of raising the standard of social duty.

Next, one amongst many stirred by a kindred inspiration, St Francis turned back to actual life and gave a new reality to religious idealism. For him the poor were once again the *pauperes Christi*. To follow Christ was to adopt the life of "evangelical poverty," and this was to live among the poor the life of a poor man. The follower was to work with his hands (as the poor clergy of the early Church had done and the clergy of the early English Church were exhorted to do); he was to receive no money; he was to earn the actual necessaries of life, though what he could not earn he might beg. To ask for this was a right, so long as he was bringing a better life into the world. All in excess of this he gave to the poor. He would possess no property, buildings, or endowments, nor was his order to do so. The fulness of his life was in the complete realization of it now, without the cares of property and without any fear of the future. Having a definite aim and mission, he was ready to accept the want that might come upon him, and his life was a discipline to enable him to suffer it if it came. To him humility was the soul making itself fit to love; and poverty was humility expanded from a mood to a life, a life not guarded by seclusion, but spent amongst those who were actually poor. The object of life was to console the poor—those outside all monasteries and institutions—the poor as they lived and worked. The movement was practically a lay movement, and its force consisted in its simplicity and directness. Book learning was disparaged: life was to be the teacher. The brothers thus became observant and practical, and afterwards indeed learned, and their learning had the same characteristics. Their power lay in their practical sagacity, in their treatment of life, outside the cloister and the hospital, at first hand. They knew the people because they settled amongst them, living just as they did. This was their method of charity.

The inspiration that drew St Francis to this method was the contemplation of the life of Christ. But it was more than this. The Christ was to him, as to St Bernard, an ideal, whose nature passed into that of the contemplating and adoring beholder, so that, as he said, "having lost its individuality, of itself the creature could no longer act." He had no impulse but the Christ impulse. He was changed. His identity was merged in that of Christ. And with this came the conception of a gracious and finely ordered charity, moving like the natural world in a constant harmonious development towards a definite end. The mysticism was intense, but it was practical because it was intense. In that lay the strength of the movement of the true Franciscans, and in those orders that, whether called heretical or not, followed them—Lollards and others. Religion thus became a personal and original possession. It became individual. It was inspired by a social endeavour, and for the world at large it made of charity a new thing.

St Thomas Aquinas took up St Bernard's position. Renunciation of property, voluntary poverty, was in his view

also a necessary means of reaching the perfect life; and the feeling that was akin to this renunciation and prompted it was charity. "All perfection of the Christian life was to be attained according to charity," and charity united us to God.

In the system elaborated by St Thomas Aquinas two lines of thought are wrought into a kind of harmony. The one stands for Aristotle and nature, the other for Christian tradition and theology. We have thus a duplicate theory of thought and action throughout both rational and theologic virtues, and a duplicate beatitude or state of happiness correspondent to each. On the one hand it is argued that the good act is an act which, in relation to its object, wholly serves its purpose; and thus the measure of goodness (*Prima Secundæ Summæ Theolog.* Q. xviii. 2) is the proportion between action and effect. On the other hand, the act has to satisfy the twofold law, human reason and eternal reason. From the point of view of the former the cardinal factor is desire, which, made proportionate to an end, is love (*amor*); and, seeking the good of others, it loses its quality of concupiscence and becomes friendly love (*amor amicitiæ*). But this rational love (*amor*) and charity (*caritas*), the theologic virtue, may meet. All virtue or goodness is a degree of love (*amor*), if by virtue we mean the cardinal virtues and refer to the rule of reason only. But there are also theologic virtues, which are on one side "essential," on the other side participative. As wood ignited participates in the natural fire, so does the individual in these virtues (II. II.^{æ} lxii. 1). Charity is a kind of friendship towards God. It is received *per infusionem spiritus sancti*, and is the chief and root of the theologic virtues of faith and hope, and on it the rational virtues depend. They are not degrees of charity as they are of (*amor*) love, but charity gives purpose, order, and quality to them all. In this sense the word is applied to the rational virtues—as, for instance, beneficence. The counterpart of charity in social life is pity (*misericordia*), the compassion that moves us to supply another's want (*summa religionis Christianæ in misericordia consistit quantum ad exteriora opera*). It is, however, an emotion, not a virtue, and must be regulated like any other emotion (. . . *passio est et non virtus. Hic autem motus potest esse secundum rationem regulatus*, II. II.^{æ} xxx. 3). Thus we pass to alms, which are the instrument of pity—an act of charity done through the intervention of pity. The act is not done in order to purchase spiritual good by a corporal means, but to merit a spiritual good (*per effectum caritatis*) through being in a state of charity; and from that point of view its effect is tested by the recipient being moved to pray for his benefactor. The claim of others on our beneficence is relative, according to consanguinity and other bonds (II. II.^{æ} xxxi. 3), subject to the condition that the common good of many is a holier obligation (*divinius*) than that of one. Obedience and obligation to parents may be crossed by other obligations, as, for instance, duty to the Church. To give alms is a command. Alms should consist of the superfluous—that is, of all that the individual possesses after he has reserved what is necessary. What is necessary the donor should fix in due relation to the claims of his family and dependants, his position in life (*dignitas*), and the sustenance of his body. On the other hand, his gift should meet the actual necessities of the recipient and no more. More than this will lead to excess on the recipient's part (*ut inde luxurietur*) or to want of spirit and apathy (*ut aliis remissio et refrigerium sit*), though allowance must be made for different requirements in different conditions of life. It were better to distribute alms to many persons than to give more than is necessary to one. In individual cases there remains the further question of correction—the removing of some evil or sin from another; and this, too, is an act of charity.

It will be seen that though St Thomas bases his argument on a duplicate theory of thought, action, and happiness, part natural, part theologic, and states fully the conditions of good action, he does not bring the two into unison. Logically the argument should follow that alms that fail in social benefit (produce *remissionem et refrigerium*, for instance) fail also in spiritual good, for the two cannot be inconsistent. But in regard to the former he does not press the importance of purpose, and, in spite of his Aristotle, he misses the point on which Aristotle, as a close observer of social conditions, insists, that gifts without purpose and reciprocity foster the dependence they are designed to meet. The proverb of the "pierced cask" is as applicable to ecclesiastical as to political almsgiving, as has often been proved by the event. The distribution of all "superfluous" income in the form of alms would have the effect of a huge endowment, and would stereotype "the poor" as a permanent and unprogressive class. The proposal suggests that St Thomas contemplated the adoption of a method of relief which would be like a voluntary poor-law; and it is noteworthy that his phrase "necessary relief" forms the defining words of the Elizabethan poor-law, while he also lays stress on the importance of "correction," which, on the decline and disappearance of the penitential system, assumed at the Reformation a prominent position in administration in relation not only to "sin," but also to offences against society, such as idleness, &c.

On this foundation was built up a classification of acts of charity, which St Thomas quotes—the seven spiritual acts (*consule, carpe, doce, solare, remitte, fer, ora*), counsel, sustain, teach, console, save, pardon, pray; and the seven corporal (*vestio, poto, cibo, redimo, tego, colligo, condo*), I clothe, I give drink to, I feed, I free from prison, I shelter, I assist in sickness, I bury (II. II.^{æ} xxxii. 2). These in subsequent thought became "good works," and availed for the after-life, bringing with them definite boons. Thus charity was linked to the system of indulgences. The bias of the act of charity is made to favour the actor. Primarily the benefit reverts to him. He becomes conscious of an ultimate reward accruing to himself. The simplicity of the deed, the spontaneity from which, as in a well-practised art, its freshness springs and its good effects result, is falsified at the outset. The thought that should be wholly concerned in the fulfilment of a definite purpose is diverted from it. The deed itself, apart from the outcome of the deed, is highly considered. An extreme inducement is placed on giving, counselling, and the like, but none on the personal or social utility of the gift or counsel. Yet the value of these lies in their end. No policy or science of charity can grow out of such a system. It can produce innumerable isolated acts, which may or may not be beneficent, but it cannot enkindle the "ordered charity." This charity is, strictly speaking, by its very nature alike intellectual and emotional. Otherwise it would inevitably fail of its purpose, for though emotion might stimulate it, intelligence would not guide it.

There are, then, these three lines of thought. That of St Bernard, who invigorated the monastic movement, and helped to make the monastery or hospital the centre of charitable relief. That of St Francis, who, passing by regular and secular clergy alike, revived and reinvigorated the conception of charity and gave it once more the reality of a social force, knowing that it would find a freer scope and larger usefulness in the life of the people than in the religious aristocracy of monasteries. And that of St Thomas Aquinas, who, analysing the problem of charity and almsgiving, and associating it with definite groups of works, led to its taking, in the common thought, certain stereotyped forms, so that its social aim and purpose were ignored and its power for good was neutralized.

We have now to turn to the conditions of social life in which these thoughts fermented and took practical shape.

Charity and social conditions in England.

The population of England from the Conquest to the 14th century is estimated at between 1½ and 2½ millions. London, it is believed, had a population of about 40,000. Other towns were small. Two or three of the larger had 4000 or 5000 inhabitants. The only substantial building in a village, apart perhaps from the manor-house, was the church, used for many secular as well as religious purposes. In the towns the mud or wood-paved huts sheltered a people who, accepting a common poverty, traded in little more than the necessaries of life (Green, *Town Life in the 15th Century*, i. 13). The population was stationary. Famine and pestilence were of frequent occurrence (Creighton, *Epidemics in Britain*, p. 19), and for the careless there was waste at harvest time and want in winter. Hunger was the drill-sergeant of society. Owing to the hardship and penury of life infant mortality was probably very great. The 15th century was, however, "the golden age of the labourer." Our problem is to ascertain what was the service of charity to this people

till the end of that century. In order to estimate this we have to apply tests similar to those we applied before to Greece and Rome and the pre-mediæval Church.

The Family.—Largely Germanic in its origin, we may perhaps set down as elemental in the English race what Tacitus said of the Germans. They had the home virtues. They had a high regard for chastity, and respected and enforced the family tie. The wife was honoured. The men were poor, but when the actual pressure of their work—fighting—was removed, idle. They were born gamblers. Much toil fell upon the wife; but slavery was rather a form of tenure than a Roman bondage. As elsewhere, there was in England "the joint family or household" (Pollock and Maitland, *English Law before Edward I.* i. 31). Each member of the community was, or should be, under some lord; for the lordless man was, like the wanderer in Homer, who belonged to no phratry, suspected and dangerous, and his kinsfolk might be required to find a lord for him. There was personal servitude, but it was not of one complexion; there were grades amongst the unfree, and the general advance to freedom was continuous. By the 9th century the larger amount of the slavery was bondage by tenure. In the reign of Edward I., though "the larger half of the rural population was unfree," yet the serf, notwithstanding the fact that he was his lord's chattel, was free against all save his lord. A century later (1381) villanage—that is payment for tenancy by service, instead of by quit-rent—was practically extinguished. So steady was the progress towards the freedom and self-maintenance of the individual and his family.

The Manor.—In social importance, next to the family, comes the manor, the organization of which affected charity greatly on one side. It was "an economic unit," the estate of a lord, on which there were associated the lord with his demesne, tenants free of service, and villans and others, tenants by service. All had the use of land, even the serf. The estate was regulated by a manor court, consisting of the lord of the manor or his representative, and the free tenants, and entrusted with wide quasi-domestic jurisdiction. The value of the estate depended on the labour available for its cultivation, and the cultivators were the unfree tenants. Hence the lord, through the manor-court, required an indemnity or fine if a child, for instance, left the manor; and similarly, if a villan died, his widow might have to remarry or pay a fine. Thus the lord reacquired a servant and the widow and her family were maintained. The courts, too, fixed prices, and thus in local and limited conditions of supply and demand were able to equalize them in a measure and neutralize some of the effects of scarcity. In this way, till the reign of Edward I., and, where the manor courts remained active, till much later, a self-supporting social organization made any systematic public or charitable relief unnecessary.

The Parish and the Tithe.—The conversion of England in the 7th century was effected by bishops, accompanied by itinerant priests, who made use of conventual houses as the centres of their work. The parochial system was not firmly established till the 10th century (970). Then, by a law of Edgar, a man who had a church on his own land was allowed to pay a third of his tithe to his own church, instead of giving the whole of it to the minster or conventual church. Theodore, archbishop of Canterbury (667), had introduced the Carlovingian system into England; and, accordingly, the parish priest was required to provide for strangers and to keep a room in his house for them. Of the tithe, a third and not a fourth was to go to the poor with any surplus; and in order to have larger means of helping them, the priests were urged to work themselves, according to the ancient canons of the Church (cf. Labbeus, IV. Conc. Carthag. A.D. 398). The importance of the tithe to the poor is shown by Acts of Richard II. and Henry IV., by which it was enacted that, if parochial tithes were appropriated to a monastery, a portion of them should be assigned to the poor of the parish. At a very early date (1287) the parish became the area for a quasi-compulsory rate (Pollock and Maitland, p. 614), though in the 14th and 15th centuries a church rate was seldom made. Collections were made by paid collectors, especially for Hoke money—money gathered for church purposes (Brand's *Antiquities*, p. 112). There were also from endowments parish doles, very many of which must have disappeared in the break-up of the 16th century. All the greater festivals were days of feasting and the distribution of food; at funerals also there were often large distributions, and also at marriages. The faithful generally, subject to penance, were required to relieve the poor and the stranger. In the larger part of England the parish and the vill were usually coterminous. In the north a parish contained several vills. There were thus side by side the charitable relief system of the parish, which at an early date became a rating area, and the self-supporting system of the manor.

The Monasteries.—As Christianity spread monasteries spread, and each monastery was a centre of relief. Sometimes they were established, like St Albans (796), for a hundred Benedictine monks and for the entertainment of strangers; or sometimes without any such special purpose, like the abbey of Croyland (reorganized 946), which, becoming exceeding rich from its *diversorium pauperum*, or almonry, "relieved the whole country round so that prodigious numbers resorted to it." But documents seem to prove (Denton, *England in Fifteenth Century*, p. 245) that the relief generally given by monasteries was much less than is usually supposed. Often they distributed relief at the homes of the poor, provided accommodation for the sick, and established hospitals, which served also as schools for the gentry and for the poor; and they were pioneers of agriculture. In the 12th century, in which many monastic orders were constituted, there were many lavish endowments. In the 14th century their usefulness had begun to wane. At the end of that century the larger estates were generally held in entail, with the result that younger sons were put into religious houses. This worldliness had its natural consequences. In the 15th century, owing to mismanagement, waste, and subsequently to the decline of rural prosperity, their resources were greatly crippled. In their relation to charity one or two points may be noted: (1) Of the small population of England the professed monks and nuns with the parish priests (Rogers, *Hist. Agric. and Prices*, i. 58) numbered at least 30,000 or 40,000. This number of celibates was a standing protest against the moral sufficiency of the family life. On the other hand, amongst them were the brothers and sisters who visited the poor and nursed the sick in hospitals; and many who now succumb physically or mentally to the pressure of life, and are cared for in institutions, may then have found maintenance and a retreat in the monasteries. (2) Bound together by no common controlling organization, the monasteries were but so many miscellaneous centres of relief, chiefly casual relief. They were mostly "magnificent hostelries." (3) They stood outside the parish, and they weakened its organization and hampered its development.

The Hospitals.—The revival of piety in the 11th century led to a large increase in the number of hospitals and hospital orders. To show how far they covered the field in England two instances may be quoted. At Canterbury (Creighton, p. 87) there were four for different purposes, two endowed by Lanfranc (1084), one for poor, infirm, lame, and blind men and women, and one outside the town for lepers. These hospitals were put under the charge of a priory, and endowed out of tithes payable to the secular clergy. Later (Henry II.) a hospital for leprous sisters was established, and afterwards a hospital for leprous monks and poor relations of the monks of St Augustine's. In a less populous parish, Luton (Cobbe, *Luton Church*), there were a hospital for the poor, an almshouse, and two hospitals, one for the sick and one for the leprous. The word "leper," it is evident, was used very loosely, and was applied to many diseases other than leprosy. There were hospitals for the infirm and the leprous; the disease was not considered contagious. The hospital in its modern sense was but slowly created. Thus St Bartholomew's in London was founded (1123) for a master, brethren, and sisters, and for the entertainment of poor diseased persons till they got well; of distressed women big with child till they were able to go abroad; and for the maintenance, until the age of seven, of all such children whose mothers died in the house. St Thomas's (rebuilt 1228) had a master and brethren, and three lay sisters, and 40 beds for poor, infirm, and impotent people, who had also victual and firing. There were hospitals for many special purposes—as for the blind, for instance. There were also many hospital orders in England and on the Continent. They sprang up beside the monastic orders, and for a time were very popular: brothers and sisters of the Holy Ghost (1198), sisters of St Elizabeth (1207-1231), Beguins and Beghards (about 1175), knights of St John, and others.

The Mendicant Orders.—The Franciscans tended the sick and poor in the slums of the towns with great devotion—indeed, the whole movement tells of a splendid self-abandonment and an intensity of effort in the early spring of its enthusiasm—and with the aid of reform councils and reformations it lengthened out its usefulness for two centuries.

Mediæval endowed charities.

As in the pre-mediæval Church, the system of relief is that of charitable endowments—a marked contrast to the modern method of voluntary associations or rate-supported institutions.

(1) *The Church as Legatee.*—The church building among the Teutonic races was not held by the bishop as part of what was originally the charitable property of the Church. It was assigned to the patron saint of the church by the donor, who retained the right of administration, of which his own patronage or right of presentation is a relic. Subsequently, with the study of Roman law, the conception of the Church as a *persona ficta* prevailed; and till the larger growth of the guilds and corporations

it was the only general legatee for charitable gifts. As these arise a large number of charitable trusts are created and held by lay corporations; and "alms" include gifts for social as well as religious or eleemosynary purposes. (2) *Freedom from Taxation and Service.*—Gifts to the Church for charitable or other purposes were made in free, pure, and perpetual alms ("ad tenendum in puram et perpetuam eleemosynam sine omni temporali servicio et consuetudine"). Land held under this *frankalmoigne* was given "in perpetual alms," therefore the donor could not retract it; in free alms, therefore he could exact no services in regard to it; and in pure alms as being free from secular jurisdiction (cf. Pollock and Maitland). (3) *Alienation and Mortmain.*—To prevent alienation of property to religious houses, with the consequent loss of service to the superior or chief lords, a license from the chief lord was required to legalize the alienation (Magna Carta, and Edw. I., *De viris religiosis*). Other statutes (Edw. I. and Rich. II.) enacted that this license should be issued out of Chancery after investigation; and the principle was applied to civil corporations. The necessity of this license was one lay check on injurious alienation. (4) *Irresponsible Administration.*—Until after the 13th century, when the lay courts had asserted their right to settle disputes as to lands held in alms, the administration of charity was from the lay point of view entirely irresponsible. It was outside the secular jurisdiction; and civilly the professed clergy, who were the administrators, were "dead." They could not sue or be sued except through their sovereign—their chief, the abbot. They formed a large body of non-civic inhabitants free from the pressure and the responsibilities of civil life. (5) *Control.*—Apart from the control of the abbot, friar, master, or other head, the bishop was visitor, or, as we should say, inspector; and abuses might be remedied by the visit of the bishop or his ordinary. The bishop's ordinary (2 Henry V. i. 1) was the recognized visitor of all hospitals apart from the founder. The founder and his family retained a right of intervention. Sometimes thus an institution was reorganized, or even dissolved, the property reverting to the founder (Dugdale, *Monasticon Anglicanum*, vi. 2. 715). (6) *Cy-près.*—Charities were, especially after Henry V.'s reign, appropriated to other uses, either because their original purpose failed or because some new object had become important. Thus, for instance, a college or hospital for lepers (1363) is re-established by the founder's family with a master and priest, *quod nulli leprosi reperiebantur;* and a similar hospital founded in Henry I.'s time near Oxford has decayed, and is given by Edward III. to Oriel College, Oxford, to maintain a chaplain and poor brethren. Thus, apart from alienation pure and simple, the principle of adaptation to new uses was put in force at an early date, and supplied many precedents to Wolsey, Edward VI., and the post-Reformation bishops. The system of endowments was indeed far more adaptable than it would at first sight seem to have been. (7) *The Sources of Income.*—The hospitals were chiefly supported by rents or the produce of land; or, if attached to monasteries, out of the tithe of their monastic lands or other sources of revenue, or out of the appropriated tithes of the secular clergy; or they might be in part maintained by collections made, for instance, by a commissioner duly authorized by a formal attested document, in which were recounted the indulgences by popes, archbishops, and bishops to those who become its benefactors (Cobbe, p. 75); or, in the case of leper hospitals, by a leper with a "clapdish," who begged in the markets; or by a proctor, in the case of more important institutions in towns, who "came with his box one day in every month to the churches and other religious houses, at times of service, and there received the voluntary gifts of the congregation"; or they might receive inmates on payment, and thus apparently a frequent abuse, decayed servants of the court and others, were "farmed out." (8) *Mode of Admission.*—The admission was usually, no doubt, regulated by the prior or master. At York, at the hospital of St Nicholas for the leprous, the conditions of admission were: promise or vow of continence, participation in prayer, the abandonment of all business, the inmate's property at death to go to the house. This may serve as an example. The master was usually one of the regular clergy. (9) *Decline of the Hospitals.*—It is said that, in addition to 645 monasteries and 90 "colleges" and many chantries, Henry VIII. suppressed 110 hospitals (Speed's *Chronicle*, p. 778). The numbers seem small. In the economic decline at the end of the 15th and beginning of the 16th centuries many hospitals may have lapsed.

The guild charities.

In the 15th century the towns grew in importance. First the wool trade and then the cloth trade flourished, and the English developed a large shipping trade. The towns grew up like "little principalities"; and for the advancement of trade, guilds, consisting alike of masters and workmen, were formed, which endeavoured to regulate and then to monopolize the market. By degrees the corporations of the towns were worked in their interests, and the whole commercial system became restrictive and inadaptable. Meanwhile the towns attracted newcomers; freedom from feudal obligations was gained with comparative ease; and a new *plebs* was congregating, a population of inhabitants not qualified as burghers or guild members, women, sons living with their fathers, menial servants, and apprentices. There was thus an increasing restriction imposed on trade, coupled with a growing *plebs*. Naturally, then, lay charities sprang up for members of guilds, and for burghers and for the commonalty. Men left estates to their guilds to maintain decayed members, to educate their children, portion their daughters, and assist their widows. The middle-class trader was thus in great measure insured against the risks of life; and so large a stake did these guilds hold in the country that it has been argued (Rogers, iv. 5) that if they had been preserved instead of abolished in Edward VI.'s reign the enactment of Queen Elizabeth's poor-law might have been unnecessary. They were one sign of the new temper and wants of burghers freed from feudalism. Another sign was a new standard of manners. Rules and saws, Hesiodic in their tone, became popular,—in regard, for instance, to such a question as "how to enable a man to live on his means, and to keep himself and those belonging to him." The boroughs established other charities also, hospitals and almshouses for the people, a movement which, like the guilds, began very early—in Italy as early as the 9th century. They sometimes gave outdoor relief also to registered poor (Green, i. 41), and they had in large towns courts of orphans presided over by the mayor and aldermen, thus taking over a duty that previously had been one of conspicuous importance in the Church. As early as 1257 in Westphalian towns there was a rough-and-ready system of Easter relief of the poor; and in Frankfort in 1437 there was a town council of almoners with a systematic programme of relief (Ratzinger, p. 352). Thus at the close of the Middle Ages the towns were gradually assuming what had been charitable functions of the Church.

Statutory serfdom.

While a new freedom was being attained by the labourer in the country and the burgher in the town, the difficulty of obtaining a sufficient supply of labour for agriculture must have been constant, especially at every visitation of plague and famine. The state accordingly stepped in as arbiter and organizer. By Statutes of Labourers beginning in 1351 it aimed at enforcing a settled wage and restraining migration. From 1388 it endeavoured to suppress mendicity, and in part to systematize it in the interest of infirm and aged mendicants. Each series of enactments is the natural complement of the other. In the main their signification, from the point of view of charity, lies in the fact that they represent a persistent endeavour to prevent social unsettlement, and in part the distress which unsettlement causes, and which vagrancy in some measure indicates, by keeping the people within the ranks of recognized dependence, or forcing them back into it by fear of the gaol or the stocks. The extreme point of this policy was reached when by the laws of Edward VI. and Elizabeth, possibly founded on Byzantine edicts, the despairing legislator offered to give the mendicant as a slave or bondman for a period to any one who would take him. On the other hand, it was desired that relief should be a means of preventing migration. In any time of general pressure there is a desire to organize mendicity, to prevent the wandering of beggars, to create a kind of settled poor, distinguished from the rest as infirm and not able-bodied, and to keep these at least at home sufficiently supported by local and parochial relief; and this, in its simpler form all the world over, has in the past been by response to public begging. The argument may be summed up thus: We cannot have begging, which implies that the beggar is cared for by no one, belongs to no one, and therefore throws himself on the world at large. Therefore, if he is able-bodied he must be punished as unsocial, for it is his fault that he belongs to no one; or we must make him some one's dependant, and so keep him; or if he is infirm, and therefore of no service to any one—if no one will keep him—we must organize his mendicity, for such mendicity is justified. If he cannot dig for the man to whom he does or should belong, he must beg. Then out of the failure to organize mendicity—for relief of itself is no remedy, least of all casual relief—a poor-law springs up, which, after-

wards associated with the provision of employment, will, it is hoped, make relief in some measure remedial by increasing its quantity by means of compulsory levies. This argument, which combined statutory serfdom and statutory poor relief, seems to have been firmly bedded in the English legislative mind for more than two centuries, from 1381 till after 1600; and until 1834 these two series of laws effectually reduced the English labourer to a new serfdom. To people imbued with ideas of feudalism the way of escape from villanage seemed to be not independence, but a new reversion to it.

The decadence.

Many elements produced the social and economic catastrophe of the 16th century, for the condition into which the country fell can hardly be considered less than a catastrophe. With the growing independence of the people there was created after the 13th century an unsettled "masterless" class, a residue of failure resulting from social changes, which was large and important enough to call for legislation. In the 15th century, "the golden age of the English labourer," the towns increased and flourished. Both town and country did well. At the end of the century came the decadence. The measure of the strain, when perhaps it had reached its lowest level, is indicated by the following comparison: "The cost of a peasant's family of four in the early part of the 14th century was £3, 4s. 9d.; after 1540 it was £8" (Rogers, iv. 756).

The cause of this has now been fairly investigated. The value of land in the 13th century generally depended chiefly on "the head of labour" retained upon it. Its fertility depended on main-œuvre (manure). To keep labour upon it was therefore the aim of the lord or owner. The enclosing of lands for sheep began early, and in the time of Edward III., in the great days of the wool staple, must have been extensive. So long as the demand for the exportation of wool, and then for its consumption at home in the cloth trade, continued, the towns prospered, and the enclosures did not become a grievance. Even before the reign of Henry VII., with the decay of trade, the towns decayed, and their population in some cases diminished extraordinarily. This reacted on the country, where the great families had already become impoverished and were hardly able to support their retainers. In Henry VIII.'s time the lands of the religious houses were confiscated. Worked on old lines, the custom of tillage remained in force on them. Accordingly, when these estates fell into private hands they were transferred subject to the condition that they should be tilled as heretofore. The condition was evaded by the new owners, and the disbandment of farm labourers went on apace. In England and Wales these changes, it is said, affected a third of the country, more than 12,000,000 acres, if the estimates be correct, or rather a third of the best land in the kingdom. With towns decaying the effect of this must have been terrible. What were really "latifundia" were created, "great landes," "enclosures of a mile or two or thereabouts . . . destroying thereby not only the farms and cottages within the same circuits, but also the towns and villages adjoining." A herdsman and his wife took the place of eighteen to twenty-four farm hands. The people thus set wandering could only join the wanderers from the decaying towns. At the same time the economic difficulty was aggravated by a new patrician or commercial greed; and once more the land question—the absorption of property into a few hands instead of its free exchange—led to lasting social demoralization. A few years after the alienation of the monasteries the coinage (1543) was debased. By this means prices were arbitrarily raised, and wages were increased nominally; but nevertheless the price of necessaries was "so enhanced" that neither "the poor labourers can live with their wages that is limited by your grace's laws, nor the artificers can make, much less sell, their wares at any reasonable price" (Lamond, *The Commonweal of this Realm of England*, p. xlvii.). No social reformation, such as the charitable instincts of More, Hales, Latimer, and other men suggested, was attempted, or at least persistently carried out. In towns the organization of labour had become restrictive, exclusive, and inadaptable, or, judged from the moral standpoint, uncharitable. There had been a time of plenty and extravagance, of which in high quarters the famous "field of the cloth of gold" was typical; and probably, in accordance with the frequently observed law of social economics, as the advance in wages and their purchasing power in the earlier part of the 15th century had not been accompanied by a simultaneous advance in self-discipline and intelligent expenditure, it resulted in part in lessened competence and industrial ability on the part of the workmen, and thus in the end produced pauperism.

The poverty of the country was very great in the reigns of Edward VI. and Elizabeth. Adversity then taught the people new manners, and households became more simple and thrifty. In the reign of James I., with enforced economy and thrift, a "slow but substantial improvement in agriculture" took place, and a new growth of commercial enterprise. The vigour of the municipalities had abated, so that in Henry VIII.'s time they had become the very humble servants of the Government; and the Government, on the other hand, had become strongly centralized—in itself a sign of the general withdrawal of self-sustaining activity in all administration, in the administration of charitable relief no less than in other departments. A system of endowed charities had been built up, supported chiefly by rents from landed property. These now had disappeared, and thus the means of relief, which Edward VI. and Queen Elizabeth might have utilized at a time of general distress, had been dissipated by the acts of their predecessors. The civil independence of the monasteries and religious houses might have been justified, possibly, when they were engaged in missionary work and were instilling into the people the precepts of a higher moral law than that which was in force around them. But afterwards, as the ability and intelligence of the community increased, their privileges became more and more antagonistic to charity, and tended to create a non-social, and even anti-social, ecclesiastical democracy actuated by aims and interests in which the general good of the people had little or no place. There was a growing alienation between religious tradition and secular opinion, as Lollardism slowly permeated the thought of the people and led the way to the Reformation. While this alienation existed no national system of charity, civic and yet religious, could be created. But worse than all, the ideal of charity had been degraded. A self-regarding system of relief had superseded charity, and it was productive of nothing but alms, large or small, isolated and unmethodic, given with a wrong bias, and thus almost inevitably with evil results. Out of this could spring no vigorous co-operative charity. Charity—not relief—indeed seemed to have left the world. The larger issues were overlooked. Then the property of the hospitals and the guilds was wantonly confiscated, though the poor had already lost that share in the revenues of the Church to which at one time they were admitted to have a just claim. A new beginning had to be made. The obligations of charity had to be revived. A new organization of charitable relief had to be created, and that with an empty exchequer and after a vast waste of charitable resources. There were signs of a new congregational and parochial energy, yet the task could not be entrusted to the religious bodies, divided and disunited as they were. In their stead it could only be imposed on some authority which represented the general community, such as municipalities; and in spite of the centralization of the Government there seemed some hope of creating a system of relief in connexion with them. They were tried, and, very naturally, failed. In the poverty of the time it seemed that the poor could be relieved only by a compulsory rate, and the administration of statutory relief naturally devolved on the central Government—the only vigorous administrative body left in the country. The Government might indeed have adopted the alternative of letting the industrial difficulties of the country work themselves out, but they had inherited a policy of minute legislative control, and they continued it. Revising previous statutes, they enacted the Poor Law, which still remains on our statute book. It could be no remedy for social offences

against charity and the community. But in part at least it was successful. It helped to conceal the failure to find a remedy.

Part VI.—After the Reformation.

The Reformation theory of charity.

During the Reformation, which extended, it should be understood, from the middle of the 14th century to the reign of James I., the groundwork of the theory of charity was being recast. The old system and the narrow theory on which it had come to depend were discredited. The recoil is startling. To a very large extent charitable administration had been in the hands of men and women who, as an indispensable condition to their participation in it, took the vows of obedience, chastity, and "wilful" poverty. Now this was all entirely set aside. It was felt (see *Homilies on Faith and Good Works*, &c., A.D. 1547) that socially and morally the method had been a failure. The vow of obedience, it was argued, led to a general disregard of the duties of civic and family life. Those who bound themselves by it were outside the state and did not serve it. In regard to chastity the *Homily* states the common opinion: "How the profession of chastity was kept, it is more honesty to pass over in silence and let the world judge of what is well known." As to wilful poverty, the regulars, it is urged, were not poor, but rich, for they were in possession of much wealth. Their property, it is true, was held *in communi*, and not personally, but nevertheless it was practically theirs, and they used it for their personal enjoyment; and "for all their riches they might never help father nor mother, nor others that were indeed very needy and poor, without the license of their father abbot" or other head. This was the negative position. The positive was found in the doctrine of justification—the central point in the discussions of the time, a plant from the garden of St Augustine. Justification was the personal conviction of a lively (or living) faith, and was defined as "a true trust and confidence of the mercy of God through our Lord Jesus Christ, and a stedfast hope of all good things to be received at His hands." Without this justification there could be no good works. They were the signs of a lively faith and grew out of it. Apart from it, what seemed to be "good works" were of the nature of sin, phantom acts productive of nothing, "birds that were lost, unreal." So were the works of pagans and heretics. The relation of almsgiving to religion was thus entirely altered. The personal reward here or hereafter to the actor was eliminated. The deed was good only in the same sense in which the doer was good; it had in itself no merit. This was a great gain, quite apart from any question as to the sufficiency or insufficiency of the Protestant scheme of salvation. The deed, it was realized, was only the outcome of the doer, the expression of himself, what he was as a whole, neither better nor worse. Logically this led to the discipline of the intelligence and the emotions, and undoubtedly "justification" to very many was only consistent with such discipline and implied it. Thus under a new guise the old position of charity reasserted itself. But there were other differences.

The relation of charity to prayer, fasting, almsgiving, and penance was altered. The prayerful contemplation of the Christ is preserved in the mysticism of Protestantism; but it is dissociated from the "historic Christ," from the fervent idealization of whom St Francis drew his inspiration and his active charitable impulse. The tradition did not die out, however. It remained with many, notably with George Herbert, of whom it made, not unlike St Francis, a poet as well as a practical parish priest; but the absence of it indicated in much post-Reformation endeavour a want, if not of devotion, yet of intensity of feeling which may in part account for the fact that sectarianism in relief has since proved itself stronger than charity, instead of yielding to charity as its superior and its organizer. Fasting was parted from prayer and almsgiving. It was "a thing not of its own proper nature good as the love of father or mother or neighbour, but according to its end." Almsgiving also as a "work" disappears, and with it a whole series of inducements that from the standpoint of the pecuniary and material supply of relief had long been active. It was no wonder that the preachers advocated it in vain, and reproached their hearers with their diminished bounty to the poor; the old personal incentive had gone, and could only gradually be superseded by the spontaneous activity of personal religion very slowly wedding itself to true views of social duty and purpose. Penance, once so closely related to almsgiving, passes out of sight. Charity, the love of God and our neighbour, had two offices, it was said, "to cherish good and harmless men," and "to correct and punish vice without regard to persons." Correction as a means of discipline takes the place of penance, and it becomes judicial, regulating and controlling church membership by the authority of the church, a congregation, minister, or elder; or dealing with laziness or ill-doing through the municipality or state, in connexion with what now first appear, not prisons, but houses of correction.

The religious life was to be democratic—not in religious bodies, but in the whole people; and in a new sense—in relation to family and social life — it was to be moral. That was the significance of the Reformation for charity.

The organization of municipal relief.

Consistently with this movement of religious activity towards a complete fulfilment of the duties of civic life, the older classical social theory, fostered by the Renaissance, assumed a new influence—the great conception of the state as a community bound together by charity and friendship. "We be not born to ourselves," it was said, "but partly to the use of our country, of our parents, of our kinsfolk, and partly of our friends and neighbours; and therefore all good virtues are grafted on us naturally, whose effects be to do good to others, when it showeth forth the image of God in man, whose property is ever to do good to others" (Lamond, p. 14). Economic theory also changed. Instead of the mediæval opinion of the "theologian or social preacher," that "trade could only be defended on the ground that honestly conducted it made no profit" (Green, ii. 71), we have a recognition of the advantages resulting from exchange, and individual interests, it is argued, are not necessarily inconsistent with those of the state, but are, on the contrary, a source of solid good to the whole community.

Municipal laws for the suppression of the mendicity of the able-bodied and the organization of relief on behalf of the infirm were common in England and on the Continent (Colmar, 1362; Nuremberg, 1478; Strasburg, 1523; London, 1514). Vives (Ehrle, *Beiträge zur Geschichte und Reform der Armenpflege*, p. 26), a Spaniard, who had been at the court of Henry VIII., in a book translated into several languages and widely read, seems to have summed up the thought of the time in regard to the management of the poor. He divided them into three classes: those in hospitals and poor-houses, the public homeless beggars, and the poor at home. He would have a census taken of the number of each class in the town, and information obtained as to the causes of their distress. Then he would establish a central organization of relief under the magistrates. Work was to be supplied for all, while begging was strictly forbidden. Non-settled poor who were able-bodied were to be sent to their homes. Able-bodied settled poor who knew no craft were to be put on some public work—the undeserving being set to hard labour. For others work was to be found, or they were to be assisted to become self-supporting. The hospitals provided with medical advice and necessaries were to be classified to meet the needs of the sick, the blind, and lunatics. The poor living at home were to work with a view to their self-support. What they earned, if insufficient, might be supplemented. If a citizen found a case of distress he was not to help it, but to send it for inquiry to the magistrate. Children were to be taught. Private relief was to be obtained from the rich. The funds of endowed charities were to be the chief source of income; if more was wanted, bequests and church collections would suffice. The scheme was put in force in Ypres in 1524. The Sorbonne approved it, and similar plans were adopted in Paris and elsewhere. It is in outline the scheme of London municipal charity promoted by Edward VI., by which the poor were classified, St Bartholomew's and St Thomas's hospitals appropriated for the sick, Christ's hospital for the children

of the poor, and Bridewell for the correction of the able-bodied. Less the institutional arrangements and plus the compulsory rate, the methods are those of the Poor Relief Act of Queen Elizabeth of 1601. At first the attempt had been made to introduce state relief in reliance on voluntary alms (1 Mary 13, 5 Eliz. 3, 1562-63), subject to the right of assessment if alms were refused. But the position was anomalous. Charity is voluntary, and spontaneously meets the demands of distress. Such demands have always a tendency to increase with the supply. Hence the very limitations of charitable finance are in the nature of a safeguard. At most economic trouble can only be assuaged by relief, and it can only be met or prevented by economic and social reforms. If a compulsory rate be not enforced, as in Scotland and formerly in some parishes in England, a voluntary rate may be made in supplementation of the local charities. In Scotland, where the compulsory clauses of the Poor Relief Act of James I. were not put in force, the country weathered the storm without them, and the compulsory rate, which was extended throughout the country by the Poor Act of 1844, came in very slowly in the 18th and 19th centuries. In France (1566) a similar Act was passed and set aside. If a compulsory rate be enforced, it is inevitable that the resources of charity, unless kept apart from the poor-law and administered on different lines from it, will diminish, and at the same time, as has happened often in the case of endowed charities, the interest in charitable administration will lapse, while the charges for poor-law relief, drawn without much scruple from the taxation of the community, will mount to millions either to meet increasing demands or to provide more elaborate institutional accommodation. The principle once adopted, it was enacted (1572-73), that the aged and infirm should be cared for by the overseers of the poor, a new authority; and in 1601 the duplicate Acts were passed, that for the relief of the poor (43 Eliz. 2), and that for the furtherance and protection of endowed charities. Thus the poor were brought into the dependence of a legally recognized class, endowed with a claim for relief, on the fulfilment of which, after a time, they could without difficulty insist if they were so minded. The civic authority had indeed taken over the alms of the parish, and an *eleemosyna civica* had taken the place of the *annona civica*. It was a similar system under a different name.

Poor Relief Acts and statutory serfdom.

A phrase of Cecil's indicates the minute domestic character of the Elizabethan legislation (D'Ewes, 674). The question (1601) was the repeal of a statute of tillage. Cecil says: "If in Edward I.'s time a law was made for the maintenance of the fry and fish, and in Henry VII.'s for the preservation of the eggs of wild fowl, shall we now throw away a law of more consequence and import? If we debar tillage, we give scope to the depopulating. And then, if the poor being thrust out of their houses go to dwell with others, straight we catch them with the statute of inmates; if they wander abroad, they are within the danger of the statute of the poor to be whipt. So by this undo this statute, and you endanger many thousands." A strong central Government and a network of legislation controlled the whole movement of economic life. On this reliance was placed to meet economic difficulties. Since 23 Edw. III. there had been labour statutes; and in 1562 a new statute was passed—not repealed till 1775—empowering the magistrates in quarter sessions to fix the rate of wages for husbandmen and artificers, and enforce it by fine and imprisonment (Rogers, v. 611); requiring yearly service in many employments; compelling persons between 15 and 60, not otherwise employed or apprenticed, to serve in husbandry; preventing migration from city or parish without a testimonial, and compelling single women to work by the year, week, or day; controlling apprenticeship, and ordaining that persons refusing to be apprenticed should be imprisoned. By this, in conjunction with other measures, the labouring classes were finally committed to a new bondage, when they had freed themselves from the serfdom of feudalism, and when the control exercised over them by the guild and municipality was relaxed. The statute was so enforced that to earn a year's livelihood would have taken a labourer not 52 weeks, but sometimes two years, or 58 weeks, or 80 weeks, or 72 weeks; sometimes, however, less—48 or 35. The rate fixed during the Commonwealth remained practically unchanged till the last quarter of the 18th century. It followed that on such a system the country could only with the utmost good fortune free itself from the economic difficulties of the century, and that the need of a poor-law was felt the more as these difficulties persisted. A voluntary or a municipal system could not suffice, even as a palliative, while such statutes as these were in force to render labour immobile and unprogressive. Also, while wages were fixed by statute or order, whether chiefly in the interest of the employers or not, obviously any shortage on the wages had to be made good by the community. The community, by fixing the wages to be earned in a livelihood, made itself responsible for their sufficiency. And accordingly we find that in the year in which the Statute of Labourers (1562) was passed, that for the enforcement of assessments of poor-rate was also enacted. The Law of Settlement passed in the reign of Charles II. was due, it is said, to a migration of labourers southward from counties where less favourable statutory wages prevailed; but it was, in fact, only a corollary of the Statute of Labourers and the Poor Relief Acts of 1562 and 1601. These laws, it may be said, were the means of making the English labourer, until the poor-law reform of 1834, a settled but landless serf, supported by a fixed wage and a state bounty. By the poor-law it was possible to continue this state of things till, in consequence of an absolute economic breakdown, there was no alternative but reform.

The philanthropic nature of the poor-law is indicated by its antecedents: once enacted, its bounties became a right; its philanthropy disappeared in a quasi-legal claim. Its object was to relieve the poor by home industries, apprentice children, and provide necessary relief to the poor unable to work. The Act was commonly interpreted so as to include the whole of that indefinite class, the "poor"; by a better and more rigid interpretation it was, at least in the 19th century, held to apply only to the "destitute." The economic fallacy of home industries founded on rate-supplied capital early declared itself, and the method could only have continued as long as it did because it formed part of a general system of industrial suppression. When in the 18th century workhouses were established, the same industrial fallacy, as records show, repeated itself under new conditions. Within the parish it resulted in the farmer paying the labourer as small a wage as possible, and leaving the parish to provide whatever he might require in addition during his working life and in his old age. Thus, indeed, a gigantic experiment in civic employment was made for centuries on a vast scale throughout the country—and failed. As was natural, the lack of economic independence reacted on the morals of the people. With pauperism came want of energy, idleness, and a disregard for chastity and the obligations of marriage. The law, it is true, recognized the mutual obligations of parents and grandparents, children and grandchildren; but in the general poverty which it was itself a means of perpetuating such obligations became practically obsolete, while at all times they were difficult to enforce. Still, the fact that they were recognized implies a great advance in charitable thought. The Act, passed at first from year to year, was very slowly put in force. Even before it was passed the poor-rate assessed under the Act of 1562 was felt to be "a greater tax than some subsidies," and in the time of Charles II. it amounted to a third of the revenue of England and Wales (Rogers, v. 81).

The service of villan and cottar was, as we have now seen, in part superseded by what we have called a statutory serfdom founded on a basis of wage supplemented by relief; to such a system a poor-law was a necessary

adjunct. But it follows that with the decay of this serfdom the poor-law itself should have disappeared, or should take some new and very limited form. Unfortunately, as in Roman times, state relief proved to be a popular and vigorous parasite that outlived the tree on which it was rooted: the labour statutes were repealed in 1775, and a century later the Act against illegal combinations of working men; but the serfdom of the poor-law, the *eleemosyna civica*, remained, to work for half a century the gravest evil to the labouring classes, and after that period to impede and hamper greatly the recovery of their independence. Nevertheless, by a new law of state alms for the aged, or by increased outdoor relief, it is now proposed to bring them once again under a thraldom similar to that from which they have so slowly emancipated themselves.

The endowed charities

The policy adopted by Queen Elizabeth for the relief of the poor (1601) included a scheme for the reorganization of voluntary charity as well as plans for the extension of rate-aided relief. During the century, as we have seen, endeavours had been made to create a system of voluntary charity. This it was proposed to safeguard and promote concurrently with the extension of the poor-rate. Accordingly, in the poor-law it was arranged that the overseers, the new civic authority, and the churchwardens, the old parochial and charitable authority, should act in conjunction, and, subject to magisterial approval, together "raise weekly or otherwise" the necessary means "by taxation of every inhabitant." The old charitable organization was based on endowment, and the churchwarden was responsible for the administration of many such endowments. What was not available from these and other sources was to be raised "by taxation." The object of the new Act was to encourage charitable gifts.

Towards the end of the 18th century, when the administration of poor relief fell into confusion, many charities were lost, or were in danger of being lost, and many were mismanaged. In 1786 and 1788 a committee of the House of Commons reported on the subject. In 1818, chiefly through the instrumentality of Lord Brougham, a commission of inquiry on educational charities was appointed, and in 1819 another commission to investigate (with some exceptions) all the charities for the poor in England and Wales. These and subsequent commissions continued their inquiries till 1835, when a select committee of the House of Commons made a strong report, advocating the establishment of a permanent and independent board, to inquire, to compel the production of accounts, to secure the safe custody of charity property, to adapt it to new uses on cy-près lines, &c. A commission followed in 1849, and eventually in 1853 the first Charitable Trusts Act was passed, under which "The Charity Commissioners of England and Wales" were appointed.

The following are details of importance:—(1) *Definition.*—The definition of the Act of 1601 (Charitable Uses, 43 Eliz. 4) still holds good. It enumerates as charitable objects all that was once called "alms": (*a*) "The relief of aged, impotent, and poor people"—the normal poor; "the maintenance of sick and maimed soldiers and mariners"—the poor chiefly by reason of war, sometime a class of privileged mendicants; (*b*) education, "schools of learning, free schools, and scholars in universities"; and then (*c*) a group of objects which include general civic and religious purposes, and the charities of guilds and corporations; "the repair of bridges, ports, havens, causeways, churches, seabanks, and highways; the education and preferment of orphans; the relief, stock, or maintenance for houses of correction; marriages of poor maids, supportation, aid, and help of young tradesmen, handicraftsmen, and persons decayed"; and there follows (*d*) "the relief or redemption of prisoners or captives"; and, lastly, (*e*) "the aid and ease of any poor inhabitants concerning payment of fifteens" (the property-tax of Tudor times), setting out of soldiers, and other taxes. The definition might be illustrated by the charitable bequests of the next 60, or indeed 225, years. It is a fair summary of them. (2) *Charitable Gifts.*—A public trust and a charitable trust are, as this definition shows, synonymous. It is a trust which relates to public charities, and is not held for the benefit of private persons, *e.g.*, relations, but for the common good, and, subject to the instructions of the founder, by trustees responsible to the community. Gifts for charitable purposes, other than those affected by the law of mortmain, have always been viewed with favour. "Where a charitable bequest is capable of two constructions, one of which would make it void and the other would make it effectual, the latter will be adopted by the court" (Tudor's *Charitable Trusts*, ed. 1889, by L. S. Bristowe and W. I. Cook, p. 28). Gifts to the poor, or widows, or orphans, indefinitely, or in a particular parish, were valid under the Act, or for any purpose or institution for the aid of the "poor." Thus practically the Act covered the same field as the poor-law, though afterwards it was decided that, "as a rule, persons receiving parochial relief were not entitled to the benefit of a charity intended for the poor" (Tudor, p. 104). (3) *Religious Differences.*—In the administration of charities which are for the poor the broadest view is taken of religious differences. (4) *Superstitious Uses.*—The superstitious use is one that has for its object the propagation of the rites of a religion not tolerated by the law (Tudor, p. 18). Consequently, so far as charities were held or left subject to such rites, they were illegal, or became legal only as toleration was extended. Thus by degrees, since the Toleration Act of 1688, all charities to dissenters have become legal—that is, trusts for schools, places for religious instruction, education, and charitable purposes generally. But bequests for masses for the soul of the donor, or for monastic orders, are still void. (5) *Administration.*—The duty of administering charitable trusts falls upon trustees or corporations, and under the term "eleemosynary corporations" are included endowed hospitals and colleges. Under schemes of the Charity Commissioners, where charities have been remodelled, besides trustees elected by corporations, there are now usually appointed *ex officio* trustees who represent some office or institution of importance in connexion with the charity. (6) *Jurisdiction by Chancery and Charity Commission.*—The Court of Chancery has jurisdiction over charities, under the old principle that "charities are trusts of a public nature, in regard to which no one is entitled by an immediate and peculiar interest to prefer a complaint for compelling the performance by the trustees of their obligations." The court, accordingly, represents the Crown as *parens patriæ*. Now, by the Charitable Trusts Act, 1853, and subsequent Acts, a charity commission has been formed which is entrusted with large powers, formerly enforced only by the Court of Chancery. (7) *Jurisdiction by Visitor.*—A further jurisdiction is by the "visitor," a right inherent in the founder of any eleemosynary corporation, and his heirs, or those whom he appoints, or in their default, the king. The object of the visitor is "to prevent all perverting of the charity, or to compose differences among members of the corporation." Formerly the bishop's ordinary was the recognized visitor (2 Henry V. i. 1) of hospitals, apart from the founder. Subsequently his power was limited (14 Eliz. c. 5) to hospitals for which the founders had appointed no visitors. Then (1601) by the Charitable Uses Act commissions were issued for inquiry by county juries. Now, apart from the duty of visitors, inquiry is conducted by the charity commissioners and the assistant commissioners. By subsequent Acts (see below) ecclesiastical and eleemosynary charities have been still further separated and defined. (8) *Advice.*—Trustees, or other persons concerned in the management of a charity, may apply to the charity commissioners for their opinion, advice, or direction; and any person acting under such advice is indemnified, unless he has been guilty of misrepresentation in obtaining it. (9) *Limitation of Charity Commissioners' Powers.*—The commissioners cannot, however, make any order with respect to any charity of which the gross annual income amounts to £50 or upwards, except on the application of the trustees or a majority of them. Their powers are thus very limited, except when put in motion by the trustees. If a parish is divided they can apportion the charities if the gross income does not exceed £20. (10) *General Powers of the Charity Commission.*—Subject to the limitation of £50, &c., the charity commissioners have power (Charitable Trusts Act, 1860) to make orders for the appointment or removal of trustees, or of any officer, and for the transfer, payment, and vesting of any real or personal estate, or "for the establishment of any scheme for the administration" of the charity. (11) *Schemes and Remodelling of Charities.*—Under this power charities are remodelled, and small and miscellaneous charities put into one fund and applied to new purposes. The cy-près doctrine is applied, by which if a testator leaves directions that are only indefinite, or if the objects for which a charity was founded are obsolete, the charity is applied to some purpose, as far as possible, in accordance with the charitable intention of the founder. This

doctrine probably received its widest application in the City of London Parochial Charities Act of 1883. Under other Acts doles have been applied to education and to allotments. About 380 schemes are issued in the course of a year. (12) *Objects adopted in remodelling Charities.*—In the remodelling of charities for the general benefit of the poor some one or more of thirteen objects are usually included in the scheme. These are subscriptions to a medical charity, to a provident club or coal or clothing society, to a friendly society; for nurses, for annuities, for outfit for service, &c.; for emigration; for recreation grounds, clubs, reading-rooms, museums, lectures; for temporary relief to a limited amount in each year; for clothes, fuel, tools, medical aid, food, &c., or in money "in cases of unexpected loss or sudden destitution"; for pensions. (13) *Parochial Charities.*—By the Local Government Act of 1892, local ecclesiastical charities, *i.e.*, endowments for "any spiritual purpose that is a legal purpose" (for spiritual persons, church and other buildings, for spiritual uses, &c.) are separated from parochial charities, "the benefits of which are, or the separate distribution of the benefits of which is, confined to inhabitants of a single parish, or of a single ancient ecclesiastical parish, or not more than five neighbouring parishes." These charities are now brought under the supervision of the recently established parish councils, who appoint trustees for their management in lieu of the former overseer or vestry trustees, or, under certain conditions, "additional trustees." The accounts have to be submitted to the parish meeting, and the names of the beneficiaries of dole charities published. (14) *Official Trustees.*—There is also "an official trustee of charity lands," who as "bare trustee" may hold the land or stock of the charity managed by the trustees or administrators. At present the stock transferred to the official trustees amounts to £20,173,654. (15) *Audit.*—The charity commissioners have no power of audit, but the trustees of every charity have to prepare a statement of accounts annually, and transmit it to the commission. The accounts have to be "certified under the hand of one or more of the trustees and by the auditor of the charity." (16) *Taxation.*—In the case of rents and profits of lands, &c., belonging to hospitals or almshouses, or vested in trustees for charitable purposes, allowances are made in diminution of income-tax (56 Vict. 35, § 61). From the inhabited house duty any hospital charity school, or house provided for the reception or relief of poor persons, is exempted (48 Geo. III. c. 55). Also there is an exemption from the land-tax in regard to land rents, &c., in possession of hospitals before 1693. (17) *The Digest.*—A digest of endowed charities in England and Wales was compiled in the years 1861 to 1876. A new digest of reports and financial particulars is now in progress. The following table gives the income of endowed charities at that time and its chief uses:—

According to Inquiry, 1861-76.	Income from		Total.	Total former Income. 1819-37.	Apprenticing and Advancement.	Almshouses and Pensioners.	Distribution in Kind.	Distribution in Money.	General Uses of Poor.	Medical Charities.
	Real Estate.	Personal Estate.								
	£	£	£	£	£	£	£	£	£	£
Counties, including Cities of London and Westminster	1,148,955	394,726	1,543,681	966,573	61,476	408,426	123,298	143,587	34,707	19,085
Diocesan charities	1,315	9,486	10,801	...	77	2,248	...	7,747		
Society of Friends' charities	17,185	10,240	27,425	...	1,978	1,100	9	8,990	2,279	
General charities	390,795	225,761	616,556	232,654	24,334	140,346	804	16,566	27,832	180,055
	1,558,250	640,213	2,198,462	1,199,227	87,865	552,120	124,111	176,890	64,818	199,140

The income of endowed charities is now, no doubt, considerably larger than it was in 1876. Partial returns show that at least a million a year is now available in England and Wales for the assistance of the aged poor and for doles. Between the poor-law, which, as it is at present administered, is a permanent endowment provided from the rates for the support of a class of permanent "poor," and endowed charities, which are funds available for the poor of successive generations, there is no great difference. But in their resources and administration the difference is marked. Local endowed charities were constantly founded after Queen Elizabeth's time till about 1830, and the poor-rate was at first supplementary of the local charities. When corn and fuel were dear and clothes very expensive, what now seem trivial endowments for food, fuel, coal, and clothes were important assets in the thrifty management of a parish. But when the poor were recognized as a class of dependants entitled by law to relief from the community, the rate increased out of all proportion to the charities. A distinction then made itself felt between the "parish" poor and the "second" poor, or the poor who were not relieved from the rates, and relief from the rates altogether overshadowed the charitable aid. Charitable endowments were ignored, ill-administered, and often were lost. After 1834 the poor-law was brought under the control of the central Government. Poor relief was placed in the hands of boards of guardians in unions of parishes. The method of co-operation between poor-law and charity suggested by the Acts of Queen Elizabeth was set aside, and, as a responsible partner in the public work of charity relief, was disestablished. In the parishes the endowed charities remained in general a disorganized medley of separate trusts, jealously guarded by incompetent administrators. To give unity to this mass of units, so long as the principles of charity are misunderstood or ignored, has proved an almost impossible and certainly an unpopular task. So far as it has been achieved, it has been accomplished by the piecemeal legislation of schemes cautiously elaborated to meet local prejudices. Active reform has been resented, and politicians have often accentuated this resentment. Recently several inquiries have been made by Parliamentary committees into the action of the charity commissioners, but no serious grievances were substantiated. The committees' reports are of interest, however, as an indication of the initial difficulties of all charitable work, the general ignorance that prevails in regard to the elementary conditions that govern it, the common disregard of these principles, and the absence of any accepted theory or constructive policy that should regulate its development and its administration.

After the Poor-Law Act of 1601 the history of the voluntary parochial charities in a town parish is marked by their decreasing amount and utility, as poor-law relief and pauperism increase. The Act, it would seem, was not adopted with much alacrity by the local authorities. From 1625 to 1646 there were many years of plague and sickness, but in St Giles's, London, as late as 1649, the amount raised by the "collectors" (or overseers) was only £176. They disbursed this to "the visited poor" as "pensions." In 1665 an extra levy of £600 is mentioned. In the accounts of St Martin's-in-the-Fields, where, as in St Giles's, gifts were received, the change wrought by another half-century (1714) is apparent. The sources of charitable relief are similar to those in all the Protestant churches—English, Scottish, or Continental: church collections and offertories; correctional fines, such as composition for bastards and conviction money for swearers; and besides these, income from annuities and legacies, the parish estate, the royal bounty, and "petitions to persons of quality." In all £2041 was collected, but, so far as relief was concerned the parish relied not on it, but on the poor-rate, which produced £3765. All this was collected and disbursed on their own authority by collectors, to orphans, "pensioners" or the "known or standing" poor, or to casual poor (£1818), including nurse children and bastards. The begging poor were numerous and the infant death-rate enormous, and each year three-fourths of those christened were "inhumanly suffered to die by the barbarity of nurses." The whole administration was uncharitable, injurious to the community and the family, and inhuman to the child. If one may judge from later accounts of other parishes even up to 1834, usually it remained the same, purposeless and unintelligent; and it can hardly be denied that, generally speaking, only in the last fifty years has any serious attention been paid to the charitable side of parochial work. Parallel to the parochial movement of the poor-law in England, in France (about 1617) were established the *bureaux de bienfaisance*, at first entirely voluntary institutions, then recognized by the state, and during the Revolution made the central administration for relief in the communes.

Charity in the parish after 1601.

In the 17th century in England, as in France, opinion favoured the establishment of large hospitals or *maisons Dieu* for the reception of the poor of different classes. In France throughout the century there was a continuous struggle with mendicancy, and the hospitals were used as places into which offenders were summarily driven. A new humanity was, however, beginning its protest. The pitiful condition of abandoned

Charitable movements after 1601.

children attracted sympathy in both countries. St Vincent de Paul established homes for the *enfants trouvés*, followed in England by the establishment of the Foundling Hospital (1739). In both countries the method was applied inconsiderately and pushed to excess, and it affected family life most injuriously. Grants from Parliament supported the foundling movement in England, and homes were opened in many parts of the country. The demand soon became overwhelming; the mortality was enormous, and the cost so large that it outstripped all financial expedients. The lesson of the experiment is the same as that of the poor-law catastrophe before 1834; only, instead of the able-bodied poor of another age, infants were made the object of a compassionate but undiscerning philanthropy. With widespread relief there came widespread abandonment of duty and economic bankruptcy. Had the poor-rates instead of charitable relief been used in the same way, the moral injury would have been as great, but the annual draft from the rates would have concealed the moral and postponed the economic disaster. To amend the evil changes were made by which the relation between child and mother was kept alive, and a personal application on her part was required; the character of the mother and her circumstances were investigated, and assistance was only given when it would be "the means of replacing the mother in the course of virtue and the way of an honest livelihood." General reforms were also made, especially through the instrumentality of Jonas Hanway, to check infant mortality, and metropolitan parishes were required to provide for their children outside London. A kindred movement led to the establishment of penitentiaries (1758), of lock hospitals and lying-in hospitals (1749-1752).

In Queen Anne's reign there was a new educational movement—"the charity school"—"to teach poor children the alphabet and the principles of religion," followed by the Sunday-school movement (1780), and about the same time (1788) by "the school of industry"—to employ children and teach them to be industrious. In 1844 the Ragged School Union was established, and until the Education Act of 1870 continued its voluntary educational work. As an outcome of these movements, through the efforts of Miss Mary Carpenter and many others, in 1854-55 industrial and reformatory schools were established, to prevent crime and reform child criminals. The orphanage movement, beginning in 1758, when the Orphan Working Home was established, has been continued to the present day on a vastly extended scale. In 1772 a society for the discharge of persons imprisoned for small debts was established, and in 1773 Howard began his prison reforms. This raised the standard of work in institutional charities generally. After the civil wars the old hospital foundations of St Bartholomew and St Thomas, municipalized by Edward VI., became endowed charities partly supported by voluntary contributions. The same fate befell Christ's Hospital, in connexion with which the voting system, the admission of candidates by the vote of the whole body of subscribers—that peculiarly English invention—first makes its appearance. A new interest in hospitals sprang up at the end of the 17th century. St. Thomas's was rebuilt (1693) and St. Bartholomew's (1739); Guy's was founded in 1724, and on the system of free "letters" obtainable in exchange for donations, voluntary hospitals and infirmaries were established in London (1733 and later) and in most of the large towns. Towards the end of the century the dispensary movement was developed,—a system of local dispensaries with fairly definite districts and home visiting, a substitute for attendance at a hospital, where "hospital fever" was dreaded, and an alternative to what was then a very ill-administered system of poor-law medical relief. After 1840 the provident dispensary was introduced, in order that the patients by small contributions in the time of health might provide for illness without having to meet large doctors' bills, and the doctor might receive some sufficient remuneration for his attendance on poor patients. This movement was largely extended after 1860. Three Hospital Funds for collecting contributions for hospitals and making them grants, a movement that originated in Birmingham in 1859, were established in London in 1873 and 1897. Since 1868 the poor-law medical system of Great Britain has been immensely improved and extended, while at the same time the number of persons in receipt of free medical relief in most of the large towns has greatly increased. The following figures refer to London: in-patients at hospitals (1900) during the year, 103,765; out-patients and casualty cases, 1,584,987; patients at free, part-pay, or provident dispensaries, about 280,000; in poor-law infirmaries (1897), 36,294; orders issued for attendance at poor-law dispensaries and at home, 109,653. There are in London 12 general hospitals with, 13 without, medical schools, and 86 special hospitals. Thus the population in receipt of public and voluntary medical relief is very large, indeed altogether excessive.

Each religious movement has brought with it its several charities. The Society of Friends, the Wesleyans, the Baptists have large charities. With the extension of the High Church movement there have been established many sisterhoods which support penitentiaries, convalescent homes and hospitals, schools, missions, &c.

The magnitude of this accumulating provision of charitable relief is evident, though it cannot be summed up in any single total.

At the beginning of the 19th century anti-mendicity societies were established; and later, about 1869, in England and Scotland a movement began for the organization of charitable relief, in connexion with which there are now societies and committees in most of the larger towns in Great Britain, in the Colonies, and in the United States of America. More recently the movement for the establishment of settlements in poor districts, initiated by Canon Barnett at Toynbee Hall—"to educate citizens in the knowledge of one another, and to provide them with teaching and recreation"—has spread to many towns in England and America.

Progress of thought in 18th and 19th centuries.

These notes of charitable movements suggest an altogether new development of thought. On behalf of the charity school of Queen Anne's time were preached very formal sermons, which showed but little sympathy with child life. After the first half of the century a new humanism, with which we connect the name of Rousseau, slowly superseded this formal beneficence. Rousseau made the world open its eyes and see nature in the child, the family, and the community. He analysed social life, intent on explaining it and discovering on what its well-being depended; and he stimulated that desire to meet definite social needs which is apparent in the charities of the century. Little as it may appear to be so at first sight, it was a period of charitable reformation. Law revised the religious conception of charity, though he was himself so strangely devoid of social instinct that, like some of his successors, he linked the utmost earnestness in belief to that form of almsgiving which most effectually fosters beggardom. Howard introduced the era of inspection, the ardent apostle of a new social sagacity; and Bentham, no less sagacious, propounded opinions, plans, and suggestions which, perhaps it may be said, in due course moulded the prin-

ciples and methods of the poor-law of 1834. In the broader sense the turn of thought is religious, for while usually stress is laid on the religious scepticism of the century, the deeper, fervent, conscientious, and evangelical charity in which Nonconformists, and especially "the Friends," took so large a part, is often forgotten. Sometimes, indeed, as often happens now, the feeling of charity passed into the merest sentimentality. This is evident, for instance, from so ill-considered a measure as Pitt's Bill for the relief of the poor. On the other hand, during the 18th century the poor-law was the object of constant criticism, though so long as the labour statutes and the old law of settlement were in force, and the relief of the labouring population as state "poor" prevailed, it was impossible to reform it. Indeed, the criticism itself was generally vitiated by a tacit acceptance of "the poor" as a class, a permanent and irrevocable charge on the funds of the community; and at the end of the 18th century, when the labour statutes were abrogated, but the conditions under which poor relief was administered remained the same, serfdom in its later stage, the serfdom of the poor-law, asserted itself in its extremest form in times of dearth and difficulty during the Napoleonic war. In 1802-03 it was calculated (Marshall's *Digest*) that 28 per cent. of the population were in receipt of permanent or occasional relief. Those in receipt of the former numbered 734,817, including children—so real had this serfdom of the poor become. In 1832 the expenditure on pauperism in England and Wales was £7,036,968. In the early years of the 19th century the mendicity societies, established in some of the larger towns, were a sign of the general discontent with existing methods of administration. The Society for Bettering the Condition of the Poor—representing a group of men such as Colquhoun, Bernard, Lettsom, Haygarth, Neald, and others—took a more positive line and issued many useful publications (1796). After 1833 the very atmosphere of thought seems changed. There was a general desire to be quit of the serfdom of pauperism. The Poor-Law Amendment Act was passed in 1834, and since then male able-bodied pauperism has dwindled to a minimum. The bad years of 1860-70 revived the problem in England and Scotland, and the old spirit of reform for a time prevailed. Improved administration working with economic progress effected still further reductions of pauperism, till in 1900 it stood at 688,505, or 21·7 per thousand of the population, instead of at 45 per thousand as in 1851. (See article POOR-LAW.) Charity organization societies were formed after 1869, with the object of "improving the condition of the poor," or, in other words, to promote independence by an ordered and co-operative charity; and the Association for Befriending Young Servants, and workhouse aid committees, in order to prevent relapse into pauperism on the part of those who as children or young women received relief from the poor-law. The Local Government Board adopted a restricted out-door relief policy, and a new interest was felt in all the chief problems of local administration. The movement was general. The results of the Elberfield system of municipal relief administered by unpaid almoners, each dealing with but one or two cases, influenced thought both in England and America. The experience gained by Mr Joseph Puckerman of New York of the utility of registering applications for relief, and the teaching of Miss Octavia Hill, led to the foundation of the system of friendly visiting and associated charity at Boston (1880) and elsewhere. Since that time the influence of Arnold Toynbee and the investigations of Mr Charles Booth have led to a better appreciation of the conditions of labour; and to some extent, in London and elsewhere, the spirit of charity has assumed the form of a new devotion to the duties of citizenship. But perhaps, in regard to charity in Great Britain, the most important change has been the revival of the teaching of Dr Chalmers (1780-1847), who (1819) introduced a system of parochial charity at St John's, Glasgow, on independent lines, consistent with the best traditions of the Scottish Church. In the development of the theory of charitable relief on the economic side this has been a main factor. His view, which he tested by experience, may be summed up as follows. Society is a growing, self-supporting organism. It has within it, as between family and family, neighbour and neighbour, master and employee, endless links of sympathy and self-support. Poverty is not an absolute, but a relative term. Naturally the members of one class help one another; the poor help the poor. There is thus a large invisible fund available and constantly used by those who, by their proximity to one another, know best how to help. The philanthropist is an alien to this life around him. Moved by a sense of contrast between his own lot, as he understands it, and the lot of those about him, whom he but little understands, he concludes that he should relieve them. But his gift, unless it be given in such a way as to promote this self-support, instead of weakening it, is really injurious. In the first place, by his interference he puts a check on the charitable resources of another class and lessens their social energy. What he gives they do not give, though they might do so. But next, he does more harm than this. He stimulates expectation, so that by a false arithmetic his gift of a few shillings seems to those who receive it and to those who hear of it a possible source of help in any difficulty. To them it represents a large command of means; and where one has received what, though it be little, is yet, relative to wage, a large sum to be acquired without labour, many will seek more, and with that object will waste their time and be put off their work, or even be tempted to lie and cheat. So social energy is diverted from its proper use. Alms thus given weakens social ties, diminishes the natural relief funds of mutual help, and beggars a neighbour instead of benefiting him. By this argument a clear and well-defined purpose is placed before charity. Charity becomes a science based on social principles and observation. Not to give alms, but to keep alive the saving health of the family, becomes its problem: relief becomes altogether subordinate to this, and institutions or societies are serviceable or the reverse according as they serve or fail to serve this purpose. Not poverty, but distress is the plea for help; not almsgiving, but charity the means. To charity is given a definite social aim, and a desire to use consistently with this aim every method that increasing knowledge and trained ability can devise. Under such influences as these, joined with better economic conditions, a great reform has been made. The poor-law, however, remains—our modern *eleemosyna civica*. It now, indeed, absorbs a proportionately lesser amount of the largely increased national income, but, excluding the maintenance of lunatics, it costs Great Britain nearly ten millions a year; and among the lower classes of the poor, directly or indirectly, it serves as a bounty on dependence and is a permanent obstacle to thrift and self-reliance. The number of those who are within the circle of its more immediate attraction is now perhaps, in different parts of the country, not more than 20, 25, or 30 per cent. of the population. Upon that population the statistics of a day census would show a pauperism not of 2·50 but of 12·50 to 8·33 per cent.; and the percentage would be much greater—twice as large perhaps—if the total number of those who in some way received poor relief in the course of a year were taken into account. The poor-law is thus among the

lower classes, those most tempted to dependence—say some six or seven millions of the people—a very potent influence definitely antagonistic to the good development of family life, unless it be limited to very narrow proportions; as, for instance, to restricted indoor or institutional relief for the sick, for the aged and infirm, who in extreme old age require special care and nursing, and for the afflicted, for whom no sufficient charitable provision is procurable. As ample experience shows, only on these conditions can poor-law relief be justified from the point of view of charity and the common good. In marked contrast to this opinion is the agitation for pensions. These, it was at first proposed, should be given out of the national exchequer to all persons over 65, at the rate of five shillings a week; and, were the plan adopted in spite of its great cost, a system of state alms for the aged would be set on foot, unlike the *annona civica*, since it would be available not for citizens only, a comparatively small part of the population, but for the whole population, yet like the *annona*, since it would be claimed as a right—a huge charity endowed with unlimited funds, funds which ultimately may largely exceed the normal cost of the army or the navy. Schemes of the kind are being adopted in some colonies—in New Zealand, for instance, and Victoria—with some apparent safeguards. In England, failing any such plan, the Local Government Board in 1900 urged the boards of guardians to give large out-door relief to aged deserving people, and laid no stress on the test of destitution, the neglect of which led to many of the difficulties of the old poor-law. History has proved that demoralization results from the wholesale relief whether of the mass of the citizens, or of the able-bodied, or of the children, and the fact that it is now proposed to limit the endowment to the aged makes no substantial difference. The social results must be similar; but social forces work slowly, and usually only the unanswerable argument of financial bankruptcy suffices to convert a people habituated to dependence, though the inward decay of vitality and character may long before be manifest. Ultimately the distribution of pensions by way of out-door relief, corrupting a far more independent people, would work a far greater injury than the *annona civica*. Such an endowment of old age might indeed be justified as part of a system of regulated labour, which, as in earlier times, could not be enforced without some such extraneous help, but it could not be justified otherwise. It is naturally associated, therefore, with socialistic proposals for the regulation of wage.

In the light of the principles of charity, which we have considered historically, we have now to turn to two questions: charity and economics, and charity and socialism.

The economics of charity.

The object of charity is to render to our neighbour the services and duties of goodwill, friendship, and love. To prevent distress charity has for its further object to preserve and develop the manhood and womanhood of individuals and their self-maintenance in and through the family; and any form of state intervention is approved or disapproved by the same standard. By self-maintenance is meant self-support throughout life in its ordinary contingencies—sickness, widowhood, old age, &c. Political economy we would define as the science of exchanges. Here it has to be considered in relation to the purposes of charity. By way of illustration we take, accordingly, three points; distribution and use, supplementation of wage, and the standard of well-being in relation to wage.

(1) *Distribution and Use.*—Economy in the Greek sense begins at this point—the use of means and resources. Political economy ignores it. Yet from the point of view of charity it is cardinal to the whole issue. The distribution of wage may or may not be largely influenced by trades unions; but the variation of wage, as is generally the case, by the increase or decrease of a few pence is of less importance than its use. Comparing a careful and an unthrifty family, the difference in use may amount to as much as a third on the total wage. Mere abstention from alcohol may make, in a normal family, a difference of 6s. in a wage of 25s. On the other hand, membership of a friendly society is at a time of sickness equivalent to the command of a large sum of money, for the common stock of capital is by that means placed at the disposal of each individual who has a share in it. Further, even a small amount saved may place the holder in a position to get a better market for his labour; he can wait when another man cannot. Rent may be high, but by co-operation that too may be reduced. Other points are obvious and need not be mentioned. It is evident that while the amount of wage is important, still more important is its use. In use it has a large expansive value. (2) *Supplementation of Wage.*—The exchange between skill and wage must be free if it is to be valid. The less the skill the greater is the temptation to philanthropists to supplement the lesser wage; and the more important is non-supplementation, for the skilled can usually look after their own interests in the market, while the less skilled, because their labour is less marketable, have to make the greater effort to avoid dependence. But the dole of endowed charities, outdoor relief, and any constant giving, tend to reduce wage, and thus to deprive the recipients of some part of the means of independence. The employer is pressed by competition himself, and in return he presses for profit through a reduced wage, if circumstances make it possible for the workman to take it. And thus a few individuals may lower the wages of a large class of poorly skilled or unskilled hands. In these conditions unionism, even if it were likely to be advantageous, is not feasible. Unionism can only create a coherent unit of workers where there is a limited market and a definite saleable skill. Except for the time, insufficient wage will not be remedied in the individual case by supplementation in any form—doles, clothes, or other kinds of relief; and in that case, too, the relief will probably produce lessened energy after a short time, or in other words lessened ability to live. An insufficient wage may be prevented by increasing the skill of the worker, who will then have the advantage of a better series of economic exchanges, but hardly otherwise. If the supplementation be not immediate, but postponed, as in the case of old-age pensions, its effect will be similar. To the extent of the prospective adventitious gain the attraction to the friendly society and to mutual help and saving will grow less. Necessity has been the inventor of these; and where wage is small, a little that would otherwise be saved is quickly spent if the necessity for saving it is removed. Only necessity schools most men, especially the weak, to whom it makes most difference ultimately, whether they are thrifty or whether or not they save for the future in any way. (3) *The Standard of Well-being or Comfort in Relation to Wage.*—With an increase of income there has to be an increase in the power to use income intelligently. Whatever is not so used reacts on the family to its undoing. Constantly when the wife can earn a few shillings a week, the husband will every week idle for two or three days. So also if the husband finds that in a few days he can earn enough to meet what he considers to be his requirements for the week. In these circumstances the standard of well-being falls below the standard of wage; the wage is in excess of the energy and intelligence necessary to its economic use, and in these cases ultimately pauperism often ensues. The family is demoralized. Thus, with a view to the prevention of distress in good times, when there is the less poverty there is the more need of charity, rightly understood; for charity would strive to promote the right use of wage, as the best means of preventing distress and preserving the economic well-being of the family.

Charity and socialism.

The theory of charity separates it entirely from socialism, as that word is commonly used. Strictly socialism means, in questions affecting the community, a dominant regard for the common or social good in so far as it is contrary to private or individual advantage. But even so the antithesis is misleading, for the two need not be inconsistent. On the contrary, the common good is really and ultimately only individual good (not advantage) harmonized to a common end. The issue, indeed, is that of old Greek days, and the conditions of a settlement of it are not substantially different. In fact, however, the word socialism is used to mean the acquisition of class benefits of a personal nature for a particular class, usually called the working or labouring class, at the expense of the rest of the community. In this sense the *annona civica*, the poor-law, and old-age pensions, and many other schemes, are social-

istic. And, as has been shown, since they injure the family and weaken independence, they cannot be charitable. They are naturally associated with regulated or statutory labour, whether in connexion with a statute of wages or the laws of a trades union, for where such measures fail, or seem to fail to provide a sufficient livelihood, relief in some form is called in to supplement the actual or assumed deficiency. Thus charity and socialism, in the usual meaning of the word, imply two quite different theories of social life, and are not in any way compatible.

The springs of charity lie in sympathy and religion. To organize it is to give to it the "ordered nature" of an organic whole, to give it a definite social purpose, and to associate the members of the community for the fulfilment of that purpose. This in turn depends on the recognition of common principles, the adoption of a common method, self-discipline and training, and co-operation. In a mass of people there may be a large variation in motives coincident with much unity in action. Thus there may be acceptance of a common social purpose in charity, while in one the impulse is similar to that which moved St Francis or George Herbert, in another to that which moved Howard or Dr Chalmers, or a modern poor-law reformer like Nicholls or Denison. Accepting, then, the principles of charity, we pass to the method in relation to assistance and relief. Details may vary, but on the following points there is general agreement among students and workers:—

The organization of charity.

(1) *The Committee or Conference.*—There are usually two kinds of local relief: the public or poor-law relief, and relief connected with religious agencies. Besides, there is the relief of endowments, societies, and charitable persons. Therefore, as a condition precedent to all organization, there must be some local centre of association for information and common help. A town should be divided for this purpose into manageable areas coincident with parishes or poor-law divisions, or other districts. Subject to an acceptance of general principles, those engaged in charity should be members of a local conference or committee, or allied to it. The committee would thus be the rallying-point of a large and somewhat loosely knit association of friends and workers. (2) *Inquiry, Aid, and Registration.*—The object of inquiry is to ascertain the actual causes of distress or dependence, and to carry on the work there must usually be a staff of several honorary and one or two paid workers. Two methods may be adopted: to inquire in regard to applications for help with a view to forming some plan of material help or friendly aid, or both, which will lead to the ultimate self-support of the family and its members, and, under certain conditions, in the case of the aged or sick, to their continuous or their sufficient help; or to ascertain the facts partly at once, partly by degrees, and then to form and carry out some plan of help, or continue to befriend the family in need of help, in the hope of bringing them to conditions of self-support, leaving the work of relief entirely to other agencies. The committee in neither case should be a relief committee—itself a direct source of relief. On the former method it has usually no relief fund, but it raises from relations, employers, charities, and charitable persons the relief required, according to the plan of help agreed upon, unless, indeed, it is better not to relieve the case, or to leave it to the poor-law. The committee thus makes itself responsible for endeavouring to the best of its ability to raise the necessary relief, and acts as trustee for those who co-operate without it, in such a way as to keep intact and give play to all the natural obligations that lie within the inner circles of a self-supporting community. On the latter method the work of relief is left to general charity, to the private persons, or to the poor-law, to whom the case is notified; and the effort is made to help the family to self-support by a friendly visitor. This procedure is that adopted by the associated charities in Boston, Mass., and other similar societies in America. The method of associated help, combined with personal work, represents the usual practice of charity organization societies. *Mutatis mutandis*, the plan can be adopted on the simplest scale in parochial or other relief committees, subject to the safeguards of sufficient training and settled method. The inquiry should cover the following points: names and address, and ages of family, previous addresses, past employment and wages, present income, rent and liabilities, membership of friendly or other society, and savings, relations, relief (if any) from any source. These points should be verified, and reference should be made to the clergy, the poor-law authorities, and others, to ascertain if they know the applicant. The result should be to show how the applicant has been living, and what are the sources of possible help, and also what is his character. The problem, however, is not whether the person is "deserving" or "undeserving," but whether, granted the facts, the distress can be stayed and self-support attained. If the help can be given privately from within the circle of the family, so much the better. Often it may be best to advise, but not to interfere. In some cases but little help may be necessary; in others again the friendly relation between applicant and friend may last for months and even years. Usually in charitable work the question of the kind of relief available—money, tickets, clothes, &c.—governs the decision how the case should be assisted. But this is quite wrong: the opposite is the true rule. The wants of the case, rightly understood, should govern the decision as to what charity should do and what it should provide. Cases are overwhelming in number, as at the out-patient and casualty departments of a hospital, where the admissions are made without inquiry, and subject practically to no restrictions; but when there is inquiry, and each case is seriously considered and aided with a view to self-support, the numbers will seldom be overwhelming. On this plan appeal is made to the strength of the applicant, and requires an effort on his part. Indiscriminate relief, on the other hand, attracts the applicant by an appeal to his weakness, and it requires of him no effort. Hence, apart even from the differentiating effect of inquiry, one method makes applicants, the other limits their number, although on the latter plan much more strenuous endeavours be made to assist the lesser number of claimants. For the routine work of the office an extremely simple system of records with card index, &c., has been devised. In some cities, particularly in the United States of America, there is a central registration of cases, notified by individual charities, poor-relief authorities, and private persons. The system of charity organization or associated charity, it will be seen, allows of the utmost variety of treatment, according to the difficulties in each instance and the remedies available, and the utmost scope for personal work. (3) *Training.*—If charitable work is an art, those who undertake it must needs be trained both in practice and method and in judgment. It requires, too, that self-discipline which blends intelligence with emotion, and so endows emotion with strength and purpose. In times of distress a reserve of trained workers is of the utmost service. At all times they do more and produce, socially, better results; but when there is general distress of any kind they do not lose their heads like new recruits, but prevent at least some of the mischief that comes of the panic which often takes possession of a community, when distress is apprehended, and leads to the wildest distributions of relief. Also trained workers make the most useful poor-law guardians, trustees of charities, secretaries of charitable societies, and district visitors. All clergy and ministers and all medical men who have to be engaged in the administration of medical relief should learn the art of charity. Poor-law guardians are usually elected on political or general grounds, and have no special knowledge of good methods of charity; and trustees are seldom appointed on the score of their qualifications on this head. To provide the necessary education in charity there should be competent helpers and teachers at charity organization committees and elsewhere, and an alliance for this purpose should be formed between them and professors and teachers of moral science and economics and "settlements." Those who study social problems in connexion with what a doctor would call "cases" or "practice" see the limits and the falsity of schemes that on paper seem logical enough. This puts a check on the influence of scheme-building and that literary sensationalism which makes capital out of social conditions. (4) *Co-operation.*—Organization in charity depends on extensive co-operation, and ultimately on the acceptance of common views. This comes but slowly. But with much tribulation the goal may be reached, if in case after case the effort is made to provide friendly help through charities and private persons, unless, as may well be, it should seem best not to interfere, but to leave the applicant to apply to the administrators of public relief. Experience of what is right and wrong in charity is thus gained on both sides. Many sources may have to be utilized for aid of different kinds even in a single case, and for the prevention of distress co-operation with members of friendly societies and with co-operative and thrift agencies is indispensable.

The poor-law.

Where there is accord between charity and the poor-law pauperism may be largely reduced. The poor-law in most countries has at its disposal certain institutional relief and out-door allowances, but it has no means of devising plans of help which may prevent application to the rates or "take" people "off the rates." Thus a widow in the first days of widowhood applies and receives an allowance according

to the number of her children. Helped at the outset by charity on some definite plan, she may become self-supporting; and if her family be large one or two of her children may be placed in schools by the guardians, while she maintains the remaining children and herself. As far as possible there should be a division of labour between the poor-law and charity. Except where some plan such as that just mentioned is adopted, one or the other should take whole charge of the case relieved. There should be no supplementation of poor-law relief by charity. This will weaken the strength and dissipate the resources of charity without adding to the efficiency of the poor-law. Unless the guardians adopt a restrictive out-door relief policy, there is no scope for any useful division of labour between them and charity; for the many cases which, taken in time, charity might save from pauperism, they will draw into chronic dependence by their allowances a very much larger number. But if there is a restrictive out-door policy, so far as relief is necessary, charity may undertake to meet on its own lines distress which the poor-law would otherwise have met by allowances, and, subject to the assistance of urgent cases, poor-law relief may thus by degrees become institutional only. Then, in the main, natural social forces would come into play, and dependence on any form of *annona civica* would cease.

Open-handed hospitality always creates mendicants. This is what the hospitals offer in the out-patient and casualty departments, and they have created a class of hospital mendicants. The cases are quickly dealt with, without inquiry and without regard to home conditions. The medical man in the hospital does not co-operate with any fellow-workers outside the hospital. Where his physic or advice ceases to operate his usefulness ceases. He regards no conditions of morality. In a large number of cases drink or vice is the cause of application, and the cure of the patient is dependent on moral conditions; but he returns home, drinks, and may beat his wife, and then on another visit to the hospital he will again be physicked, and so on. The man is not even referred to the poor-law infirmary for relief. Nor are conditions of home sanitation regarded. One cause of constant sickness is thus entirely overlooked, while drugs, otherwise unnecessary, are constantly given at the hospital. The hospitals are thus large isolated relief stations which are creating a new kind of pauperism. So far as the patients can pay—and many can do so—the general practitioners, to whom they would otherwise go, are deprived of their gains. Still worse is it when the hospital itself charges a fee in its out-patient department. The relief is then claimed even more absolutely as a right, and the general practitioners are still further injured. The doctors, as a medical staff, are not only medical men, but, whether they recognize the fact or not, they are also almsgivers or almoners; what they give is relief. Yet few or none of them have ever been trained for that work, and consequently they do not realize how very advantageous, even for the cure of their own patients, would be a thorough treatment of each case both at the hospital and outside it. Nor can they understand how their methods at present protract sickness and promote habitual dependence. Were this side of their work studied by them in any way they would be the first, probably, to press upon the governors of their hospitals the necessity for a change. Unfortunately, at present the governors are themselves untrained, and to finance the hospital and to make it a good institution is their sole object. Hospitals, however, are, after all, only a part of the general administration of charity, though as they are now managed they have seldom any systematic connexion with that administration. Nor is there any co-ordination between the several hospitals and dispensaries. If one rightly refuses further treatment to certain applicants, they have only to wander to some other hospital, there to be admitted with little or no scrutiny. For usually out-patients and casualty patients are not even registered, nor can they be identified if they apply again. Practically they come and go at will. The definite limitation of cases, according to some standard of effectual work, association with general charity, trained almonership and inquiry, and a just regard for the interests of general practitioners, are stepping-stones to reform. In towns where medical charities are numerous a representative board would promote mutual help and organization.

Hospitals.

Like the poor-law, endowed charities may be permanent institutions established to meet what should be passing and decreasing needs (cf. the arguments in *The State and Charity*, by T. Mackay). Administered as they usually are in isolation—apart from the living voluntary charities of the generation, and consisting often of small trusts difficult to utilize satisfactorily, they tend to create a permanent demand which they meet by fixed quantities of relief. Also, as a rule, they make no systematic inquiries with a view to the verification of the statements of the applicants, for they have no staff for these purposes; nor have they the assistance of almoners or friendly visitors. Nor does the relief which they give form part of any plan of help in conjunction with other aid from without; nor is the administration subject to frequent inspection, as in the case of the poor-law. All these conditions have led to a want of progress in the actual administration of endowed charities, in regard to which it is often very difficult to prevent the exercise of an undue patronage. But there is no reason why these charities should not become a responsible part of the country's administration, aiding it to reduce outdoor pauperism. It was never intended that the poor-law should extinguish the endowed charities, still less, as statistics now prove, that where endowments abound the rate of pauperism should be considerably above the average of the rest of the country. This shows that these charities often foster pauperism instead of preventing it. As a step to reform, the publication of an annual register of endowed charities in England and Wales is greatly needed. The consolidating schemes of the charity commissioners have done much good; still more may be done in some counties by extending to the county the benefits of the charities of well-endowed towns, as has been accomplished by the extension of the eleemosynary endowments of the City of London to the metropolitan police area. Nor, again, until quite lately, and that as yet only in one or two schemes, has the principle been adopted that pensions or other relief should be given only in supplementation of the relief of relations, former employers, and friends, and not in substitution of it. Hence hitherto, in the main, the system has tended to weaken the family and to pauperize.

Endowed charities.

In many places funds are raised for the relief of school children by the supply of meals during the winter and spring. Usually a very large number of children are said to be underfed, but inquiry shows that such statements may be taken as altogether excessive. They are sometimes based on information drawn from the children at school, or sometimes on general deductions; they are seldom founded on any systematic and competent inquiry at the homes. When this has been made, the numbers dwindle to very small proportions. Teachers of experience have noted the effect of the meals in weakening the independence of the family. While they are forthcoming women sometimes give up cooking meals at home, use their money for other things, and tell the child he can get his meal at school. Great temptations are put before a parent to neglect her family, and very much distress is due to this. The meals—just at a time when, owing to the age of her children, the mother's care is most needed, and just in those families where the

Relief to children at school.

temptation is greatest and where the family instinct should be strengthened—stimulate this neglect. So in the case of the fathers: men who are lazy, and whose wives can earn a little, get the benefit of this help, and work for two or three days a week instead of for the whole week. Winter after winter, hard or mild, the meals are given, forgetful of the fact that man is made provident and responsible only by the pressure of nature; and thus winter, with its possibilities of want of employment, provides one of the strongest incentives to the practice of thrift, which, if it be encouraged, will do more for the health and contentment of the children than the meals of all their school life. Such relief, indeed, is wrong by all the canons of reasonable charity, and, appealing to the weakness of the poor, it creates an increasing demand which it cannot meet. Thus, for instance, in Paris the municipal subvention for the meals rose from 545,900 francs in 1892 to 912,885 francs in 1897, and the number of meals from 6,971,340 to 8,229,870. *Mutatis mutandis* the same result follows when charitable funds for the same purpose are forthcoming. The cause of distress in these cases is usually to be found in the home; the cases are comparatively few; being few, they should be systematically dealt with individually, with the object of preserving the family life; or, if the family be so vicious that its true life is entirely lost, and there is no alternative, as privately as possible some separate provision should be made for the children, so that they may grow up strong and healthy, to become the fathers and mothers of healthy families when they in turn make their start in life.

Exceptional distress.

At a time of exceptional distress the following suggestions founded on much English experience may be of service. Usually at such a time proposals are made to establish special funds, and to provide employment to men and women out of work. But it is best, if possible, and as long as possible, to rely on existing agencies and to strengthen them. Round them there are usually workers more or less trained. A new fund usually draws to it new people, many of whom may not have had any special experience at all. If a new fund is inevitable, it is best that it should make its grants to existing agencies after consultation with them. In any case a clear policy should be adopted, and people should keep their heads. The exaggeration of feeling at a time of apprehended or actual distress is sometimes extraordinary, and the unwise action which it prompts is often a cause of continuing pauperism afterwards. Where there is public or poor-law relief the following plan may be adopted:—In any large town there are usually different recognized poor-law, charitable, or other areas. The local people already at work in these areas should be formed into local committees. In each case a quick inquiry should be made, and the relieving officer communicated with, some central facts verified, and the home visited. Roughly, cases may be divided into three classes: the irresponsible casual labouring class; a middle class of men with decent homes, who have made no provision for the future, and are not members of either friendly society or trades union; and a third class, who have made some provision. These usually are affected last of all; at all hazards they should be kept from receiving public relief, and should be helped, as far as possible, privately and personally. If there are public works, the second class might be referred to them; if there are not, probably some should be left to the poor-law, some assisted in the same way as members of class three. Much would turn upon the family and the home. The first class should be left to the poor-law. If there is no poor-law system at work they should be put on public works. Working men of independent position, not the creatures of any political club, but such as are respected members of a friendly society or are otherwise well qualified for the task, should be called into consultation. The relief should be settled according to the requirements of each case, but, if the pressure is great, at first at least it may be necessary to make grants according to some generally sufficient scale. There should be as constant a revision of cases as time permits. Great care should be taken to stop the relief as soon as possible, and to do nothing to make it the stepping-stone to permanent dependence.

As an alternative to relief, employment on public works is often suggested. It must be remembered, however, that where there is distress nothing should be done to prevent the migration of the workman, nothing to attract unsettled labour or vagrancy to the town. Employment, artificially provided, may cause as many difficulties as relief. If resort must be had to it, it should be work within the skill of all; it should be fairly remunerated, so that at least the scantiness of the pay may not be an excuse for neglect; and it should be paid for according to measured or piece work. The discipline should be strict, though due regard should be paid at first to those unaccustomed to digging or earthwork. In England and Wales the guardians have power to open labour yards. These, like charities which provide work, tend to attract and keep in employment a low class of labourer or workman, who finds it pays him to use the institution as a convenience. It is best, therefore, to avoid the opening of a labour yard, if possible. If it is opened, the discipline should be very strict, and when there is laziness or insubordination, relief in the workhouse should at once be offered. The relief furnished to men employed in a labour yard, of which in England at least half has to be given in kind, should, it has been said, be dealt out from day to day. This leads to the men giving up the work sooner than they otherwise would. They have less to spend.

Vagrancy.

In some of the English colonies Homeric hospitality still prevails, but by degrees the station-house or some refuge is established in the towns as they grow more populous. Finally, some system of labour in exchange for relief is evolved. At first this is voluntary, afterwards it is officially recognized, and finally it may become part of the system of public relief. As bad years come, these changes are made step by step. In England the vagrant or wayfarer is tolerated and discouraged, but not kept employed. He should maintain himself, it is thought. His relief is public relief, and now, usually after he has had a bath and food, he is admitted to a separate room or cell in a casual ward. Before he leaves he has to do a task of work, and, subject to the discretion of the master, he is detained two nights. This plan has reduced vagrancy, and, if it were universally adopted, clean accommodation would everywhere be provided for the vagrant without the attractions of a common or "associate" ward; and probably vagrancy would diminish still further. It seems almost needless to say that in these circumstances, at any rate, casual alms should not be given to vagrants. They know much better how to provide for themselves than the almsgiver imagines, for vagrancy is in the main a mode of life not the result of any casual difficulty. Vagrancy and criminality are also nearly allied. The magistrate, therefore, rather than the almsgiver, should usually interfere; and, as a rule, where the magistrates are strict vagrancy in a county diminishes. Still undoubtedly vagrancy has its economic side. In a bad year the number of tramps is increased by the addition of unskilled and irresponsible labourers, who are soonest discharged when work is slack. As a part-voluntary system under official recognition the German *Arbeiter-colonien* are of interest. This in a measure has led to the introduction of labour homes in England, the justification of which should be that they recruit the energy of the men who find their way to them, and enable them to earn a living which they could not do otherwise. In a small percentage of cases this result may be achieved. Charitable refuges or philanthropic common lodging-houses, usually established in districts where this class already congregate, only aggravate the difficulty. They give additional attractions to a vagrant and casual life, and make it more endurable. They also make a comfortable avoidance of the responsibilities of family life comparatively easy, and, in so far as they do this, they are clearly injurious to the community.

United States of America.

The English colonists of the New England states and Pennsylvania introduced the disciplinary religious and relief system of Protestantism and the Elizabethan poor-law. To the former reference has already been made. With an appreciation of the fact that the cause of distress is not usually poverty, but weakness of character and want of judgment, and that relief is in itself no remedy, those who have inherited the old Puritan traditions have, in the light of toleration and a larger social experience, organized the method of friendly visiting, the object of which is illustrated by the motto "Not alms, but a friend." To the friendship of charity is thus given a disciplinary force, capable of immense expansion and usefulness, if the friendship on the side of those who would help is sincere and guided by practical knowledge and sagacity, and if on the side of those in distress there is awakened a reciprocal regard and a willingness to change their way of life by

degrees. Visiting by "districts" is set aside, for "friendliness" is not a quality easily diffused over a wide area. To be real it must be limited as time and ability allow. Consequently, a friendly visitor usually befriends but one or two, or in any case only a few, families. The friendly visitor is the outcome of the movement for "associated charities," but in America charity organization societies have also adopted the term and to a certain extent the method. Between the two movements there is the closest affinity. The registration of applicants for relief is much more complete in American cities than in England, where the plan meets with comparatively little support. At the office of the associated charities in Boston there is a central and practically a complete register of all the applications made to the public authority for poor relief, to the associated charities, and to many other voluntary bodies.

The Elizabethan poor-law system, with the machinery of overseers, poor-houses, and out-door relief, is still maintained in the New England states and Pennsylvania, but with many modifications, especially in New York State. A chief factor in these changes has been immigration. While the county or town remained the administrative area for local poor relief, the large number of immigrant and "unsettled" poor, and the business connected with their removal from the state, entailed the establishment of a secondary or state system of administration and aid, with special classes of institutions to which the counties or towns could send their poor, as, for instance, state reform schools, farms, almshouses, &c. For the oversight of these institutions, and often of prisons also and lunatic asylums, in many states there have been established state boards of "charity or corrections and charity." The members of these boards are selected by the state for a term of years, and give their services honorarily. There are state boards in Massachusetts, New York, Rhode Island, Pennsylvania, Minnesota, Michigan, Wisconsin, Iowa, Colorado, and elsewhere. There is also a district board of charities in the district of Columbia. These boards publish most useful and detailed reports. Besides the state board there is sometimes also, as in New York State, a State Charities Aid Association, whose members, in the counties in which they reside, have a legal right of entry to visit and inspect any public or charitable institution owned by the state and any county and other poor-house. A large association of visitors accustomed to inspect and report on institutions has thus been created. Further, the counties and towns in New York State, for instance, and Massachusetts, and the almshouse districts in Pennsylvania, are under boards of supervision. Usually the overseers give out-door relief, and the pauperism of some areas is as high as that in some English unions, 3, 4, and 5 per cent. On the whole population of the States, however, and of individual states, consisting to a great extent of comparatively young and energetic immigrants, the pauperism is insignificant. In Massachusetts "it has been the general policy of the state to order the removal to the state almshouse of unsettled residents of the several cities and towns in need of temporary aid, thus avoiding some of the abuses incident to out-door relief." In New York State, in the city of New York, including Brooklyn, the distribution of outdoor relief by the department of charities is forbidden, except for purposes of transportation and for the adult blind. Most counties in the state have an almshouse, and the county superintendents and overseers of the poor "furnish necessary relief to such of the county poor as may require only temporary assistance, or are so disabled that they cannot be safely removed to the almshouse." Public attention is in many cases being drawn to the inutility and injury of out-door relief.

In some states and cities the system of subsidizing voluntary institutions is in full force, and it is in force also in many English colonies. At first sight it has the advantage of providing relief for public purposes without the creation of a new staff or establishment. There is thus an apparent economy. But the evils are many. Political partisanship and favour may influence the amount and disposition of the grants. The grants act as a bounty on the establishment and continuance of charitable institutions, homes for children, hospitals, &c., but not on the expansion of the voluntary charitable funds and efforts that should maintain them; and thus charitable homes exist in which charity in its truer sense may have little part, but in which the chief motive of the administration may be to support sectarian interests by public subsidies. Claimants for relief have little scruple in turning such institutions to their own account; and the institutions, being financially irresponsible, are not in these circumstances scrupulous on their side to prevent a misdirection of their bounties. "Parents unload their children upon the community more recklessly when they know that such children will be provided for in private orphan asylums and protectories, where the religious training that the parents prefer will be given them" (Amos G. Warner, in *International Congress: Charities and Correction*, 1893). Sometimes, as in New York, the admission is entirely in the hands of the managers. They admit; the city pays. In New York City the population between 1870 and 1890 increased about 80 per cent.; the subsidies for prisoners and public paupers increased by 43 per cent., but those for paupers in private institutions increased from $334,828 to $1,845,872, or about 461 per cent. The total was at that time $3,794,972; in 1898 it was rather less, $3,132,786. The alternative to this system is either the establishment of state or municipal institutions, and possibly in special cases payments to voluntary homes for the maintenance of inmates admitted at the request of a state authority, as at certified and other homes in England, with grants made conditional on the work being conducted on specified lines, and subject to a certain increasing amount of voluntary financial support; or a close general and financial inspection of charitable institutions; or payment for only those inmates who are sent by public authorities and admitted on their request.

The enormous extent to which children's aid societies have been increased in the United States, sometimes with the help of considerable public grants, suggests the greatest need for caution from the point of the preservation of the family as the central element of social strength in the community. The problem of charity in relation to medical relief in the large towns of the United States is similar to that of England: its difficulties are alike.

BOOKS.—As good translations of the classics become accessible it is easy for the general reader or student to combine a study of the principles of charity in relation to the community with a study of history. Thus, and in connexion with some special investigations (such as those made by Mr Charles Booth) and the conditions of practical charity, social economics may best be studied. In *Chalmers on Charity*, N. MASTERMAN (1900), *Methods of Social Reform*, T. MACKAY, and *Some Aspects of the Social Problem*, this point of view is generally assumed. For the history of charity there is no good single work. On details there are many good articles in Daremberg's *Dictionary of Classical Antiquities*, and in other similar works. Apart from books and official documents mentioned in the text as to the present state of charitable and public relief, or as aids to practical work, the following may be of service:—**England**: *Annual Charities' Register and Digest, with Introduction on "How to help Cases of Distress"* (1901); the *Charity Organisation Review*; and *Reports of Proceedings of Conferences of Poor-Law Guardians*; *Occasional Papers* (two vols.), published by the London Charity Organisation Society (1896 and 1900). **United States of America**: *The Proceedings of the International Conference on Charities and Correction* (1894), and the proceedings of the annual conferences.—*Friendly Visiting among the Poor*, by MARY E. RICHMOND (1899); *American*

Charities, by AMOS G. WARNER (1895).—*Handwörterbuch der Staatswissenschaften*, Dr J. CONRAD, &c., vol. ii. supplement; *Das Armenwesen in den Vereinigten Staaten von America*, Dr FRANCIS G. PEABODY (1897).—The *Charities Review*, published monthly by the New York Charity Organisation Society. The Papers and Reports of the Boston and Baltimore societies. **France**: *La Bibliographie charitable*, by CAMILLE GRANIER (1891).—*La Charité avant et depuis 1789*, by P. HUBERT VALLEROUX.—Fascicules of the Conseil Supérieur de l'assistance publique.—*Revue d'Assistance*, published by the Société internationale pour l'étude des questions d'assistance. **Germany**: *Reports and Proceedings of the Deutsche Verein für Armenpflege und Wohlthätigkeit*; *Die Armenpflege*, a practical handbook, by Dr E. MÜNSTERBERG, 1897. **Austria**: *Oesterreichs Wohlfarts—Einrichtungen*, 1848-98; Dr ERNEST MISCHLER, 1899. (C. S. L.)

Charjui, town of Russia, Transcaspian territory, 74 miles by rail S.W. of Bokhara, and 662 miles by rail from Krasnovodsk. It is a great entrepôt for raw cotton. There is a railway bridge across the Amu-Daria.

Charkhari, a native state of India, in the Bundelkhand agency. Area, 788 square miles; population (1891), 143,108; average density, 183 persons per square mile; estimated revenue, Rs.5,00,000. The chief, whose title is maharaja, is a Rajput of the Bundela clan, descended from Chhatar Sal, the champion of the independence of Bundelkhand in the 18th century. The town of CHARKHARI is situated in 25° 44′ N. lat. and 79° 47′ E. long., about 40 miles W. of Banda.

Charleroi, a town of Belgium, in the province of Hainaut, 23 miles E. of Mons, on the Sambre, at an important junction of railways. In 1886 Socialist excesses led to sanguinary encounters with the forces of order. The output of coal still continues on an extensive scale. Population (1880), 16,372; (1897), 23,480.

Charleroi, a borough of Washington county, Pennsylvania, U.S.A., on the Monongahela river and a branch of the Pennsylvania railway. It is an iron manufacturing town of recent growth. Population (1900), 5930.

Charles (KARL EITEL ZEPHYRIN LUDWIG), King of Rumania (1839-——), second son of Prince Karl Anton of Hohenzollern, was born 20th April 1839. He was educated at Dresden, 1850-56, and passed through his university course at Bonn. Entering the Prussian army in 1859, he won considerable distinction in the Danish war of 1864, and was a captain in the 2nd regiment of Dragoon Guards when he was elected domn or lord of Rumania, 20th April 1866, after the compulsory abdication of Prince Alexander John Couza. Regarded at first with distrust by Turkey, Russia, and Austria, he succeeded in gaining general recognition within six months; but he had to contend for ten years with the fierce party struggles that raged between the Boyars and the Liberals until the latter were finally victorious in 1876. During this period, however, Charles displayed great tact in his dealings with both parties, and kept his country in the path of administrative and economical reform, organizing the army, developing the railways, and establishing commercial relations with foreign powers. The sympathy of Rumania with France in the Franco-Prussian war, and the consequent interruption of certain commercial undertakings, led to a hostile movement against Prince Charles, which, being fostered by Russia, made him resolve to abdicate, and it was with difficulty that he was persuaded to remain. In the Russo-Turkish war of 1877-78 he hurried to the help of the Russians before Plevna, and being placed in command of the combined Russian and Rumanian forces, he captured the enemy's camp and took Osman Pasha prisoner. As a consequence of the prince's vigorous action the independence of Rumania, which had been proclaimed in May 1877, was confirmed by various treaties in 1878, and recognized by Great Britain, France, and Germany in 1880. On 26th March 1881 Prince Charles (Carol) was proclaimed king of Rumania, and was crowned with his consort on the 23rd May following. From that time he has pursued a successful career in home and foreign policy, and has raised the financial and military position of his country far beyond that of the other Balkan states, while his appreciation of the fine arts has been shown by the formation of an important collection of paintings of all schools in his palaces at Sinaïa and Bucarest. His consort, the Queen ELIZABETH (Pauline Elizabeth Ottilie Louise), widely known by her literary name "Carmen Sylva," was born 29th December 1843, being the daughter of Prince Hermann of Neuwied. She first met the future king of Rumania at Berlin in 1861, and was married to him 15th November 1869. Early distinguished by her excellence as a pianist, organist, and singer, she also showed considerable ability in painting and illuminating; but a lively poetic imagination has led her to the path of literature, and more especially to poetry, folklore, and ballads. In addition to numerous original works, she has put into literary form many of the legends current among the Rumanian peasantry. In the Russo-Turkish war of 1877-78 she devoted herself to the care of the wounded, and founded the Order of Elizabeth (a gold cross on a blue ribbon) to reward distinguished service in such work. She fostered the higher education of women in Rumania, and established societies for various charitable objects. The following is the chronicle of her literary work, the books marked with an asterisk being written in collaboration with Frau Mite Kremnitz:—1880, *Sappho*, *Hammerstein*; 1881, *Stürme*, *Rumänische Dichtungen* (translations); 1882, *Leidens Erdengang*, *Jehovah*, *Ein Gebet*, *Pensées d'une Reine*, *Die Hexe*, *Aus Zwei Welten**; 1883, *Das Leben meines Bruders*, *Aus Carmen Sylva's Königreich* (in two parts: I. *Pelesch-Märchen*; II. *Durch die Jahrhunderte*); 1884, *Handzeichnungen*, *Mein Rhein*, *Meine Ruh*, *Pelesch im Dienst*; 1885, *Mein Buch*; 1886, *Feldpost*, *Astra*,* *Anna Boleyn**; 1887, *Es Klopft*, *In der Irre**; 1888, *Cuvinte Sufletesci*, *Rache*,* *Islandfischer* (from the French of Pierre Loti); 1889, *Lieder aus dem Dimbovitzathal* (from the Rumanian of H. Văcărescu); 1890, *Frauenmuth*, *Deficit*, *Vom Amboss*; 1891, *Handwerkerlieder*, *Meerlieder*, *Heimath*, *Weihnachtskerzchen*; 1892, *Meister Manole*, *Bucarest* (in *Les Capitales du Monde*).

As the only child of the marriage, a daughter, died in 1874, the succession was finally settled upon the king's nephew, Prince Ferdinand of Hohenzollern-Sigmaringen, who was created prince of Rumania, 18th March 1889, and who married, on 10th January 1893, Princess Marie, daughter of the late Duke Alfred of Saxe-Coburg. Their children are Prince Carol (b. 1893) and Princess Elizabeth (b. 1894).

Charleston, capital of Coles county, Illinois, U.S.A., at the intersection of the Cleveland, Cincinnati, Chicago, and St Louis, and the Toledo, St Louis, and Kansas City railways. Population (1890), 4135; (1900), 5488, of whom 139 were foreign-born and 45 negroes.

Charleston, the principal city and seaport of South Carolina, U.S.A., capital of Charleston county, situated on a peninsula between Ashley and Cooper rivers in 32° 46′ N. lat. and 79° 56′ W. long. It has three railways, the Atlantic Coast Line, the Plant System, and the South Carolina and Georgia, which bring to it the products of the interior—cotton, phosphates, and turpentine. The bar at the entrance to its deep and spacious harbour has been cut away by the use of jetties, so as to make entrance for vessels of 24·5 feet draught. In 1898 the export trade amounted to $11,440,130, and consisted mainly of cotton and phosphates. There are regular

steamship lines to the great northern and southern seaports. Charleston is thus a commercial rather than a manufacturing city, but its manufactures had in 1898 a capital of $7,345,000, employed 5500 persons, and the output was valued at $9,000,000. The College of Charleston, founded in 1785, had in 1898 a faculty of six professors and an attendance of 36 students. It had property valued at $372,000, and an income of $12,627. The city contains also the South Carolina Military Academy. The assessed valuation of real and personal property (the former being assessed on a basis of about 40 per cent. of the full value) was in 1900, $17,246,142, the net debt of the corporation was $3,798,200, and the municipal tax rate $29.50 per $1000. The death-rate in 1900 was 37·5 per 1000. In 1886 an earthquake destroyed a large part of the city, and many lives were lost, but the city has been rebuilt and few traces of the disaster remain. Population (1880), 49,984; (1890), 54,955; (1900), 55,807, of whom 2592 were foreign-born and 31,522 were negroes. Out of 14,167 males of voting age 2259 were illiterate (unable to write), of whom 2163 were negroes. The city has profited by the deepening of its harbour entrance, and also by the discovery of valuable beds of phosphates in the neighbourhood.

Charleston, a city of West Virginia, U.S.A., capital of Kanawha county and of the state. It is situated near the centre of the state, in 38° 22′ N. lat. and 81° 38′ W. long., on the north bank of Kanawha river, at the mouth of Elk river, at an altitude of 600 feet. It has a level site on land lying above the river, and the plan is regular. Among its buildings is a fine new state capitol. It is on the main line of the Chesapeake and Ohio railway, and is entered by two smaller railways. It has large traffic by rail and river, especially in the shipment of bituminous coal. This is mined from horizontal beds, which outcrop on the face of the river bluffs in the neighbourhood. Population (1880), 4192; (1890), 6742; (1900), 11,099.

Charlotte, capital of Mecklenburg county, North Carolina, U.S.A., situated in the south-western part of the state, on the Southern railway and on two branches of the Seaboard Air line. It is at an altitude of 725 feet, is surrounded by a fertile farming district, and is a shipping-point for cotton and tobacco. Biddle University and Elizabeth College are situated in this place. Population (1880), 7094; (1890), 11,557; (1900), 18,091, of whom 287 were foreign-born and 7151 were negroes.

Charlottenburg, a town of Prussia, on the Spree, lying immediately to the west of Berlin, of which it practically forms the entire western suburb. Although retaining its own municipal government, it was in 1900, together with the adjacent suburban towns of Schöneberg and Rixdorf, included in the police district of the capital. Of new public buildings, the technical academy and the Kaiser Wilhelm memorial church are referred to in the article Berlin. There are also a new Catholic church and two high schools for music and art respectively. It was in the Schloss that the Emperor Frederick III. took over the reins of government in 1888, and resided for nearly the whole of his three months' reign. In the mausoleum in the castle grounds the Emperor William I. and the Empress Augusta lie interred in two white marble sarcophagi—masterpieces of the sculptor Encke. In addition to the famous royal porcelain manufactory, which has of late been much enlarged, Charlottenburg has many flourishing industries, notably iron-works, grouped along the banks of the Spree. Its main streets are laid out on a spacious plan, while there are many quiet streets containing pretty villa residences. Population (1880), 30,483; (1890), 76,859; (1900), 189,290.

Charlottesville, a city of Virginia, U.S.A., situated a little north of the centre of the state, in the Piedmont region, on Rivanna river, at an altitude of 451 feet. Though within Albemarle county, and containing the court-house, it is independent of the county government. It is entered by the Chesapeake and Ohio and the Southern railways. The University of Virginia, near Charlottesville, had, in 1898, 24 professors and was attended by 489 students. Its property was valued at nearly $1,500,000, and its total income was $125,000. Population (1880), 2676; (1890), 5591; (1900), 6449.

Charlottetown, a city of Canada, the capital of Prince Edward Island, situated on Hillsborough river. It is well supplied with gas, electric light, and splendid water-works, and contains 8 churches, 3 banks, 3 daily and 6 weekly newspapers, and numerous factories. It exports large quantities of butter, cheese, potatoes, &c. The head offices and workshops of the Prince Edward Island railway are situated here. For the fiscal year 1900 the exports were $1,147,574 and the imports $435,032. Population, about 12,000.

CHARTERED COMPANIES.

A CHARTERED company is a trading corporation enjoying certain rights and privileges, and bound by certain obligations under a special charter granted to it by the sovereign authority of the State, such charter defining and limiting those rights, privileges, and obligations, and the localities in which they are to be exercised. Such companies existed in early times, but have undergone changes and modifications in accordance with the developments which have taken place in the economic history of the states where they have existed. For the influence of the early trading companies on mediæval industry and commerce the reader is referred to the articles Commerce, Shipping, and Hanseatic League, in the ninth edition of this work. In Great Britain the first trading charters were granted, not to English companies, which were then non-existent, but to branches of the Hanseatic League, and it was not till 1597 that England was finally relieved from the presence of a foreign chartered company. In that year Queen Elizabeth closed the steel-yard where Teutons had been established for 700 years.

The early chartered companies.

The origin of all English trading companies is to be sought in the Merchants of the Staple. They lingered on into the 18th century, but only as a name, for their business was solely to export English products which, as English manufactures grew, were wanted at home. Of all early English chartered companies, the "Merchant Adventurers" conducted its operations the most widely. Itself a development of very early trading guilds, at the height of its prosperity it employed as many as 50,000 persons in the Netherlands, and the enormous influence it was able to exercise undoubtedly saved Antwerp from the institution of the Inquisition within its walls in the time of Charles V. In the reign of Elizabeth British trade with the Netherlands reached in one year 12,000,000 ducats, and in that of James I. the company's yearly commerce with Germany and the Netherlands was as much as £1,000,000. Hamburg afterwards was its principal depot, and it became known as the "Hamburg Company." In the "Merchant Adventurers'" enterprises is to be seen the germ of the trading companies which had so remarkable a development in the 16th and 17th centuries.

These old regulated trade guilds passed gradually into joint stock associations, which were capable of far greater extension, both as to the number of members and amount of stock, each member being only accountable for the amount of his own stock, and being able to transfer it at will to any other person.

It was in the age of Elizabeth and the early Stuarts that the chartered company, in the modern sense of the term, had its rise. The discovery of the New World, and the opening out of fresh trading routes to the Indies, gave an extraordinary impulse to shipping, commerce, and industrial enterprise throughout Western Europe. The English, French, and Dutch Governments were ready to assist trade by the granting of charters to trading associations. It is to the "Russia Company," which received its first charter in 1554, that Great Britain owed its first intercourse with an empire then almost unknown (see art. RUSSIA, *Ency. Brit.* vol. xxi.). The first recorded instance of a purely chartered company annexing territory is to be found in the action of this company in setting up a cross at Spitzbergen in 1613 with King James's arms upon it. Among other associations trading to the continent of Europe, receiving charters at this time, were the Turkey Company and the Eastland Company. Both the Russia and Turkey Companies had an important effect upon British relations with those empires. They maintained British influence in those countries, and even paid the expenses of the embassies which were sent out by the English Government to their courts. The Russia Company carried on a large trade with Persia through Russian territory; but from various causes their business gradually declined, though the Turkey Company existed in name until 1825.

The chartered companies which were formed during this period for trade with the Indies and the New World have had a more wide-reaching influence in history. The extraordinary career of the East India Company is told in *Ency. Brit.* vol. xii. p. 798.

Charters were given to companies trading to Guinea, Morocco, Guiana, and the Canaries, but none of these enjoyed a very long or prosperous existence, principally owing to the difficulties caused by foreign competition. It is when we turn to North America that the importance of the chartered company, as a colonizing rather than a trading agency, is seen in its full development. The "Hudson Bay Company," which still exists as a commercial concern, is dealt with in detail in *Ency. Brit.* vol. xii. p. 333, but most of the thirteen British North American colonies were in their inception chartered companies very much in the modern acceptation of the term. The history of these companies will be found under the heading of the different colonies of which they were the origin. It is necessary, however, to bear in mind that two classes of charters are to be found in force among the early American colonies: (1) Those granted to trading associations, which were often useful when the colony was first founded, but which formed a serious obstacle to its progress when the country had become settled and was looking forward to commercial expansion; the existence of these charters then often led to serious conflicts between the grantees of the charter and the colonists; ultimately elective assemblies everywhere superseded control by trading companies. (2) The second class of charters were those granted to the settlers themselves, to protect them against the oppressions of the Crown and the provincial governors. These were highly prized by the colonists.

In France and Holland, no less than in England, the institution of chartered companies became a settled principle of the Governments of those countries during the whole of the period in question. In France, from 1599 to 1789, more than 70 of such companies came into existence, but after 1770, when the great "Compagnie des Indes Orientales" went into liquidation, they were almost abandoned, and finally perished in the general sweeping away of privileges which followed on the outbreak of the Revolution.

Economic principles of the earlier companies.

If we inquire into the economic ideas which induced the granting of charters to these earlier companies and animated their promoters, we shall find that they were entirely consistent with the general principles of government at the time and what were then held to be sound commercial views. Under the old régime everything was a matter of monopoly and privilege, and to this state of things the constitution of the old companies corresponded, the sovereign rights accorded to them being also quite in accordance with the views of the time. It would have been thought impossible then that private individuals could have found the funds or maintained the magnitude of such enterprises. It was only this necessity which induced statesmen like Colbert to countenance them, and Montesquieu took the same view (*Esprit des Lois*, t. xx. c. 10). John de Witt's view was that such companies were not useful for colonization properly so called, because they want quick returns to pay their dividends. So, even in France and Holland, opinion was by no means settled as to their utility. In England historic protests were made against such monopolies, but the chartered companies were less exclusive in England than in either France or Holland, the governors of provinces almost always allowing strangers to trade on receiving some pecuniary inducement. French commercial companies were more privileged, exclusive, and artificial than those in Holland and England. Those of Holland may be said to have been national enterprises. French companies rested more than did their rivals on false principles; they were more fettered by the royal power, and had less initiative of their own, and therefore had less chance of surviving. As an example of the kind of rules which prevented the growth of the French companies, it may be pointed out that no Protestants were allowed to take part in them. State subventions, rather than commerce or colonization, were often their object; but that has been a characteristic of French colonial enterprise at all times.

Such companies, however, under the old commercial system could hardly have come into existence without exclusive privileges. Their existence might have been prolonged had the whole people in time been allowed the chance of participating in them.

To sum up the causes of failure of the old chartered companies, they are to be attributed to (1) bad administration; (2) want of capital and credit; (3) bad economic organization; (4) distribution of dividends made prematurely or fictitiously. But those survived the longest which extended the most widely their privileges to outsiders. According to contemporary protests, they had a most injurious effect on the commerce of the countries where they had their rise. They were monopolies, and therefore, of course, obnoxious; and it is undoubted that the colonies they founded only became prosperous when they had escaped from their yoke.

On the other hand, it must not be forgotten that they contributed in no small degree to the commercial progress of their own states. They gave colonies to the mother country, and an impulse to the development of its fleet. In the case of England and Holland, the enterprise of the companies saved them from suffering from the monopolies of Spain and Portugal, and the wars of the English, and those of the Dutch in the Indies with Spain and Portugal, were paid for by the companies. They furnished the

mother country with luxuries which, by the 18th century, had become necessaries. They offered a career for the younger sons of good families, and sometimes greatly assisted large and useful enterprises.

Chartered companies of modern times.

During the last twenty years of the 19th century there was a great revival of the system of chartered companies in Great Britain. It is a feature of the general growth of interest in colonial expansion and commercial development which has made itself felt almost universally among European nations. Great Britain, however, alone has succeeded in establishing such companies as have materially contributed to the growth of her empire. These companies succeed or fail for reasons different from those which affected the chartered companies of former days, though there are points in common. Apart from causes inherent in the particular case of each company, which necessitates their being examined separately, recent experience leads us to lay down certain general principles regarding them. The modern companies are not like those of the 16th and 17th centuries. They are not privileged in the sense that those companies were. They are not monopolists; they have only a limited sovereignty, always being subject to the control of the home Government. It is true that they have certain advantages given them, for without these advantages no capital would risk itself in the lands where they carry on their operations. They often have very heavy corresponding obligations, as will be seen in the case of one (the East Africa) where the obligations were too onerous for the company to discharge, though they were inseparable from its position. The charters of modern companies differ in two points strongly from those of the old: they contain clauses prohibiting any monopoly of trade, and they generally confer some special political rights directly under the control of the secretary of state. The political freedom of the old companies was much greater. In these charters State control has been made a distinguishing feature. It is to be exercised in almost all directions in which the companies may come into contact with matters political. Of course, it is inevitable in all disputes of the companies with foreign Powers, and is extended over all decrees of the company regarding the administration of its territories, the taxation of natives, and mining regulations. In all cases of dispute between the companies and the natives the secretary of state is *ex officio* the judge, and to the secretary of state (in the case of the South Africa Company) the accounts of administration have to be submitted for his approbation. It is deserving of notice that the British character of the company is insisted upon in each case in the charter which calls it into life. The Crown always retains complete control over the company by reserving to itself the power of revoking the charter in case of the neglect of its stipulations. There are special clauses in the charters of the British East Africa and South Africa Companies enabling the Government to forfeit their charters if they do not promote the objects alleged as reasons for demanding a charter. This binds them still more strongly, and in the case of the South Africa Company the duration of the charter is fixed at twenty-five years.

Results and limitations.

The chartered company of these days is therefore very strongly fixed within limits imposed by law on its political action. As a whole, however, very remarkable results have been achieved. This may be attributed in no small degree to the personality of the men who have had the supreme direction at home and abroad, and who have, by their social position and personal qualities, acquired the confidence of the public. With the exception of the Royal Niger Company, it would be incorrect to say that they have been financially successful, but in the domain of government and colonization they have achieved remarkable results. This may be seen more clearly by considering each case by itself, but generally it may be said that they have added vast territories to the British empire (in Africa about 1,700,000 square miles), and in these territories they have acted as a civilizing force. They have made roads, opened facilities for trade, enforced peace, and laid at all events the foundation of settled administration. It is not too much to say that they have often acted unselfishly for the benefit of the mother country and even humanity. We may instance the anti-slavery and anti-alcohol campaigns which have been carried on, the latter certainly being against the immediate pecuniary interests of the companies themselves. It must, of course, be recognized that to a certain extent this has been done under the influence of the home Government. The occupation of Uganda certainly, and of the Upper Niger territory and Rhodesia probably, will prove to have been rather for the benefit of posterity than of the companies which effected it. In the two cases where the companies have been bought out by the State, they have had no compensation for much that they have expended. In fact, it would have been impossible to take into account actual expenditure day by day, and the cost of wars. To use the expression of Sir William Mackinnon, the shareholders have been compelled in some cases to "take out their dividends in philanthropy."

The existence of such companies to-day is justified in certain political and economic conditions only. It may be highly desirable for the Government to occupy certain territories, but political exigencies at home will not permit it to incur the expenditure, or international relations may make such an undertaking inexpedient at the time. In such a case the formation of a chartered company may be the best way out of the difficulty. But it has been demonstrated again and again that, directly the company's interests begin to clash with those of foreign Powers, the home Government must assume a protectorate over its territories in order to simplify the situation and save perhaps disastrous collisions. So long as the political relations of such a company are with savages or semi-savages, it may be left free to act, but directly it becomes involved with a civilized Power the State has (if it wishes to retain the territory) to acquire by purchase the political rights of the company, and it is obviously much easier to induce a popular assembly to grant money for the purpose of maintaining rights already existing than to acquire new ones. With the strict system of Government supervision enforced by the modern charters it is not easy for the State to be involved against its will in foreign complications. Economically such companies are also justifiable up to a certain point. When there is no other means of entering into commercial relations with remote and savage races save by enterprise of such magnitude that private individuals could not incur the risk involved, then a company may be well entrusted with special privileges for the purpose, as an inventor is accorded a certain protection by law by means of a patent which enables him to bring out his invention at a profit if there is anything in it. But such privileges should not be continued longer than is necessary for the purpose of reasonably recompensing the adventurers. A successful company, even when it has lost monopoly or privileges, has, by its command of capital and general resources, established so strong a position that private individuals or new companies can rarely compete with it successfully. This is clearly shown in the case of the Hudson Bay Company as at present constituted, and it will probably be so in the case of the Niger and North Borneo Companies. In colonizing new lands these

companies often act successfully. They have proved more potent than the direct action of governments. This may be seen in Africa, where France and England have of late acquired vast areas, but have developed them with very different results, acting from the opposite principles of private and State promotion of colonization. Apart from national characteristics, the individual has far more to gain under the British system of private enterprise. A strong point in favour of some of the British companies has been that their undertakings have been practically extensions of existing British colonies rather than entirely isolated ventures. But a chartered company can never be anything but a transition stage of colonization; sooner or later the State must take the lead. A company may act beneficially so long as a country is undeveloped, but as soon as it becomes even semi-civilized its conflicts with private interests become so frequent and serious that its authority has to make way for that of the central Government.

The companies which have been formed in France during recent years do not yet afford material for profitable study, for they have been subject to so much vexatious interference from home owing to lack of a fixed system of control sanctioned by Government, that they have not been able, like the British, to develop along their own lines.

In the sketch which follows of certain chartered companies which have existed since 1880, or still exist, the application of the principles stated above may be seen.

The British South Africa Company.

South Africa in 1889.

At the time when this company received its charter of incorporation, October 1889, South Africa was inhabited by three races exclusive of native tribes—the British, the Portuguese, and the Dutch. The first named held roughly the south, the Portuguese retained little more than the eastern coast-line from Beira to Delagoa Bay, while more in the centre lay the Dutch republics of the Transvaal and Orange Free State. Germany had shortly before established herself on the west. Meanwhile in the central portion of the country north of the Transvaal and Bechuanaland lay the extensive territories of various native tribes, among whom the Mashonas and the warlike Matabele occupied the richest and largest areas. These tribes were under the sway of one powerful chief, Lo-Bengula, whose royal kraal was situated at Bulawayo. The portion of these territories known as Matabeleland had before 1889 only been traversed by explorers such as Kirk, Baines, and Livingstone, but the reports they had brought back of its fertility, and especially its mineral wealth, had excited the cupidity and enterprise of white people, and the prompt action of Mr Cecil Rhodes and others alone saved them for the British flag. Mr Rhodes, after consolidating the conflicting interests of different owners into the great diamond-mining company of De Beers, had devoted his energies to the development of South Africa, and had become the life and soul of its financial enterprises. His was the guiding hand which directed British adventure into these vast fields of promise. Before 1888 Lo-Bengula had had frequent relations with foreign "prospectors." Among them two Englishmen, Mr Baines in 1871 and Sir John Swinburne in 1872, had obtained concessions of mineral rights, but little effort had been made to put them in force. Now the neighbouring nations began to move, but in 1888 the British Government, at the instance of Sir Sidney Shippard, K.C.M.G., then administrator of British Bechuanaland, took steps which for ever excluded other nationalities from acquiring control over the country. On the 11th February of that year Lo-Bengula signed a treaty of peace and amity with Great Britain, under which he agreed that he would refrain from entering into any correspondence or treaty with any foreign State or Power without the previous knowledge and sanction of H.B.M.'s high commissioner for South Africa. Shortly after the conclusion of this treaty, representatives of influential syndicates directed by Mr Rhodes were sent, with the knowledge of the British Government and the high commissioner, to negotiate with Lo-Bengula, and on the 30th October of the same year he concluded an arrangement with Messrs Rudd, Rochfort Maguire, and Thompson, by which, in return for the payment of £100 a month made to him by the syndicate, together with 1000 Martini-Henry rifles and 100,000 rounds of ammunition, he gave the syndicate complete control over all the metals and minerals in his kingdom, with power to exclude from his dominions "all persons seeking land, metals, minerals, or mining rights therein," in which action, if necessary, he promised to render them assistance. This concession once obtained, Mr Rhodes proceeded with rapidity to prosecute his great enterprise. He extinguished the interests of earlier concessionaires by purchase (giving, for instance, £10,046 for the Baines and Swinburne interests), and then formed "The Central Search Association," with a capital of £121,000. Of this total, £92,000 was represented by shares of £1, which were distributed to the shareholders in payment of rights they had surrendered or advances made, while the rest, to the number of 29,000 shares, was subscribed in ready money to be employed in preparing the ground for future operations. This pioneer company soon merged in "The United Concessions Company." The latter undertook to explore and develop, the former bought its concessions, and they were to share equally the profits. Before long these companies became the "British South Africa Company," commonly known as the "Chartered Company."

Origin of the company.

On 30th April 1889 Lord Gifford addressed to the British Government, on behalf of the founders, an outline of a scheme for the formation of a company to develop the Bechuanaland Protectorate and the territories lying to the north. It may be stated that Bechuanaland is native territory lying north of Cape Colony, between it and what was then Lo-Bengula's land, and west of the Transvaal. Bechuanaland had been occupied by England a few years previously and divided into two parts—the south a Crown colony and the north a protectorate only. The Government, having ascertained the substantial nature of the company's resources and the composition of the proposed directorate, and also that they were prepared to begin immediately the development of the country, granted the charter which bears date 29th October 1889.

The Charter.—A few points in the charter itself deserve to be noted. In the first place, it gives a considerable extension to the terms of the original concessions by Lo-Bengula. In short, it transforms the rights of working minerals and metals, and preventing others from doing so, into rights practically sovereign over the regions in which the company's activity is to be employed. These rights the Crown grants directly itself, not merely confirming a previous grant from another source. In this it differs from charters granted to other companies. By Article X. the company was empowered to "make ordinances (to be approved by our secretary of state), and may establish and maintain a force of police." A strict supervision is provided for, to be exercised by the secretary of state over the relations between the company and the natives. It is worth noting that in clause 1 (where the sphere of the company's operations is defined) its limits are very clearly laid down on all sides but the north, where it was left by implication entirely free. The British Government reserved to itself entire power to repeal the charter at any time that it did not consider the company was fulfilling its obligations or endeavouring duly to carry out the objects for which the charter was granted. The share capital of the company was fixed at £1,000,000 in shares of £1 each. The original directors were the duke of Abercorn, the duke of Fife, Lord Gifford, Mr (afterwards Earl) Grey, Mr Cawston, Mr Rhodes, and Mr A. Beit.

History of development.

The company at the commencement of its operations had to deal with a country absolutely untouched by the hand of civilization. The size of the territory was 500,000 square miles at least, as large as France and Germany combined, ruled over by Lo-Bengula, whose power was supported by hordes of savage warriors. The only possessions of the natives were enormous herds of cattle; there was no cultivation of the soil or attempt to work its mineral riches. Of course there was at every step a grave danger of incurring the hostility of the natives. The first move of the company was to extend northwards the railway and the telegraph. In 1889 the former only went as far as Kimberley and the latter to Mafeking. The Cape Government agreed to make the railway to Vryburg, and the company was to continue it. A police force of 250 men under experienced officers was enrolled. In order to open up the new territories it was necessary to set on foot a pioneer expedition. This was done by an arrangement between the company and Mr Frank Johnson, who undertook to fit out and conduct the expedition on certain terms which included grants of reef claims and farms to each pioneer. Among the pioneers was Mr F. C. Selous, the well-known explorer. After the pioneer force had been duly inspected by General Lord Methuen, its advance was authorized by the high commissioner, and it set out in June 1890, accompanied by a force of police, the whole expedition being under the command of Lt.-Col. Pennefather. Its results were striking. It constructed a road 400 miles long, known as the "Selous Road"; it bridged streams; it established fortified stations at Tuli, Victoria, Charter, and Salisbury; it brought peace and security to Mashonaland, which had formerly been a prey to its more warlike neighbours—and all this without losing a rifle or firing a shot. Mashonaland was taken in hand by Mr A. R. Colquhoun, and its administration organized; but his health gave way, and he was succeeded by Dr Jameson. During the first two years of its occupation the white population of that country reached 3000. In 1891 the company successfully interfered to prevent a large Boer trek into the south-east portion of Matabeleland and the occupation by them of that territory by force. About this time there were serious threats that Germany would attempt to stretch her hinterland boundary across Lake Nyasa to the Congo State, but this was averted by the establishment of Forts Fife and Abercorn at the southern end of Lake Tanganyika and midway between the two lakes. The company also agreed to buy up a company called "The African Lakes Company," which had unsuccessfully endeavoured to open up the districts north of the Zambezi. This was a Scottish company founded in 1878 to protect the mission stations and to trade between the lakes of Mweru, Tanganyika, and Nyasa, but its capital had been expended in strife with the slave-traders. The shareholders in the "African Lakes Company" exchanged their shares for shares in the South Africa Company, and the latter in return acquired all their rights. By 1893 the absorption of that company in the South Africa Company was complete. In the early part of 1891 the British Government extended the field of the company's operations so as to include the whole of the British sphere immediately north of the Zambezi, except Nyasaland, towards the expense of the administration of which district the company was contributing at this time £10,000 a year. The imperial commissioner for Nyasaland was allowed to act also as administrator of the company's sphere north of the Zambezi, and in 1894 the Government took over all liabilities connected with this Nyasaland territory.

The company took early steps to open up its territory by the construction of railways and telegraphs. As has been stated, the railway running north from Cape Town went no farther than Kimberley when the company began its operations, but in November 1889 the extension was taken in hand, and by December 1890 the section to Vryburg was open, about 120 miles; and at the same time the telegraph was carried on to Mafeking; by the end of 1892 the telegraph had reached Victoria. Meanwhile prospects of mining development had brought into the country a large number of settlers, who had marked out claims.

During the first three years the opening up of Mashonaland proceeded apace. Salisbury, Umtali, and Victoria began to grow into towns, and building plots fetched at the lowest £35. The company also entered upon a regular system of agricultural development, and by the end of 1892 as many as 500 concessions of farms had been made, and the number of immigrants in 1892 reached 1121. Administration had also been satisfactorily and rapidly organized. Dr Jameson reduced the standing police force to 40, and set on foot a volunteer corps which soon had 500 members. The Transvaal burgher system was also adopted, which allows the Government to demand on necessity the services of every able-bodied citizen, supplying him at the same time with rifle and ammunition. A regular postal service was established. Under Mr Selous the road system was completed, and the headquarters of the administrator were fixed at Salisbury.

Though Mashonaland was being civilized, Matabeleland was still the home of Lo-Bengula and his savage warriors. Their continued raids into the company's territories led to war, which broke out in July 1893 and lasted till the end of the year. This war cost the company 100 men and £110,000. Lo-Bengula died, and his lands passed under the sway of the company. Charges were made against the latter of having provoked the natives in order to bring on this war, but after inquiry they were expressly exonerated from the charge by Lord Ripon, then colonial secretary. The conditions under which Matabeleland was handed over to the company were set out in the "Matabeleland Order in Council" of 18th July 1894. The administrator was given a council of four to assist him. Local taxes and customs dues were to be fixed by the company with the approbation of the secretary of state. A high court and a land commission were established. Magistracies were established, and resident magistrates and civil commissioners appointed at Salisbury, Umtali, Victoria, and Tuli, with functions similar to those exercised by like officials in Cape Colony, the law administered being the Roman-Dutch law of that colony.

During 1894 and 1895 the company continued the development of its territory, now increased to 750,000 square miles. It stretched uninterruptedly to the southern end of Lake Tanganyika in the north, *i.e.*, roughly to the 8th degree of latitude. This increase of territory led at first to a great increase of expenditure, and the original capital of £1,000,000 was raised to £2,000,000 by a resolution passed at an extraordinary meeting of the shareholders held in November 1893; and this was increased by another £500,000 in July 1895, and by further issues in 1896 and 1898.

By a proclamation of 3rd May 1895 the company's territory received officially the name of "Rhodesia," and was divided into three provinces, Mashonaland, Matabeleland, and Northern Zambezia. The two provinces comprising Southern Rhodesia were subdivided into districts. The districts, for convenience of administration, were grouped into fiscal and mining divisions, and the civil magistrates and mining commissioners were reappointed to the new divisions. A native commissioner was, as heretofore, appointed to each district, the whole being under the

control of the chief native commissioners at Salisbury and Bulawayo respectively. The system of land apportionment adopted in Mashonaland was followed in the new territory. "Stands" or plots were sold at extraordinary prices in Bulawayo; 539 fetched a total of £153,312, about £285 a stand. In within nine months Bulawayo had a population of 1900 whites, and in the various goldfields over 2000 prospectors. The construction of telegraphs proceeded with great rapidity, and by the end of 1895, 500 miles of new lines had been constructed, making about 1500 in all. A new company, the "African Transcontinental Company," had been founded under the auspices of Mr Rhodes, with the ultimate purpose of connecting the Cape with Cairo. By the end of 1895, 313 miles of these lines had been laid.

The events of 1896 brought a rude change on this smiling prospect. In that disastrous year occurred the Jameson Raid, the Mashona and Matabele revolt, and the outbreak of rinderpest, which killed nearly all the beasts of burden in the country. The rebellions were finally put down in the early part of 1897, but when the cost to the company of these misfortunes came to be reckoned up it was found to amount to at least £2,500,000 sterling. All this involved the company in a heavy debt, and in April 1898 it was resolved, at a general meeting of shareholders, to increase the capital by £1,500,000 sterling, only one-sixth of which was issued in shares at once. At the same meeting it was enthusiastically resolved to proceed again with the work of the company. In consequence of the events of 1896 the British Government imposed a new or supplemental charter on the company. This charter gave the Government a much stronger hold on the whole administration of the company than it possessed before. By this charter the power of the company to make ordinances was to pass to a legislative council to be established for Southern Rhodesia. Duly authorized agents of the secretary of state were to have access to all the company's documents. All resolutions passed by the directors regarding the administration were to be submitted to the secretary of state within eight days for his approval or rejection, and any neglect to comply with these conditions was to subject the company's servant guilty of the same to the possibility of instant dismissal. Still the opening of the railway to Bulawayo in November 1897 seemed to promise a new era of development, and it greatly reduced the cost of transport. The population began to increase rapidly, and by 1898 Bulawayo had more than 5000 inhabitants. The value of the public buildings was estimated at £140,000. There were 1664 miles of telegraphs and nearly 850 miles of roads brought into existence through the energy of the company. By the last balance-sheet issued by the company previous to the outbreak of the Boer war it would appear that the revenue of Rhodesia for the year ending 31st March 1898 amounted to £260,516 net, of which amount the sale of land plots accounts for £63,628; stamps and licenses, £69,658; and posts and telegraphs, £46,745, so that the machinery of civilized life was already in full activity where Lo-Bengula's kraal had stood in 1894. The Government buildings were estimated in March 1898 to be worth £165,672, and the assessed value of the town property at Bulawayo was £2,045,000, and that at Salisbury £750,000. Education was arranged under the supervision of Government inspectors, and various religious communities have now brought their own organizations to a high state of efficiency. In the years 1897-98, 2485 miles of road were being maintained by the company at a cost of £23,500. A police force of 1322 men maintained order in the two provinces, and the hut tax paid by the natives throughout the territory amounted to over £19,000. At this time the relations between the natives and the company's servants appear to have been most satisfactory, an inference which is borne out by the peaceable attitude of the former during the Boer war. In 1896 it was found necessary to appoint a puisne judge to preside over the high court at Bulawayo. So far back as 1891 a system of municipal as distinguished from military police had been inaugurated, and, following the precedent of Cape Colony, sanitary boards were formed to regulate the municipal affairs of the several townships. At the public request, and in order that the ratepayers should enjoy a fuller measure of control, regulations for the constitution of municipalities were framed by the administration and promulgated in September 1897. Under the provisions thus enacted, the sanitary boards of Salisbury and Bulawayo gave place to duly constituted municipal councils, and the first mayors were elected for the two towns in that year.

On the 25th November 1898 the Southern Rhodesia Order in Council became law. Southern Rhodesia was divided into two provinces, Mashonaland and Matabeleland, with separate administrators. The order further provided for a high court of Southern Rhodesia and for the constitution of executive and legislative councils, and made other changes in the administrative organization.

North-Western Rhodesia is also known as Barotseland. The principal native chief is King Lewanika, and the representative of the company resides at his court. He is favourably disposed to white men. There is a force of thirty white police quartered in the Batoka plateau, besides a force of native police. This latter is necessary, for much of this country is almost uninhabitable by whites in the rainy season. A new mail service has been arranged. Runners leave Francistown weekly for Kazungala, returning with outgoing mails. The delimitation of the boundary is not yet completed between Barotseland and the Portuguese territory.

North-Eastern Rhodesia is divided into districts in charge of collectors and subdistricts in charge of assistant collectors. There are four districts, and through them run 700 or 800 miles of road constructed by the collectors. Defence is conducted under an arrangement with the British Central Africa Protectorate. The civil police number about 200. The revenue for the year ending 31st March 1899 amounted to £2275, 18s. 3d., of which about £1000 is claimed as owing from sales of ivory given as tribute, and about £565 came from postal charges. As there are no import or export duties except on ivory, no complete record of imports and exports is possible. The area of this province is estimated at 120,000 square miles, the whole of which (with the exception of a small portion of the valley of the Loangwa river) lies over 3000 feet above the sea.

By the beginning of 1899 the company appeared to be starting on a new career after the unfortunate reverses it had sustained in 1896, but a stop was put to all progress by the Boer war. The company can point with satisfaction to the fact that Rhodesia contributed nearly 1500 men to the forces serving in the war, or 12½ per cent. of the European population. Of these British South Africa police supplied 300; Mashonaland volunteers, 800; Mashonaland squadron, 150; independent volunteers estimated at 250. Rhodesia itself was not subjected to invasion, but the withdrawal of so large a number of able-bodied men seriously interfered with the progress of the country.

It must be remembered that the company possesses vast territories north of the Zambezi already in great part explored, and it is believed that the future will show them to be rich in mineral wealth and containing immense resources for agricultural and commercial development.

This country has been traversed by several travellers, among them Major St Hill Gibbons and Colonel Goold Adams. Traders, prospectors, and the company's officials pass through it, but generally leave no printed records. It is now divided into two provinces, North-Eastern and North-Western Rhodesia, each having its own administrator, and regulated by Orders in Council of 1899 and July 1900.

Railways.—The railway from Mafeking to Bulawayo, completed in 1897, shows a steady increase in revenue. The net earnings had risen from £11,877 in the year ending 31st October 1895 to £99,290 in the year ending 31st October 1898. The Mashonaland railway from Umtali to Salisbury, begun in October 1897, reached Salisbury on 1st May 1899. The share interests of these railways were amalgamated under the "Rhodesia Railways Trust," Limited, with a capital of £1,000,000. To sum up the work accomplished in this direction, the British South Africa Company first built the railway from Kimberley to Vryburg (a distance of 127 miles), which was soon afterwards purchased by the Cape Government. The company then continued the line to Bulawayo, a distance of 590 miles. It also obtained the capital and built the railway from Beira on the east coast through Portuguese territory to Umtali, a distance of 210 miles. This line was afterwards continued to Salisbury, a distance of 170 miles. The British South Africa Company has therefore built, or has caused to be built, 717 miles of railway from the south to Bulawayo, and 380 miles from Beira to Salisbury, giving a total of 1097 miles of completed railways. Contracts have been entered into for a further 300 miles of railway which will connect Bulawayo with Salisbury, and Bulawayo with Gwanda, 93 miles. This work is in active progress. A survey has also been made 250 miles northwards from Bulawayo through the Wankie coalfields to Victoria Falls.

Beira and Mashonaland Railways.

Beira to Salisbury	380 miles	
Rhodesia Railways.		
Kimberley to Vryburg	127 ,,	
Vryburg to Bulawayo	590 ,,	
		717 miles
Total mileage completed	1097 ,,	
In Course of Construction.		
Bulawayo to Salisbury	300 miles	
Bulawayo to Wankie	200 ,,	
Bulawayo to Gwanda	93 ,,	
Total mileage in hand	593 ,,	

Telegraphs.—The telegraph system now under the company's control is as follows :—

Rhodesian System on 31st March 1900.

Railway	1755 miles of line	
,,	3309 ,,	wire
Police telephone lines	471 ,,	line
,, ,,	471 ,,	wire

African Transcontinental Telegraph Line.

Mileage of line	1225 miles
Mileage of wire	1225 ,,

Total Mileage of Line and Wire under the Control of the Rhodesian Postal Department.

	Mileage. Line.	Wire.
Rhodesian lines proper	1755	3309
Police telephone lines	471	471
African Transcontinental Company's lines	1225	1225
	3451	5005

Mines.—With regard to mines, numerous concessions to prospectors have been granted by the company, and some extensive finds of precious metal have been made. Extensive pegging has been done by prospectors under licenses issued by the company, and also by subsidiary companies and individuals who have acquired grants. The results of development operations here given and conducted, in spite of adverse conditions prevailing in consequence of the war of 1893, the rinderpest, the native rising in 1896 and 1897, and later the Boer war, should be studied in order to gauge the probable future of Rhodesia as a gold-producing country. There are sixteen gold-mining companies actually milling, with a total crushing power of 269 stamps, while a further 240 stamps have been ordered by other companies whose properties are approaching the producing stage. Two mines have already erected cyanide plant for the treatment of tailings, and further plant has been ordered for ten other mines. The total output of gold from Rhodesia from the occupation of the country to the 31st August 1898 was 6532 oz.; from that date to the 31st December 1899 the output was 72,940 oz.; while for the year ended 31st December 1900 the Rhodesian output reached 85,534 oz., giving a total output to that date of 165,006 oz. In Northern Rhodesia valuable deposits of copper are being opened up, and in Southern Rhodesia coal of excellent quality has been proved to exist in enormous quantities in the Wankie district, a short distance south of the Victoria Falls.

Whatever the judgment of history may be as to the career of the company as a whole, it must be admitted that it has performed a great work as a civilizing agency, and that this has been done entirely at the expense of the shareholders without their coming upon the Government for a single shilling. At present the investors have reaped no pecuniary advantage from their enterprise, for, except in 1895-96, the expenses of administration have exceeded every year the income from revenue, as a glance at the following table will show :—

	Revenue.	Expenditure.
1892-93	£34,153	£91,189
1893-94	44,489	183,979[1]
1894-95	118,883	153,607
1895-96	399,090	227,626
1896-97	122,542	2,512,529[2]
1897-98	258,179	1,122,334[2]
1898-99	275,609	1,049,635[3]

Capital.—The following are the complete statistics of the company's capital :—

Date of Meeting.	Authorized.	Issued.	Dis. Nos. of Shares.
Original issue	£1,000,000	£1,000,000	1/1,000,000
20.11.93, and 19.12.93, purchase of R. R. concession	2,000,000	1,000,000 (f.p.)	1,000,001 2,000,000
12.7.95	2,500,000	500,000 (3/, 10/-)	2,000,000 2,500,000
6.11.96	3,500,000	500,000 (2/-)	2,500,001 3,000,000
Nov. '96			
Jan. '97		500,000 (2/-)	3,000,001 3,500,000
21.4.98	5,000,000		
May '98		250,000 (2/-)	3,500,001 3,750,000
Jan. '99		625,000 (2/, 10/-)	3,750,001 4,375,000

Leaving unissued £625,000, Nos. 4,375,001/5,000,000, at January 1901.

Debentures and debenture stock bearing 6 per cent. interest for £750,000 were paid off in February 1896, but in July 1896 there was an issue of £1,250,000 debentures, bearing interest at the rate of 5 per cent.

On the unissued balance of £625,000 the company gave the subscribers to £3,125,000 debentures of Rhodesia Railways, Limited, an option to exchange their debentures for these shares at £5 per share of £1 each, on or before the 15th May 1901, or, as an alternative, an option, on or before that date, to apply for an allotment of an equivalent number of shares at £5 per share of £1 each, paying cash, and retaining their debentures. As has been pointed out before, this expenditure does not include the cost of the Jameson Raid (which was not borne by the company), and the expenses of suppressing the native rebellions in 1896-97, which came in all to £2,266,976.

Into the general question of the value of such acquisitions of territory as have been made by the British South Africa Company it is not our function to inquire here, but the history of this corporation demonstrates very forcibly the

[1] Including war. [2] Including rebellion.
[3] Includes £241,460 expended on stores.

dangers and advantages of development by chartered companies. Lack of control over its officers, and irritation excited among other nationalities, have led undoubtedly to serious complications; on the other hand, its administration is now under strict supervision by Government, and the territories occupied by the company could hardly have been British unless through the agency of a chartered company. Had not the territory of Rhodesia been in British hands in 1889, Germany, the Transvaal, and possibly Portugal would almost certainly have asserted claims. The action of Government is slow, and is hampered by public opinion, which it takes time to inform fully in such matters. Even had the British Government occupied the territory, it is more than doubtful if ten years could have seen the development which has taken place under the administration of the chartered company. No one can doubt that the native population is infinitely better off under the company's administration than in the days of raid and massacre under Lo-Bengula.

The Royal Niger Company.

The charter of the Royal Niger Company was granted on 10th July 1886, but its real origin was earlier. Since trade began between Europeans and the native races inhabiting the coast round the mouths of the Niger and its hinterland, it had been practically monopolized by the British. The Niger itself had been discovered by British travellers. Mungo Park traced its course from its source to Bussa, and from Bussa to the sea. It was a Scotsman, Laird, who first organized, in 1833, the navigation from the sea to a point above the confluence of the river with the Benue. Within the next twenty-five years expeditions were despatched into the interior, and a consul was posted at Lokoja; but the deadly climate discouraged Government efforts, and the consulate was abandoned in 1866. Thus no effective attempt was made to connect these rich regions of the interior with British possessions on the coast. With regard to the delta of the river there is much the same story to tell. By the end of the 18th century British enterprise had almost entirely displaced the Portuguese, who had traded principally in slaves. The coast-line of the Niger delta may be said roughly to extend from Lagos to the mouth of the river Kwo-ibo, 200 miles eastward. The various streams into which the great river is divided at its mouth became known as the "Oil Rivers," from the palm oil which formed the staple article of commerce after the suppression of the slave trade. By the fourth decade of the 19th century British interests had grown so important that a permanent consulate was established, but up to the year 1880 no event of political importance calls for comment. From that year onwards constant pressure exerted by the United Africa Company, hereafter mentioned, on the Foreign Office and the Board of Trade caused the Government to contemplate taking over all the coast from Lagos to the Gaboon. Owing to complications elsewhere, however, this was not done, and Germany seized a portion of Cameroon. Then the British flag was planted in other parts of that district, but eventually the last patch of British territory in Cameroon was surrendered to Germany in 1887. Afterwards by agreement with Germany the eastern boundary of the Oil Rivers Protectorate was extended to the upper waters of the Benue and the shores of Lake Chad. Thus the entrance to the Niger territory passed into British hands.

Origin and sphere of action.

It was in the development of the hinterland and the delta above mentioned that the Niger Company played so important a part. The French Government had been beforehand with the British in that district. Before 1880 two French companies, actively encouraged by Gambetta, had set up trading stations along the Lower Niger, and the administration of Senegal had stretched out its arms towards the upper waters of the river. There was every likelihood of British trade being throttled. At this juncture Mr George Goldie-Taubman, previously an officer in the Royal Engineers, went to the Niger in 1877 for the purpose of crossing the continent to the waters of the Upper Nile. He then conceived the idea of creating a British province there, and in 1879 formed all the petty British firms trading on the main Niger into the United Africa Company. In 1881 he applied to Government for a charter, having found that the company could not exercise jurisdiction over foreigners without it. The capital of the company (£100,000) being too small for it to be entrusted with sovereign rights, he formed in 1882 the National Africa Company, with a capital of £1,000,000 subscribed. Even then the charter could not be issued until the two existing large French companies had been got rid of. These were bought out, and anticipating the Germans, Mr Goldie-Taubman (better known as Sir George Taubman Goldie) secured himself in the south by concluding treaties with the sultans of Sokoto and Gando. By the time of the Berlin Conference (1884) Great Britain could show that she alone possessed subjects with trading firms on the river. Her claim to a protectorate was admitted, and the company (now known as the Royal Niger) received its charter. It was anticipated that the new chartered company would extend the sphere of its operations, for provision was made in the first article for its authority over future acquisitions, and its political powers were defined. Any attempt on the part of the company to acquire a commercial monopoly in the regions under its sway was distinctly forbidden, and taxation could only be imposed sufficient to cover the actual expenses of the government.

The territories hereby put under the company's control did not include those on the coast which were directly under the British Government and known as the Niger Coast Protectorate. The interior, however, lay open to it, but here it was exposed to keen competition from foreign rivals. Its treaties also covered about half of the coast-line between Lagos and Cameroon, as well as all the delta behind that half of the coast-line. The greater part of the Niger delta was thus secured and saved by the company, as well as the two great entrances to that river, the Forcados branch and the Nun branch. On the south-east lay German Cameroon. The frontier had been settled by a convention in 1886, which was confirmed by another made in November 1893. The line was drawn from Rio del Rey to the rapids of Cross river, thence through Yola to the southern bank of Lake Chad. On the north and west the frontier coterminous with French territory was not yet settled; and this uncertainty led ultimately to dangerous complications, which were finally settled in June 1898. The territories over which the company exercised its sway were more than 500,000 square miles in extent, and contained from 20,000,000 to 40,000,000 of inhabitants. Their lower portion was occupied principally by small tribes in the most abject stage of barbarism, but above the lower Niger a very different country lay open to its enterprise. The Central (British) Sudan is one of the richest and most populous districts in Africa. Cereals, fruits, cotton, and indiarubber are among its products, and it possesses many large and thriving towns, some with as many as 100,000 inhabitants, and all capable of becoming centres for trade and commerce. Haussaland is the home of a stalwart race, many members of which have embraced Mahommedanism, and from them comes the finest material for the native soldiery. The company brought the greatest activity to bear upon

this promising region, and within a few years had extended its operations in all directions, concluding more than 400 treaties with various native chiefs. In 1888 the company was authorized to issue a loan of £250,000. This sum represented the amount that had been expended in the acquisition and maintenance of concessions. The interest was to be paid by means of taxation, gathered from customs duties which might be levied up to the amount of £12,500 a year. It is to be observed that for the payment of this interest the company as a trading concern was to be in no way responsible. The company was, in fact, twofold in its nature. It was, on the one hand, a political and governing body, on the other a purely commercial corporation. Within its own territory it acted as a simple trader, competing with others, and did not include State revenues among its assets. As a trading concern it has paid since 1882 an average dividend of 6 to 6½ per cent. on a paid-up capital of £493,680 and a subscribed capital of £1,027,080.

The organization of the company as a political body prospered rapidly after it had received its charter. The executive powers in Africa were entrusted to an agent-general, three provincial and twelve district superintendents. A chief-justice directed the judicial staff, and a commandant the troops. The entire direction was in the hands of a court sitting in London, with whom all the above officials communicated direct. This was called the "governing council." The first president or governor was Lord Aberdare, who was succeeded by Sir George Taubman Goldie, the founder of the company, and who was its "political administrator" during the whole period of its charter. The territory of the company was divided into districts, over each of which was placed a European governor, only a few commercial stations being in the hands of blacks. In 1891 the whole number of agents conducting the company's affairs in Africa only reached the number of 71. There was a judiciary at work in the territories of the company. The chief-justice had his residence at Asaba. The company had a fleet of about 30 steamers, two of which were protected by armour-plating and guns, and capable of carrying 300 or 400 men each. The army of the company consisted of about 1000 men, mostly drawn from the Haussas and under the command of British officers. Dues to defray the cost of administration were imposed on gunpowder, salt, alcohol, and tobacco, and there were also taxes on many articles of export.

Not long after coming into existence the company concluded a treaty with the sultan of Sokoto, by which, in return for the payment to him of a pension of £1500 a year, it enjoyed sovereign rights over the greater part of his states. This treaty was followed by others concluded with other chiefs, until rights had been obtained over nearly the whole of Haussaland. Disputes arose with France regarding the possession of the sultanate of Borgu, especially the important ports of Nikki and Boussa. At times these seemed to threaten the peace of the world, but fortunately they were amicably arranged in 1898. The progress of the company naturally involved some military operations, for collisions with the natives occasionally took place, especially with the slave-traders. The most important expedition was that of 1897, undertaken against the sultans of Nupe and Ilorin, whose power had become extremely menacing. A force was despatched under the command of Sir George Taubman Goldie himself. The principal object in view was to destroy once for all the extensive slave trade which found its chief centre and support in the dominions of these potentates. The expedition consisted of native troops (500 Haussas) under 30 white officers with machine guns. In January 1897 the force left Lokoja, and in three weeks had decisively defeated the sultan of Nupe and 20,000 men; he was deprived of most of his dominions, and a sovereign was set up in his stead who was a vassal of the company. From Bida the company's forces marched upon Ilorin, the sultan of which was defeated, and the whole district then submitted to the company's authority. On 22nd June 1897 the legal status of slavery within the company's territory was abolished by statute. Long before this the importation of alcohol had been forbidden north of the 7th degree of north latitude. By this provision the consumption of spirits was reduced to one-quarter of the amount to which it had previously attained. Charges were frequently made against the company of unjust and excessive taxation, overstepping the limits allowed by the charter. These were formulated in the most comprehensive manner by Herr von Puttkamer, who was sent to the Niger as the Imperial German commissioner, and the same accusations were made by British and French traders. An independent commission, however, was despatched by the British Government under Sir Claude Macdonald, which exonerated the company from all charges of violating its charter and spoke in terms of high praise of the work it had effected.

History and development.

After the settlement with France in 1898 it was impossible that the company could long continue to hold sway over half a million square miles of territory in the immediate neighbourhood of the possessions of great Powers, which often refused to recognize the acquisitions made by so ambiguous a competitor. The resources of the company also no longer sufficed for the work of administration and police required by so vast a dominion. Its leading minds had always foreseen the ultimate probability of the State stepping forward to acquire their rights of sovereignty. There was no disposition, therefore, to resist the inevitable, the only question being the amount which was to be accepted as an adequate compensation for the surrender of these rights. The Act which enabled the British Government to purchase the company's rights under the charter became law in August 1899, and in January 1900 it took over the company's territories. The terms did not, perhaps, err on the side of generosity, but they were as high as any Government could venture to propose to the House of Commons. No allowance was made to the shareholders as compensation for the risks which they had undergone before their venture became a pronounced success, but, in return for the surrender of the charter and the transfer of all the political rights which the company had acquired by "treaties, conquest, or other lawful means," the Government was to repay the amount of £300,000 which the company had advanced out of its private trading profits to cover the costs of administration. The company was to receive the further sum of £150,000 for the surrender of their private land and mining rights, and it was also to be entitled to one-half of any royalties which the Government of Nigeria might receive during the next 99 years in respect of minerals exported from such portions of the territory as were bounded on the west by the main stream of the Niger, and on the east by a line running direct from Yola towards Zinder, provided that such minerals were exported from a British port or passed through a British custom house. The barracks, stores, wharves, steamers, &c., which were purchased from the company were surrendered at a price fixed by agreement at £115,000. The Imperial Government, of course, assumed the payment of the interest (£12,500 per annum) on the loan mentioned above which the company had been authorized to raise for the purpose of administration. On these terms

the transfer to the Government was completed, and though the company still continues its existence as a trading concern, it has ceased to have any connexion with the administration of Nigeria.

It now remains to sum up the results accomplished by the Niger Company during the fourteen years of its existence. Before the company got to work the settlements on the Oil Rivers might at any time have had their markets in the interior closed to them. There was no administration even at the Oil Rivers until 1891. To the energetic action of the company the colony of Lagos owes its mainland sphere, for it had saved the hinterland of these coast districts from falling into the hands of France and Germany. Indeed, it was only by a margin of a few months that the eastern portion of Nigeria was snatched from the encroachments of the latter Power. It may be doubted whether the British Government itself could ever have accomplished the task, since little interest at the time was felt in the Niger territories, which were looked upon rather as an unhealthy locality of which little was to be made. Among the greatest obstructives were the private traders, who always opposed annexation on the ground of increased taxation, but whose eyes were opened to a certain extent by the seizure of Cameroon by Germany. Five years of struggle with that Power ended in 1890 in the Anglo-German agreement, which recognized British rights which had been acquired by the company against the strenuous opposition of Flegel, Hoenigsberg, and other explorers backed up by Prince Bismarck. Nor was Germany the only Power with which the company had to reckon. It constantly opposed the increase of French influence. Since 1879 that Power had adopted an aggressive colonial policy in those regions. The plan was very simple, and was succinctly described by Sir George Taubman Goldie as "pushing inland from her coastal possessions, and then adopting lateral extensions and occupying the land in the rear of the coastal possessions of her neighbours, cutting them off from their markets in the interior." France had pursued this policy successfully in the case of Gambia. Though Great Britain had been established for seventy years on the coast, France annexed the rich districts on the Upper Niger now known as French Sudan, and thus spoiled the markets for Gambia. The same policy was partially successful with regard to the Gold Coast and Sierra Leone colonies, but the progress of the Niger Company aroused public attention in Great Britain, and the further progress of this design was frustrated. By buying up the rival companies before the Berlin Conference of 1884, the company secured recognition of the supremacy of the British flag on the Niger, and later by its enterprise enabled the British Government to insure a satisfactory settlement of claims in the regions of the Upper Niger and the possession of the vast dominions of the Sokoto sultanate.

Results.

Apart from political considerations, the work effected by the company for civilization must not be ignored. The absolute prohibition of the trade in alcohol in certain districts, and the severe blow dealt to the slave trade by the campaign of 1897, entitle it to the respect and gratitude of humanity. In ten years the company established in a barbarous region an organized system of justice and police supported by an adequate military force, placed on the waterways a fleet of 30 steamboats, founded a number of trading stations, and set on foot a regular scheme of cultivation in certain districts, besides conducting a large and lucrative commerce. All this was done without costing Great Britain a penny, while the neighbouring settlements of France and Germany were not only mulcting these countries of vast sums, but bringing in no return.

At the close of the company's existence as a governing body, when the administration of its territories definitely passed from its hands into those of the imperial authorities, a consideration of the following figures will supply some data for estimating the progress made under its administration and also as a trading concern :—

Statistics.

The Niger Trading Company.—The first balance-sheet was issued in July 1888, and carries the transactions of the company to 31st December 1887.

The trading account for 1887 amounted to	£46,765	10	5
leaving a balance to profit of	26,005	11	5
The total assets of the company amounted to	470,317	6	8
With slight fluctuations the profits gradually rose, and in December 1898 there was a balance to profit of	86,396	9	6
In that year the total assets of the company were valued at	700,035	6	0

To show the increase in the volume of commodities dealt with, it is interesting to compare the inventory of goods, stores, produce, &c., in Africa in December 1887 and December 1898.

In 1887 the stock of goods, stores, &c., in Africa was valued at	£158,023	18	8
Goods awaiting shipment	723	18	7
Produce in England and afloat	30,799	13	10
Total	£189,547	11	1
In 1898 stock of goods, &c., in Africa	£247,961	2	9
Goods awaiting shipment	2,237	19	5
Produce in England and afloat	89,717	2	0
Total	£339,916	4	2

Niger Government.—If we now consider the company in its administrative capacity for the same period, the statistics are no less instructive.

In 1887 the company's revenue stood at	£42,396	0	0
And its expenditure at	71,824	0	0
The revenue from imports amounted to	24,037	0	0
,, ,, exports to	16,781	0	0
,, ,, licenses to	1,280	0	0
In that year the expenditure on the constabulary force amounted to	13,395	0	0
And the salaries of the staff in Africa to	10,269	0	0
At the end of 1898 the revenue amounted to a total of	113,305	0	0
And the expenditure to	135,093	0	0
The revenue from imports now amounted to	63,054	0	0
,, ,, exports to	48,981	0	0
,, ,, licenses to	480	0	0

The expenses of administration and revenue were thus showing a tendency to balance themselves at the time the company's territory was taken over.

Private Traders.—One point is worth noting in considering these balance-sheets, as bearing out what has been said above as to the capacity of great trading companies to kill private competition within their own districts, even without any unfair advantages.

In 1887 the revenue from the imports of private traders amounted to	£998	0	0
From the exports to	1335	0	0
And licenses to private traders to	660	0	0
In 1898 the revenue from private imports amounted only to	260	0	0
While that from exports and licenses was	*nil.*		

The Imperial British East Africa Company.

This company came into existence in 1888, but its origin may be traced 10 years earlier. In 1877 the sultan of Zanzibar had offered to Mr (afterwards Sir) William Mackinnon, or to a company to be formed by him, a lease for 70 years of the customs and administration of the whole of the Zanzibar dominions, including all rights of sovereignty, with certain reservations. This was declined owing to a lack of support by the Foreign Office. Between 1880 and 1885, however, the large number of German concessions acquired aroused the interest of those who recognized the paramount importance of the maintenance of the British influence in those regions, and in May 1887 a concession bearing that date was voluntarily made by

Origin and early difficulties.

the sultan and accepted by the association which had now been formed by Mr Mackinnon. This association became the Imperial British East Africa Company by a founder's agreement of April 1888, having received a royal charter in September of the same year. To this company the sultan made a further concession dated October 1888, to be read with the previous concession. On the faith of these concessions and the charters an amount of £240,000 was subscribed, and the company received formal charge of their concessions. The rights of which they believed that they were to assume possession were "all the powers and authority to which the sultan was entitled on the mainland in the Mrima, and all his territories and dependencies from Wanga to Kipini inclusive, also the islands embraced in such territory," saving, of course, all obligations already incurred by that potentate with Great Britain or other Power. The first difficulties which the company had to encounter arose out of the aggressions of the German East Africa Company, supported by the German Government. This company also received a grant from the sultan in October 1888, and its appearance on the coast was followed by grave disturbances among the native tribes which had welcomed the British. This outbreak led to a joint British and German blockade, which seriously hampered trade operations. It had also been anticipated, in reliance on certain assurances of Prince Bismarck, emphasized by Lord Salisbury, that German enterprise in the interior of the country would be confined to the south of Victoria Nyanza. Unfortunately this expectation was not realized. It was necessary that the British company should enjoy the command of all the ports from which it was to draw its customs revenue, but from the first disputes arose between them and German subjects who formulated claims over certain portions of the same districts. A German claim was put forward to the petty sultanate of Witu, where there were some German plantations subsequently bought up, and the German Government endeavoured unsuccessfully to obtain a concession of the island of Lamu, which contains the principal town on the coast north of Mombasa. These claims were submitted for arbitration to Baron de Lambermont, the Belgian secretary of state, who decided against the German contention. German intrigues did not thereby come to an end, and native resistance to the company's authority was fomented. Similar difficulties arose over the possession and administration of Manda and Pata, and of the port of Wanga, though in those cases the German claims had even slighter foundation than at Witu. In all these disputes the German Government countenanced its own subjects, while the British Foreign Office did little or nothing to assist the company, sometimes directly discouraging its activity. The great importance to the trading operations of the company involved in the peaceable possession of these places may be gathered from a brief study of the terms on which the company's right to exact revenue in its territories had been granted by the sultan. The basis of this arrangement is to be found in article 9 of the concession of 9th October 1888.

The company guaranteed to the sultan the whole amount of the customs duty he received at the time the concession was entered into, the annual average payable being fixed according to the original understanding by the experience of the first year, but, at the time this agreement was actually entered into, the Germans were pressing for a grant of Lamu, and the British company had to accept the sultan's interpretation of these financial clauses. It was therefore agreed that (1) the annual revenue was to be based, not on an average, but on the actual results of the first year; (2) the payment to the sultan was to be determined by the amount of the gross revenue without allowing for expenses of collection. These concessions seemed worth making from a business point of view, as it might reasonably be supposed that they would largely increase their customs duties under the company no less than from an imperial point of view, for they confirmed the sultan in loyalty to British interests, and these would have virtually vanished in East Africa had he transferred Lamu and the northern stations to Germany. The importance attached by the company to the possession of these places may be gauged, therefore, by the sacrifices they were prepared to make to retain them. Unfortunately, by a curious combination of circumstances, the first year's revenue was unusually large; the German ports were closed and some of their trade came to the British ports, and a sudden impulse was given to trade by the appearance of the British company. All this was ultimately much to its disadvantage.

The next serious difficulty encountered by the company arose from what was known as "the race for Uganda." By the hinterland doctrine, accepted both by Great Britain and Germany in the diplomatic correspondence of July 1887, there was no doubt that Uganda would be taken to fall within Great Britain's "sphere of influence," but German public opinion evidently did not so regard the matter. The maps published in that country assigned the territory to Germany, and in England public opinion as strongly expected British influence to be paramount. However, in 1889 Dr Peters led what was practically a raiding expedition into that country after running a blockade of the ports. The British Government made no attempt to put a stop to this beyond a formal protest to the German Government, which expressed its determination not to countenance Peters. They were not, however, pressed to stop his advance by force, and he managed to make his way into the back of the company's territory. Early in 1890 Emin Pasha made an arrangement with the German Government to lead an expedition in the direction of Uganda. As the British Government did not feel inclined to undertake the protection of British interests in Uganda, the company had to protect itself. In March 1890 it despatched an expedition thither under Captain Lugard. An expedition under Mr Jackson, which had left the year previously, with instructions to avoid Uganda, had been diverted there on receipt of the news regarding Peters and Emin Pasha. Peters retired at Jackson's approach, claiming, however, to have made certain treaties which constituted "effective occupation," and Emin threatened to complete Peters's work. The dispute came to an end by the Anglo-German agreement of 1890. Uganda was assigned to the British sphere of influence. The country was in a dangerous state of ferment; Roman Catholic and Protestant converts were arrayed against each other, and the French missionaries unfortunately fomented the ill-feeling. By the middle of 1890, however, Captain Lugard had established peace and the authority of the company had become supreme. In July 1890 representatives of the Powers assembled at Brussels and agreed on common efforts for the suppression of the slave trade. The interference of the company in Uganda had been a material step towards that object, but no really satisfactory occupation could be brought about except by the construction of a railway, and this the company's resources did not allow them to undertake. Though the British prime minister paid the highest tribute to their labours, and a preliminary grant for the survey had been practically agreed upon, the scheme was wrecked in Parliament. The company had imported some 50 miles of light, narrow-gauge rails, which were actually laid for a distance of 14 miles. Locomotives were tried, but the line was too

Uganda.

light for safety, and serious accidents happened. The line in the island of Mombasa is still worked by human labour. Finally, the company decided to withdraw Captain Lugard and his forces in August 1891; the occupation was, however, prolonged to 31st March 1893, on the promise of the Government to bear the expense.

Administrative difficulties.

The company found itself involved in further difficulties through having to undertake the administration of the coast towns. Witu it took over with great reluctance, as it did not regard it as part of the contract under the charter, though the Government held the opposite view. Kismayu, however, was a port of little importance to Great Britain, for it is a poor harbour, difficult of approach, and much exposed to the south-west monsoon. The trade is small, for there is no trade route there to the interior. To facilitate trade the company had adopted the policy of subsidizing the Somali tribes in the hinterland, and the Government agents took exception to this method of proceeding. The pecuniary interests of the company further sustained a severe blow owing to the action of the British Government in Zanzibar, which had been taken under the protectorate of Great Britain in October 1891, by the agreement with Germany made in 1890, though its administration remained in the hands of the Zanzibar Government.[1] In June 1892 the British Government declared the dominions of the sultan of Zanzibar, including the mainland territory under the company's rule, to be within the free zone. This act extinguished the treaties regulating all tariffs and duties with foreign Powers, and gave free trade all along the line. This was plainly a violation of the rights of the company under its original agreement with the sultan. The answer of the British Foreign Office to the company's protest was that there was only a "delegation" of the sultan's powers, which he had a right to withdraw when he liked; yet the company was still held liable to pay the compensation for the customs dues which it had originally undertaken to pay. The result for the company was that dues were now swept away without compensation, and the company was left saddled with the payment of the rent, and with the cost of administration in addition, though administration had been the inevitable corollary of taking the dues over. In June 1894 the sultan signified his willingness to negotiate with the company for its withdrawal from the contract.

A final difficulty between the company and the British Government remains to be noted. At the invitation of the Foreign Office the company had instituted efficient tribunals and secured consular powers in the coast towns for the benefit of British subjects, and had been invited to prepare a scheme of taxation which might be offered for the approval of the Government. Such a scheme was duly drawn up and submitted, but never approved, and ultimately the Foreign Office took up the position that, in instituting a system of administration, the company had been merely fulfilling its obligations to the untaxed population (principally British-Indian), and that the whole question must be considered apart from that of taxation and jurisdiction over foreigners. With regard to British subjects residing beyond the concession limits the difficulties were very great. The company found itself responsible for the maintenance of order, yet was not permitted to arrest offenders who were British subjects and bring them to the coast for trial.

[1] In giving his assent to the Berlin Act the sultan had (on the advice of H.M. Government) reserved his fiscal rights against the operation of the free trade provisions of that Act. Subsequently the reservation was overruled, and without any *quid pro quo* his highness's dominions were included in the free-zone system.

In every direction the company's affairs had drifted into an *impasse*. In addition to the causes already indicated, this may be attributed to insufficient capital, want of funds, and small revenue. Plantations had been taken over on the coast and worked at a loss, money had been advanced to native traders and lost, and expectations of trade had been disappointed. At a meeting of shareholders on 8th May 1894 an offer to surrender the charter to the Government was approved, though not without strong protests. Negotiations dragged on for over two years, and ultimately the terms of settlement were that the Government should purchase the property, rights, and assets of the company in East Africa for £250,000. Uganda had been made a protectorate before the extinction of the company, on the Portal report being received by the Foreign Office.

Results.

Altogether, considering the slow development which this region has since shown, the commercial prospects of the company, and the cost to it of administration, it cannot be said that the price paid at the time by the British Government was so insufficient as it appears at first sight. Sir William Mackinnon, through whose judgment, foresight, and patriotism British influence had become predominant in East Africa, had died in June 1893. He was fated to see the company by no means a success commercially, yet it had accomplished a solid work in advancing the civilization of the dark continent. In exploring and development it could point to several successful expeditions: to the founding of the Scottish Industrial Mission at Kibwezi (which is now extinct), about 200 miles from the coast on the way to Uganda, and its connexion with the sea by a track known as the "Mackinnon road"; and to the establishment of telegraphic and telephonic communication between Mombasa and Lamu. It had set up a system of administration which had helped to create confidence and stimulate trade. In 1893 the cost of transport for a ton of merchandise between Mombasa and Uganda had been as much as £300. It had made pioneer experiments in transport, the results of which were reaped by later traders; its official reports afforded valuable information about the tribes of the interior, and under its administration more than 3000 slaves had been freed, though this is a small number compared with those saved in stopping the trade itself. The drink traffic, too, had been prohibited. On the successful termination of the Sudan war in 1898, the importance of its work in establishing British influence in the region of Victoria Nyanza became clear.

Statistics.

When the company's affairs were finally wound up in March 1897, it was found that in acquiring, developing, and administering the territories ultimately taken over by H.M. Government there was a total deficit of £193,757, 7s. 8d., which was made up as follows:—

(1) Outlay within the sultan of Zanzibar's 10-miles limit under deduction of all revenues	£139,404	14	1
(2) Outlay in the interior, including Uganda and Witu, under deduction of grants by Sir W. Mackinnon and friends of Church Missionary Society (£26,633, 13s. 6d.) .	122,542	2	6
(3) Costs of all assets handed over to H.M. Government	145,780	12	4
(4) Home charges, including costs of charter less amount recovered on forfeited shares (£2825)	36,029	18	9
Total	£443,757	7	8
Payment from H.M. Government . . .	250,000	0	0
Total deficit	£193,757	7	8

At the time of the company's liquidation the accounts showed a total revenue during the whole period of its existence of £171,469, 0s. 1d.

This was principally made up of:—

Gross customs collections	£89,067	3	10
Revenue from various sources, departmental and otherwise	51,373	15	4

The amount expended on the survey and construction of railways, tramways, &c., was more than £67,000.

THE BRITISH NORTH BORNEO COMPANY.

The occupation of the island of Labuan by the British Government in 1847 is the starting-point from which to trace the connexion of Great Britain with North Borneo. In 1872 the Labuan Trading Company was established in Sandakan, and in 1878, through the instrumentality of Mr Dent, the sultan of Sulu transferred all his rights in North Borneo to a syndicate, the chief promoters of which were Sir Rutherford Alcock, Admiral the Hon. Sir Henry Keppel, and Mr R. B. Martin. Early in 1881 the British North Borneo Provisional Association, Limited, was formed to take over the cession with all rights and properties. A petition was addressed to Queen Victoria for a royal charter in November 1881, and the British North Borneo Company, which was formed in May 1882, took over, in spite of some diplomatic protests on the part of the Dutch and Spanish Governments, all the rights, territorial and sovereign, in the original grants, and proceeded under the charter to organize the administration and development of the territory in question. The company has since acquired further territories: the Putatan river in May 1884, the Padas district in November 1884 (including two important rivers, the Padas and the Kalias), the Kawang river in February 1885, and the Mantanani islands in April 1885. In 1888 H.M. Government declared the whole territory to be under the protection of Great Britain, and thenceforth it was officially known as "The State of North Borneo." In 1890 the British Government placed the island of Labuan under the administration of the company. In March 1898, after the suppression of the Mat Salleh rebellion, arrangements were made whereby the sultan of Brunei transferred to the company all the sovereign and other rights over the districts north of the Padas river which had previously been in his possession. This cession was of the highest importance, for it meant that a large number of enclaves, which had formerly been resorts for disaffected natives, and therefore a continual source of annoyance, passed under the control of the company, which was also enabled to consolidate its somewhat scattered possessions into a compact territory. (See also BORNEO.)

Administration.—There are now ten Government stations on the coast administered by Europeans, and five inland, the most important being at Sandakan, Darvel Bay, and Gaya Bay. The entire population of the company's territory is estimated at 200,000, including some 20,000 Chinese, and about 150,000 of the population are distributed throughout the west coast. The population of Sandakan, the capital, is estimated at from 6000 to 7000.

The form of government adopted by the company is practically that of a British colony. It is vested in a court of directors, appointed under royal charter, administered by a resident governor with the assistance of a colonial secretary. Under them are three residents of districts, several assistant residents, and departments of the Government service, such as treasury, land and survey, public works, harbour, medical, judicial, and constabulary. At the head of the judiciary is the governor, who is the chief judicial officer of the supreme court and court of appeal. The residents are the senior judges and judges of the courts of appeal. There are also district magistrates and justices of the peace. The Indian penal code and the Indian Civil Procedure and Evidence Acts have been adopted almost as they stand, but the rights and customs of the natives receive special recognition, and the land regulations are so framed as to encourage immigrants. The higher officers of the Government form the legislative council. The native chiefs and headmen are responsible to the Government for the preservation of order in their own districts, a trust which they discharge on the whole remarkably well. The Government police number about 500; the majority of these are Sikhs, with some Pathans and Dyaks.

Revenue.—The principal sources of revenue are the following: license for purchasing and retailing opium, spirits, &c., all of which are in the hands of private persons. Five to ten per cent. duty is placed on imports, and the same amount of royalty on jungle produce exported. The old source of revenue among the natives was a poll-tax, and this has been retained in lieu of land taxes; there is also a stamp duty. Proceeds of sales of Government land, quit-rents, and fees on transfers, make up the land revenue. Judicial fees and post and revenue stamps make up the sources of revenue.

When the company obtained its charter the northern portion of the island was in a state of chaos, the interior was divided up among a number of small chieftains whose authority was hardly recognized, and the coasts were devastated by pirates. All this has been changed, and at a rate of taxation which barely reaches one shilling and threepence per head of the inhabitants, as compared with five to twelve shillings in India, or six to sixteen shillings in Java. From an imperial point of view the change is no less remarkable. In 1881 the influence of Great Britain went for nothing. To-day she is mistress of the best part of the island, and her commerce is predominant.

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Charters Towers, a municipality and mining town, Queensland, Australia, in the county of Devonport, 82 miles S.W. from Townsville, with which it is connected by rail. It is in the centre of an important gold-field, the output of which was valued, in 1899, at £1,216,750. Abundant water supply is obtained from the Burdekin river, about 8 miles distant. Altitude about 1000 feet. Population, 4597.

Charts.—A chart is a marine map intended specially for the use of seamen. It is constructed for the purpose of ascertaining the position of a ship with reference to the land, of finding the direction in which she has to steer, the distance to sail or steam, and the hidden dangers to avoid. The surface of the sea on charts is studded with numerous small figures. These are known as the *soundings,* indicating in fathoms or in feet (as shown upon the title of the chart), at low water of ordinary spring tides, the least depth of water through which the ship may be sailing. Charts show the nature of the unseen bottom of the sea—with the irregularities in its character in the shape of hidden rocks or sand-banks, and give information of the greatest importance to the mariner. No matter how well the land may be surveyed or finely delineated, unless the soundings are shown a chart is of little use.

The early charts were plane charts, drawn on the principle of the earth being an extended plane. This construction is suitable for harbours, coastal sheets, limited districts, such as the English Channel, or for coasts within the tropics, but becomes incorrect and even dangerous if used on voyages extending over the oceans. To remedy this defect, in 1569 Gerard Mercator, a Fleming, conceived

the idea of representing the earth's surface on a cylinder, in which the length of the degrees of latitude were increased as they approached the pole in the same proportion as those of longitude decreased on the globe. This idea was perfected about 1590 by Edward Wright, an Englishmen, and it is on his principle that the present charts are drawn on what is known as "Mercator's projection." The advantage of this projection to the sailor is that the ship's course between any two places is represented by a straight line. On a sphere the meridians all converge towards the pole, the degrees of latitude are equal, those of longitude decreasing towards the pole; on a Mercator's chart the meridians are drawn as parallel lines, and the degrees of longitude are all equal. To compensate for this error, the degrees on the Mercator chart are increased as they approach the pole beyond their actual lengths, in the same proportion as the degrees of longitude on the sphere diminish in length as they approach the pole. The length of a degree of latitude in the parallel of 70° is consequently three times that of a degree at the equator. It is, however, only when equatorial and polar regions are contrasted that the distortion becomes evident—contiguous countries and seas appear but little out of proportion to each other, and no other projection is known that so well meets nautical requirements. Distances on a Mercator chart are measured on the latitude scale, on the sides of the chart, taking care to use that part of the scale which is in the same latitude as the ship; *e.g.*, distances between places within the parallels of 50° and 60° must be measured upon the latitude scale between 50° and 60°.

Mercator's projection.

The British Admiralty charts are compiled, drawn, and issued by the Hydrographic Office. This department of the Admiralty was established under Earl Spencer by an order in council in 1795, and consists of the hydrographer, one assistant, and a draughtsman. The first hydrographer was Mr Alexander Dalrymple, a gentleman in the East India Company's civil service. From this small beginning arose the important department which is now the main source of the supply of hydrographical information to the whole of the maritime world. The charts prepared by the officers and draughtsmen of the Hydrographic Office, and published by order of the lords commissioners of the Admiralty, are over 3100 in number. They are compiled chiefly from the labours of British naval officers employed in the surveying service; and also from valuable contributions received from time to time from officers of the royal navy and mercantile marine. In addition to the work of British sailors, the labours of other nations have been collected and utilized. Charts of the coasts of Europe have naturally been taken from the surveys made by the various nations, and in charts of other quarters of the world considerable assistance has been received from the labours of French, Spanish, Dutch, and American surveyors. The Admiralty charts are published with the view of meeting the wants of the sailor in all parts of the world. They may be classed under five heads, viz., ocean, general, and coast charts, harbour plans, and physical charts; for instance, the Indian Ocean, the Mediterranean, approaches to Plymouth, Plymouth Sound, and wind and current charts. The harbour plans and coast sheets are constructed on the simple principles of plane trigonometry by the surveying officers. (See SURVEYING, *Nautical.*) That important feature, the depth of the sea, is obtained by the ordinary sounding line or wire; all soundings are reduced to low water of ordinary spring tides. The times and heights of the tides, with the direction and velocity of the tidal streams, are also ascertained. These MS. charts are forwarded to the Admiralty, and form the foundation of the hydrography of the world. The ocean and general charts are compiled and drawn at the Hydrographic Office, and as originals, existing charts, latest surveys and maps, have to be consulted, their compilation requires considerable experience and is a painstaking work, for the compiler has to decide what to omit, what to insert, and to arrange the necessary names in such a manner that while full information is given, the features of the coast are not interfered with. As a very slight error in the position of a light or buoy, dot, cross, or figure, might lead to grave disaster, every symbol on the Admiralty chart has been delineated with great care and consideration, and no pains are spared in the effort to lay before the public the labours of the nautical surveyors and explorers, not only of England, but of the maritime world; reducing their various styles into a comprehensive system furnishing the intelligent seaman with an intelligible guide, which common industry will soon enable him to appreciate and take full advantage of.

Hydrographic office.

As certain abbreviations are used in the charts, attention is called to the "signs and abbreviations adopted in the charts published by the Admiralty." Certain parts of the world are still unsurveyed, or not surveyed in sufficient detail for the requirements that steamships now demand. Charts of these localities are therefore drawn in a light hair-line and unfinished manner, so that the experienced seaman sees at a glance that less trust is to be reposed upon charts drawn in this manner. The charts given to the public are only correct up to the time of their actual publication. They have still to be kept up to date. Recent publications by foreign Governments, newly reported dangers, changes in character or position of lights and buoys, are as soon as practicable inserted on the charts and due notice given of such insertions in the Admiralty "Notices to Mariners."

During the year 1900, 102 new plates of charts and plans were engraved, 30 plates received the addition of 8 new plans, and 224 plates were largely improved by corrections and additions; 4520 corrections were made to the plates by the engraver; 35,500 received minor corrections at the hands of the draughtsmen, and 875 "Notices to Mariners" were issued. The number of charts printed for the requirements of the Royal Navy, and to meet the demand of the general public, during 1900, amounted to 580,207.

These facts show the necessity of charts being closely watched by sailors and shipowners using them, to insure their being supplied with the most recently corrected charts. The dates of the corrections are noted at the foot of the charts—those of large corrections, and additions, for which the charts have been cancelled, being written in full against the imprint; while the date of smaller corrections, such as changes in lights and buoys, are noted in Roman numerals on the left-hand lower corner. For the mercantile marine the Board of Trade collects and publishes the above information in a small pamphlet, *Notices to Mariners for Foreign-going Ships.* This pamphlet, supplemented by a weekly issue, is supplied free of charge to the ships of the mercantile marine.

The Admiralty charts, when issued from the London chart agent (J. D. Potter), have received all necessary corrections to date. Once out of his hands, there is no guarantee that further corrections are made before sale, by local firms at different ports; and purchasers should obtain some assurance that they are correct to date. The charts are also supplemented by the *Admiralty Pilots*, or books of sailing directions, with tide tables, and lists of lighthouses, light vessels, &c., for the coasts to which a ship may be bound. The physical charts are the continuation of the work so ably begun by Maury of the United States and FitzRoy of the Royal Navy, and give the sailor a good general idea of the world's ocean winds and currents at the different periods of the year; the probable tracks and seasons of the tropical revolving or cyclonic storms; the coastal winds; the extent or months of the rainy seasons; localities and times where ice may be fallen in with; and, lastly, the direction and force of the stream and drift currents of the oceans. (T. A. H.)

Chaskoi, CHASKOVO, KHASKOI, HASKOI, or HASKOVO, the chief town of a department in Bulgarian Eastern Rumelia, 45 miles E.S.E. of Philippopolis. It has

manufactures of carpets and woollens, and some trade in tobacco and silk. The quantity of cocoons raised in the district in 1899 was 109,218 kilogrammes, valued at £12,494. Population, 14,392.

Chassepot.—The Chassepot rifle, so named after its designer, was a modification of the Dreyse rifle—the so-called Prussian "needle gun" of 1841. It was adopted by France in 1866, and was the weapon with which her troops were armed in the Franco-German war of 1870-71.

It is a breech-loader, with its breech closed by a bolt very similar in shape and action to those now in use (see SMALL ARMS). The cartridge case is, however, cylindrical throughout, and of paper, with stout cardboard wads at the top and bottom, the percussion cap being imbedded in the latter, and also covered in rear with a disc of india-rubber. The bullet is rolled up in greased paper and attached to the case by the paper wrapping being extended over the sides of the case and bound with twine. The cartridge case plays no part in obturation (except the india-rubber disc over the cap, as will be explained), and the bolt therefore has to perform this function. The arrangements to effect this are as follows:—In front of, and attached to, the bolt proper is a mushroom-shaped bolt-head, capable of a slight longitudinal movement independent of the bolt. Threaded on to the spindle of the bolt-head, and between its rear face and the front of the bolt proper, is an india-rubber ring. On closing the bolt this ring is compressed between the faces of the bolt and bolt-head and forced outwards against the sides of the breech recess. When the rifle fires the pressure of the gas compresses the india-rubber still more, and so seals escape. (The arrangement is very similar to the "de Bange" obturator in heavy guns.) The escape round the striker point is fairly sealed by the india-rubber disc over the percussion cap. This is pierced by the striker, and is therefore blown back over the annulus between the striker and the hole for it in the bolt-head. The metallic self-obturating cartridge case was adopted by all nations very shortly after 1870, Great Britain having already done so in the Snider rifle in 1865.

The details of the Chassepot are:—

Weight with bayonet		10 lb 12 oz.
Weight without bayonet		9 lb 5 oz.
Length with bayonet		6 ft. 2 in.
Length without bayonet		4 ft. 4 in.
Calibre		·433 in.
Number of grooves		4.
Depth ,,		·012.
Twist of rifling		one turn in 21·2 inches, left hand.
Sights	Highest for	1312 yards.
	Lowest	219 ,,
Cartridge	Length	2·68 inches.
	Weight	494 grains.
Bullet	Material	Lead.
	Length	·98 inch.
	Diameter	·465 ,,
	Weight	386 grains.
Charge		86·4 ,, (black powder).
Muzzle velocity		1328 feet per second.

(H. W. B.)

Châteaubriant, chief town of arrondissement, department of Loire Inférieure, France, 40 miles N.N.E. of Nantes. It has become an important railway centre on lines to Paris and Orleans. Population (1881), 3748; (1896), 5808, (comm.) 6884.

Châtelineau, a town of Belgium, in the province of Hainaut, on the Sambre, 27 miles E. of Mons, with a station on the railway between Charleroi and Namur. It has coal-mines and iron-works. Population (communal) (1880), 8290; (1897), 11,950.

Chatham, a municipal (1890) and parliamentary borough of Kent, England, on the Medway, adjoining the city of Rochester, 34 miles E.S.E. of London by rail. The town is divided into three wards, under a mayor, 6 aldermen, and 18 councillors. It has large and important naval and military stations, and a royal dockyard. Christ Church, Luton, was erected in 1885. Recent erections are a Congregational church, a town hall and municipal offices (opened 1900, cost about £28,000), a technical institute and school of art. Among the schools are a Royal Engineers' school of military engineering, a Royal Marines' school, and two garrison schools. The royal dockyard has a river frontage of more than three miles and an area of about 500 acres. One basin is 800 feet wide, with a quay frontage of 6000 feet. The rope-house is 1140 feet long by 50 feet wide. The dockyard employs 7000 workmen. Extensive naval barracks are in course of construction, also a naval hospital. A pier was built in 1886, and belongs to the corporation, and a railway bridge over the Medway was finished in 1890. In front of the Royal Engineers' Institute is a statue (1890) of General Gordon, and near the railway station another (1888) to Waghorn, promoter of the overland route to India. Area of municipal borough, 4336 acres; population (1881), 26,424; (1891), 31,657; (1901), 36,937.

Chatham, an incorporated town and port of entry, Canada, New Brunswick, on the Miramichi river, 24 miles from its mouth and 10 miles by rail from Chatham junction on the intercolonial railway. The town contains the Roman Catholic pro-cathedral, 4 churches, 2 branch banks, and 2 newspapers, many large saw-mills, 2 pulp-mills, and several establishments for exporting fish. The lumber trade, the fisheries, and the manufacture of pulp are the chief industries. Exports in 1899-1900 were valued at $1,483,563, imports at $161,378. Population (1900), about 6000. The town is also called MIRAMICHI.

Chatham, a town and port of entry of Ontario, Canada, and the capital of Kent county, situated 64 miles S.W. of London, and 11 miles N. of Lake Erie, on the Thames River and the Grand Trunk, Canadian Pacific, and Lake Erie and Detroit River railways. There is also steamboat communication with Detroit. It contains an extensive waggon factory, planing and flour mills, manufactories of fanning mills, woven wire goods, engines, windmills, &c. Incorporated as a city in 1895, it had a population of 7873 in 1881 and of 9068 in 1901.

Chatham Islands, a small group of islands forming part of New Zealand, 536 miles due E. of Lyttelton in the South Island. Little change has taken place since 1875, except that cultivation has somewhat extended, and the native population, the Morioris (who belong to the same race as the Maoris of New Zealand, and are but slightly modified by long isolation), have considerably decreased. The larger island of the group—Whairikauri—whose highest point reaches about 1000 feet, is remarkable for the number of lakes and tarns it contains, and for the extensive bogs which cover the surface of nearly the whole of the uplands. There are no indigenous mammals; the reptiles belong to New Zealand species. The birds—the largest factor in the fauna—have become very greatly reduced through the introduction of cats, dogs, and pigs, as well as by the constant persecution of every sort of animal by the natives. The larger bell-bird (*Anthornis melanocephala*) has become quite scarce; the magnificent fruit-pigeon (*Carpophaga chathamensis*), the two endemic rails (*Nesolimnas dieffenbachii* and *Cabalus modestus*), the one of which was confined to Whairikauri and the other to Mangare Island, have become exterminated. Several fossil or subfossil avian forms, very interesting from the point of view of geographical distribution, have in the interval been discovered by Dr H. O. Forbes, namely, a true species of raven (*Palæocorax moriorum*), a remarkable rail (*Diaphorapteryx*), closely related to the extinct *Aphanapteryx* of Mauritius, and a large coot (*Palæolimnas chathamensis*). There have come to light also the remains of a species of swan belonging to the South American genus *Chenopis* and of the tuatara (*Hatteria*) lizard, the unique species of an ancient family now surviving only in New Zealand. The swan is identical with an extinct species found in

caves and kitchen-middens in New Zealand, which was contemporaneous with the prehistoric Maoris and was largely used by them for food. One of the finest of the endemic flowering plants of the group is the boraginaceous "Chatham Island lily" (*Myositidium nobile*), a gigantic forget-me-not, which grows on the shingly shore in a few places only, and always just on the high-water mark, where it is daily deluged by the waves; while dracophyllums, leucopogons, and arborescent ragworts are characteristic forms in the vegetation. The chief export from the group is wool, grown upon runs farmed both by Europeans and Morioris. There is also a small export by the natives of the flesh of young albatrosses and other sea birds, boiled down and cured, for the Maoris of New Zealand, by whom it is reckoned a delicacy. The imports consist of the usual commodities required by a population where little of the land is actually cultivated.

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Chattanooga, capital of Hamilton county, Tennessee, U.S.A., in 35° 2′ N. lat. and 85° 21′ W. long., on the left bank of Tennessee river, just north of the state line, at an altitude of 681 feet. It is an important railway centre, being at the intersection of eight railways, five of which are trunk lines. In manufactures it is of great importance, its invested capital amounting in 1890 to $7,400,000, with 5741 employees and an output of $10,216,000, the leading industries being iron and steel. This city is the seat of the U.S. Grant University, a Methodist Episcopal institution, founded in 1867. In 1898 this had a faculty of 42 teachers and was attended by 491 students. The assessed valuation of the real and personal property of Chattanooga, on a basis of about 65 per cent. of the full value, was in 1900, $12,552,090; the net debt was $879,032, and the rate of taxation, including that for the state and county, $27 per $1000. During the Civil War a series of engagements took place near Chattanooga on 23rd to 25th November 1863, when Grant with 60,000 men defeated the Confederates under Bragg (40,000 to 50,000 men). The Federal losses were 5616, those of the Confederates 8684 and 6142 prisoners. Population (1880), 12,872; (1890), 29,100; (1900), 30,154, of whom 994 were foreign-born and 13,122 were negroes. Out of 9133 males of voting age, 1347 were illiterate (unable to write), of whom 1200 were negroes.

Chautauqua, a summer educational village on the shores of Chautauqua Lake, in western New York, U.S.A. The lake is a beautiful sheet of water, 1212 feet above the sea, 20 miles long, and one to two miles in width, and flows out by Conewango Creek into Allegheny river. The village is situated on the western side of the lake, near its northern end, at the terminus of the Chautauqua and Jamestown railway. It was founded in 1874 by the Chautauqua Assembly, and contains some 500 cottages, with hotels and numerous buildings for educational purposes. All municipal improvements, including water-supply, drainage, fire department, electric lighting, &c., have been provided. Every summer classes are held in literature, art, pedagogy, and kindred subjects, when the population is estimated at 10,000 and the attendance at the various schools at 1000 to 1500.

Chaux de Fonds, La, a town in the Swiss canton of Neuchâtel. It is 18¾ miles N.W. of Neuchâtel by rail, and stands at a height of about 3281 feet in a valley (5 miles long) of the same name in the Jura. It is still the centre of the watchmaking industry. In 1896 it exported watches to the value of nearly 2½ million pounds sterling. It boasts of being "le plus grand village de l'Europe," and certainly, despite many handsome buildings, has preserved some features of a big village. Population (1888), 25,603 (mostly Protestant and French-speaking); (1900), 35,890.

Cheboygan, capital of Cheboygan county, Michigan, U.S.A., situated on M'Leod Bay, Strait of Mackinac, in the northern part of the lower peninsula, at an altitude of 598 feet. It is a lumber city, and has considerable lake commerce. It is on a branch of the Michigan Central railway. Population (1880), 2269; (1890), 6235; (1900), 6489, of whom 2101 were foreign-born.

Chefoo, or CHIFU, a treaty port in the province of Shantung, China, 260 miles S.E. by E. of Peking. It has continued to show fair progress as a place of trade, but the total volume is inconsiderable, having regard to the area it supplies. In 1880 the total exports and imports were valued at H. taels 9,906,000 (£2,724,000), and in 1899 amounted to H. taels 28,154,000 (£4,228,000). Communication with the interior is only by roads, which are extremely defective, and nearly all the traffic is by pack animals. In the event of the German Government building the railways which are now in contemplation from their newly-acquired port of Kiaochow, situated on the south side of the peninsula of Shantung, it is probable that the trade of Chefoo will dwindle into insignificance. From its salubrious situation and the convenience of its anchorage, Chefoo has become a favourite rendezvous for the fleets of the European Powers in Chinese waters, and consequently it has at times been an important coaling station. It lies in close proximity to Korea, Port Arthur, and Wei-hai-Wei, and it shared to some extent in the excitement to which the military and naval operations in these quarters gave rise. The Chefoo convention was signed here in 1876 between Sir Thomas Wade and Li Hung-Chang.

Chelmsford, a municipal borough (1888), market town, and county town of Essex, England, on the Chelmer, 29 miles N.E. of London by rail, in the mid-parliamentary division of the county. It has agricultural implement and iron foundries, large electric light and engineering works, breweries, maltings, extensive corn-mills and large cattle and corn markets, a large tannery, and fine shops. The rateable value (1888) was £42,220, (1901) £61,460. Area of borough (a civil parish), 2033 acres. Population (1881), 9793; (1901), 12,580.

Chelmsford, Frederic Thesiger, 1st BARON (1794-1878), Lord Chancellor of England, was the seventh and youngest child of Charles Thesiger, and was born in London on 15th April 1794. His father, Charles Thesiger, collector of customs at St Vincent's, was the son of a Saxon gentleman who had migrated to England and become secretary to Lord Rockingham, and was the brother of Sir Frederick Thesiger, naval A.D.C. to Nelson at Copenhagen. Young Frederick Thesiger was originally destined, like another Chancellor, Lord Erskine, for a naval career, and he served as a midshipman on board the *Cambrian* frigate in 1807 at the second bombardment of Copenhagen. His only surviving brother, however, died about this time, and he became entitled to succeed to a valuable estate in the West Indies, so it was decided that he should leave the navy and study law, with a view to practising in the West Indies and eventually managing his property in person. Another change of fortune, however, awaited him, for a volcano destroyed the family estate, and he was thrown back upon his

prospect of a legal practice in the West Indies. He proceeded to enter at Gray's Inn in 1813, and was called on 18th November 1818, another change in his prospects being brought about by the strong advice of Mr Godfrey Sykes, a special pleader in whose chambers he had been a pupil, that he should remain to try his fortune in England. He accordingly joined the home circuit, and soon got into good practice at the Surrey sessions, while he also made a fortunate purchase in buying the right to appear in the old Palace Court, where were tried small causes arising within twelve miles of Westminster, and where only four counsel were privileged to practise. In 1824 he was briefed to defend Hunt when on his trial at Hertford with Thurtell for the murder of Mr Weare, and was considered to have distinguished himself in his conduct of the case; and eight years later at Chelmsford assizes he won a hard-fought action after three trials, to which he attributed so much of his subsequent success, that when he was raised to the peerage he assumed the title Lord Chelmsford in grateful remembrance of the circuit town and of that particular achievement. In 1834 he was made king's counsel by Lord Lyndhurst, and in 1835 was briefed in the Dublin election inquiry which unseated Daniel O'Connell. In 1840 he decided to enter Parliament. He accordingly contested Newark in the Conservative interest without success, but soon after obtained a seat as member for Woodstock. In 1844 he became solicitor-general in succession to Sir W. Follett, and was knighted, but having ceased to enjoy the favour of the duke of Marlborough, lost his seat for Woodstock and had to find another at Abingdon. In 1845 Follett died, and Sir Frederick Thesiger, who next to Follett had for long been the most popular and most successful advocate at the bar, succeeded him as attorney-general, holding the post until the fall of the Peel administration on 3rd July 1846. Thus by three days Thesiger missed being Lord Chief Justice of the Common Pleas, for on 6th July Sir Nicholas Tindal died, and the seat on the bench, which would have been Thesiger's as of right, fell to the Liberal attorney-general, Sir Thomas Wilde. Sir Frederick Thesiger remained in Parliament, changing his seat, however, again in 1852, and becoming member for Stamford. During this period he enjoyed a very large practice at the bar, his talents as an advocate causing him to be employed in many *causes célèbres*, including the action for breach of promise brought by Miss Smith against Lord Ferrers, his speech in which was highly praised, and the action arising out of an impostor's claim to be the son of Sir Hugh Smyth. On Lord Derby coming into office for the second time in 1858, Sir Frederick Thesiger was raised straight from the bar to the Lord Chancellorship (as were Lord Brougham, Lord Selborne, and Lord Halsbury). In the following year Lord Derby resigned and his Cabinet was broken up. Again in 1866, on Lord Derby coming into office for the third time, Lord Chelmsford became Lord Chancellor for a short period. In 1868 Lord Derby retired, and Disraeli, who took his place as Prime Minister, wished for Lord Cairns as Lord Chancellor. Lord Chelmsford was very sore at his supersession and the manner of it, but, according to Lord Malmesbury, he retired under a compact made before he took office. Ten years later Lord Chelmsford died on 5th October 1878, after having industriously fulfilled during his two periods of retirement from office the usual judicial functions that devolve upon an ex-Chancellor. Lord Chelmsford had married in 1822 Anna Maria Tinling, niece of Major Pierson, whose name is associated with the defence of Jersey. He left surviving him four sons and three daughters, of whom the eldest, second Lord Chelmsford, earned distinction as a soldier, while the third, Alfred Henry, was made a lord justice of appeal and a privy councillor in 1877, at the early age of thirty-nine, but unfortunately died only three years later.

Lord Chelmsford was a brilliant and successful advocate rather than a distinguished lawyer or a great Lord Chancellor. He combined with ability and marked industry a high sense of honour and spotless integrity, while his fine presence and sparkling wit contributed to his success both in Parliament and his profession. Many stories are told of his ready tongue. "I have a right to deal with my witnesses as I please," said a learned serjeant once, when Thesiger had objected that he was suggesting answers to the person giving evidence. "My friend," said Thesiger promptly, addressing the court, "may *deal*, if he likes, my lord, but I submit that he must not *lead*." Lord Denman used to narrate how he had complained to Thesiger of the length of a certain barrister's speeches, "ever ending, still beginning." "Yes," said Thesiger; "his windings up are like the winding up of a watch, which only gives it a fresh start." On another occasion, Warren (author of the novel *Ten Thousand a Year*), who was always anxious to claim that he moved in high social circles, said, "I dined the other night at the duke of Leeds's, and—would you believe it?—there was no fish." "Indeed!" replied Thesiger; "I suppose they had finished it all upstairs." In 1869, when the House of Lords divided over the Irish Church Bill, a Conservative peer, seeing that Samuel Wilberforce was about to vote with the Government, remarked, "The Bishop of Oxford is going the wrong way." "No, no," said Lord Chelmsford; "he is going the road to Winchester"—a prophecy fulfilled when Mr Gladstone made Wilberforce bishop of Winchester later in the year. (E. A. Ar.)

Chelsea, a city of Suffolk county, Massachusetts, U.S.A., situated in 42° 25′ N. lat. and 71° 0′ W. long., on a peninsula between Mystic and Chelsea rivers, and fronting on Boston harbour. Its manufactures employed in 1890 a capital of $7,028,356 and 3470 persons. The value of the output was $8,158,207, one-third of which consisted of rubber goods. The assessed valuation of property was in 1899 $23,405,294, the net debt $1,290,051, and the tax-rate $17.40 per $1000. Population (1880), 21,782; (1890), 27,909; (1900), 34,072.

Cheltenham, a municipal and parliamentary borough (one member) and market town of Gloucestershire, England, on the Chelt, a tributary of the Severn, 9 miles E.N.E. of Gloucester, 121 miles W.N.W. of London by rail. The place was little known until 1716, when its mineral water springs were accidentally discovered. It is now equally well known as a great educational centre and a health resort. Cheltenham College (incorporated 1894) and the Ladies' College are famous all over the world. There are several other large scholastic institutions, and a free library, art gallery, and museum. The architectural appearance of Cheltenham is deservedly admired. The parish church (St Mary's) is an old Gothic building, with an elegant spire. The town possesses twelve other places of worship connected with the Established Church, and twenty-three Nonconformist churches or chapels. The High Street contains many fine buildings (notably the new grammar school). The celebrated Promenade, the most beautiful and verdant of English streets, has been compared to Unter den Linden, Berlin. The town is well lighted (by electricity), well paved and drained, and has an excellent water-supply. There are other attractions in the shape of beautiful gardens (Montpellier and Pittville, the latter with a lake for boating) and splendidly equipped baths, both being the property of the corporation. The area of the municipal borough is 4677 acres. Population (1901), 49,439.

Chelyabinsk, a district town of Russia, 363 miles N.E. of Orenburg, on Mias river, situated at the east foot of the Urals, at the beginning of the lowlands of W. Siberia. It is the head of the Siberian railway, and is 428 miles by rail E.N.E. of Samara and 154 miles S.S.E. of Ekaterinburg, with which it is also connected by a railway. It is the centre of the trade in corn and produce of cattle, shipped to the Ural iron works. Population, 19,891.

CHEMISTRY.

THE final paragraph of the article CHEMISTRY in the *Encyclopædia Britannica*, ninth edition, vol. v. p. 544, although written at a time when Mendeléeff's classical essay, clearly defining the periodic character of the relationship among the elements, was barely five years old, may well be taken as an appropriate introduction to the present supplementary article, as calling attention to important points of view from which it is desirable, in the first instance, to consider the progress that has been made. It is as follows:—

> The establishment of the periodic law may truly be said to mark an era in chemical science, and we may anticipate that its application and extension will be fraught with the most important consequences. It reminds us how important above all things is the correct determination of the fundamental constants of our science—the atomic weights of the elements, about which in many cases great uncertainty prevails; it is much to be desired that this may not long remain the case. It also affords the strongest encouragement to the chemist to persevere in the search for new elements.

DISCOVERY OF NEW ELEMENTS.

To deal first with the question of new elements. An interval of no less than twelve years elapsed between the discovery of indium (in 1863) and that of another new element, gallium (in 1875), but since the latter date our knowledge of the elements—the primary materials with which the chemist works—has been very considerably extended, ten or more having been added to the list, and now the number of well-defined species borders on eighty. Such discoveries serve a far higher purpose than that of gratifying the mere collector's instinct, for the introduction of law among the elements has led us to realize that progress in our knowledge of the true relationships subsisting between them generally depends more on the completion of the record than on anything else. As Mendeléeff himself pointed out in his Faraday lecture (*Trans. Chem. Soc.* 1889, p. 634):—

> Before the promulgation of the periodic law the chemical elements were mere fragmentary incidental facts in nature; there was no special reason to expect the discovery of new elements, and the new ones which were discovered from time to time appeared to be possessed of quite novel properties. The law of periodicity first enabled us to perceive undiscovered elements at a distance which formerly were inaccessible to chemical vision, and long ere they were discovered new elements appeared before our eyes possessed of a number of well-defined properties.

Mendeléeff here refers to the fact that in his original essay he fully described in advance the properties of three elements, which he named ekaaluminium, ekaboron, and ekasilicium, and that elements were subsequently discovered which were found to be endowed with properties for the most part in closest accord with his predictions. Indeed it is from this circumstance more than any other, perhaps, that the periodic law at an early date acquired its extreme popularity. It will be evident from the following brief statements that the circumstances attending the discovery of new elements in recent times have often been of peculiar interest:—

Predicted elements.

Gallium = Ekaaluminium.—The discovery of gallium was made in 1875 by Lecoq de Boisbaudran (*C. R.* 81, p. 493, cf. *Ann. Phys. Chim.* (6) 2, p. 176), who was led by means of the spectroscope to recognize its presence in very minute proportion in a zinc blende from the Pyrenees. He afterwards found it in blendes from other sources. Although a very rare element, gallium seems to be widely distributed: thus Hartley and Ramage have shown that it is present in Cleveland iron ores (*Proc. R. Soc.* 1896, 60, p. 393), and have even separated it from the crude blast-furnace metal; although, according to their estimate, only 1 part is present in 30,000 of the iron, the proportion is larger than in any other known material.

Scandium = Ekaboron.—The existence of this element was first noticed by Nilson in 1879, in the course of an examination of ytterbia prepared by Marignac's method from the rare mineral gadolinite. Cleve, who had succeeded in carrying the purification much further, shortly afterwards gave a description of the properties of scandium—remarkable for its completeness in view of the very small amount of material at his disposal—in which he proved that it corresponds to Mendeléeff's hypothetical ekaboron. According to Cleve, it is present in gadolinite and yttrotantalite to the extent of only about 0·005 per cent., but euxenite, according to Nilson, contains a larger proportion.

Germanium = Ekasilicium.—The original source of this element, and the only one known up to the present time, is argyrodite, a double sulphide of silver and germanium, $3Ag_2S.GeS_2$ (*Jour. prakt. Chem.* 1886, 34, p. 177), of which several hundred kilogrammes were found in 1885 quite locally deposited in an adit in the Himmelsfürst mine near Freiberg. Clemens Winkler was led to recognize the presence of a new element in this mineral in consequence of the difficulties he experienced in effecting its analysis.

Since thoria has been required in quantity for the manufacture of the mantles devised by Auer von Welsbach as a means of producing the incandescent gas light, new and abundant sources of the minerals in which it is contained have been discovered. The attendant earths are consequently almost waste products, and the designation "rare earths," which has so long served to characterize the oxides of the yttrium-cerium group of elements, is scarcely applicable. The field of work that these elements present is one of extraordinary difficulty, and we are clearly still but at the threshold of knowledge. The history of discovery in this branch of chemistry has been set out in a clear and concise manner by the Scandinavian chemist Cleve—the highest living authority on the group—in a lecture delivered in memory of the Swiss chemist Marignac, who specially devoted himself to the investigation of the rare earths (*Trans. Chem. Soc.* 1895, p. 468). Crookes, a noted worker in this field, who has added very largely to the methods of discriminating the rare earths, has fully discussed the question of the individuality of the various earths in two presidential addresses to the Chemical Society of London (*Trans. Chem. Soc.* 1888, p. 487; 1889, p. 257). Cleve classes the elements of the group in two divisions—one containing "perfectly characterized," the other "not yet thoroughly characterized" elements. The former includes the following four new elements:—

Yttrium-cerium group.

Ytterbium.—This element was isolated by Marignac in 1878 from erbia separated from gadolinite, and was subsequently studied by Nilson. It yields a white oxide and colourless salts; its spark spectrum is rich in lines, although its salts have no absorptive effect.

Samarium.—Attention was called to the existence of a new element in the earths from samarskite in 1878, first by Delafontaine, and soon afterwards by Lecoq de Boisbaudran; their observations were extended by Marignac in 1880, but we owe our knowledge of samarium mainly to Cleve (*Trans. Chem. Soc.* 1883, p. 362; cf. Bettendorf, *Liebig's Annalen*, 1891, 263, p. 164). The oxide of

samarium is white; its salts are yellow, and are characterized by definite absorption spectra.

Gadolinium.—This element was discovered in 1880 by Marignac among the samarskite earths; it was subsequently studied by de Boisbaudran, Cleve and Bettendorf. Its oxide and salts resemble in appearance those of ytterbium, but it has a much lower atomic weight than that element.

Praseodymium and Neodymium.—Didymia—one of the most fully studied of the rare earths—which yields salts either rose-red or violet in colour, was always regarded as a definite substance until Auer von Welsbach, in 1885, by an extended and most laborious series of fractional crystallizations of the mixed nitrates of ammonium, lanthanum and didymium, succeeded in resolving it into two constituents, praseodymia and neodymia. The former gives green salts and solutions, the latter amethyst-coloured salts and rose-coloured solutions. The elements differ in atomic weight by nearly three units, but while the contrast between their physical properties is very marked, they differ chemically to an extraordinarily slight extent. Auer's observations have been abundantly confirmed, except that, curiously enough, it has been shown by both Brauner and Jones that in assigning atomic weights to the two elements he interchanged the values. But opinion is divided as to the individuality of the products described by Auer. Cleve, while accepting praseodymium as a new element, doubts the individuality of neodymium (cf. Muthman and Stritzel, *Ber. deut. chem. Ges.* 1899, 32, p. 653). Crookes goes farther, and points out that when the absorption spectra of the two substances are superposed, a spectrum is obtained nearly identical with that of the original didymia, except that two bands are missing. From this circumstance it might be presumed that a third substance is present, but his own work on the fractionation of didymia leads him to conclude that it must not be regarded as compounded of only two, but rather as an aggregation of many closely allied elements. Krüss and Nilson have arrived at a similar conclusion.

Victorium.—In discriminating the elements of the yttrium-cerium group, the spectroscope plays an all important part, several of them being characterized by their absorption spectra, whilst others, although they exert no absorbent action in solution, afford definite spark-spectra. A third method introduced by Crookes consists in submitting the oxides, or preferably the basic sulphates, to the influence of the negative electric discharge *in vacuo*, and viewing the phosphorescence thus produced with the spectroscope. By a refinement of this method—by photographing the spectrum of the phosphorescent light, using lenses and prisms of quartz—he has been able to study the invisible ultra-violet spectra afforded by the rare earths, and in consequence to detect and separate a new element—victorium—from yttria. Starting from crude yttria, separated in the ordinary way from metals of the cerium subgroup, and subjecting the nitrate prepared from this, time after time, to the well-known process of alternate heating and then boiling the partially decomposed salt with water, thereby separating each time an insoluble basic nitrate from a soluble nitrate, he obtained fractions giving different spectra—a group of lines high up in the ultra-violet attaining a maximum brilliancy in certain intermediate fractions. By fractionally recrystallizing the oxalates prepared from these intermediate fractions a great number of times, further concentration was effected of the substance affording the spectrum referred to. Resort was then again had to the nitrate method; and finally fractions selected with the aid of the spectroscope as likely to be the richest were converted into sulphates, and fractionally precipitated by potassium sulphate. The substance ultimately isolated in this manner contained the new element, victorium.

Cleve's list of "not yet thoroughly characterized" elements of the yttrium-cerium group contains holmium, thulium,—these two he himself discovered in ordinary erbia, but has not yet satisfactorily separated,—terbium and dysprosium, and in addition a dozen or more not yet dignified with names the existence of which is suspected by Crookes or de Boisbaudran in various earths (cf. Demarçay, *C. R.* 1900, 130, p. 1185; 131, p. 387).

The inchoate state of knowledge of the rare earth elements will be sufficiently inferred from the foregoing statements; it may safely be said that no single element of the group is known in a state of practical purity, or can be regarded as "thoroughly characterized."

Gases of the atmosphere.

With a view of redetermining the densities of the elementary gases, and thus obtaining data for the further discussion of Prout's hypothesis that the atomic weights of the elements generally stand in simple relation to that of hydrogen, Lord Rayleigh was led, in the course of experiments commenced in 1882, to redetermine the density of nitrogen. Operating with the gas prepared by various chemical interactions, as well as with that separated from atmospheric air, he was led, in 1894, to discover that the nitrogen from air was very distinctly denser than that prepared from any nitrogen compound, a litre of the former weighing under standard conditions 1·2572, and one of the latter only 1·2505 gram. Having considered and tested the various possible explanations of the anomaly, Lord Rayleigh was at last led to ask what was the evidence on which the prevailing view was founded that the inert residue from air is a single substance. It then appeared that this was based entirely on the experiment made as far back as 1785 by the celebrated Cavendish, in which what was then called "phlogisticated air," *i.e.*, nitrogen, was combined with oxygen by passing sparks from a frictional electric machine through a mixture of the two gases confined over potash, and so converted into nitre. On repeating the experiment Lord Rayleigh obtained results in accordance with those described by Cavendish, a small residue of uncombined gas being always left; and as he found that this residue was in proportion to the amount of air operated upon, and that its spectrum was not that of nitrogen, the initial discovery of a previously unknown constituent of our atmosphere was made. Meanwhile Ramsay had also succeeded in obtaining a gas differing from nitrogen, by passing air deprived of oxygen, etc., over heated magnesium—a well-known absorbent of nitrogen. Pursuing the investigation conjointly, Rayleigh and Ramsay ultimately proved that the superior density of atmospheric nitrogen is due to the admixture of a small proportion (about 1 per cent.) of a gas which they have termed argon (*q.v.*)—on account of its complete chemical indifference—of superior density to nitrogen in the ratio 14·003 : 19·9 (cf. *Phil. Trans.* 1895, A. p. 187).

Argon.

At the time the discovery of argon was made public, Ramsay's attention was called by Miers to an observation recorded by an American chemist, Hillebrand, that on boiling the mineral uraninite with acid a gas was given off which appeared to be nitrogen. On examining cleveite, an allied uranium mineral, Ramsay obtained a gas almost free from nitrogen, and having observed that its spectrum contained a yellow line close to, but not coincident with, the D lines characteristic of sodium, he submitted it to Crookes for examination. On mapping the spectrum, Crookes found that the line referred to was the line D_3, first noticed by Lockyer in 1878 in the spectrum of the solar chromosphere, and ascribed by Frankland and Lockyer to a hypothetical element helium. Helium very

closely resembles argon, being also an entirely inert gas; its density is only about twice that of hydrogen (cf. *Proc. Chem. Soc.* 1895, p. 59; *Trans. ditto*, 1895, p. 1107; *Proc. Roy. Soc.* 60, p. 442). Helium has since been extracted from a variety of minerals consisting of salts of uranium, yttrium, thorium and other rare earths. It is present in the gas evolved from the Bath springs and in other natural waters. Dewar has shown that it may be separated from the Bath spring gas by subjecting this to a process of fractional liquefactions by means of liquid air (*Proc. Chem. Soc.* 1897, p. 187). By adopting such a method, as well as by the fractional distillation of liquefied argon and liquefied air, Ramsay and Travers have more recently succeeded in obtaining evidence of the presence in excessively minute proportions of three other inert gases besides helium and argon in air; they have named these neon, krypton, and xenon. In the account of their work laid before the Royal Society on 30th November 1900, the relative density of neon was stated to be nearly 10 (9·97), that of krypton 40·88, and that of xenon 64. The quantities of the three gases dealt with were so small, however, that these values must be regarded as provisional. When vacuum tubes charged with the gases are excited, that containing neon assumes an intense flame colour, the krypton tube a pale violet, and the xenon tube a sky blue. Neon can be liquefied only with the aid of liquid hydrogen. Krypton melts at − 169° and boils at about − 152°, whilst xenon melts at − 140° and boils at − 109°; the melting-point of argon, it may be mentioned, is − 188°, and its boiling-point − 186·4°. They appear to resemble helium and argon in properties. According to Liveing and Dewar (*Proc. Roy. Soc.* 1901, 67, p. 467), the spectra of the more volatile gases of atmospheric air and of the Bath spring gas which are not condensed at the temperature of liquid hydrogen contain numerous lines occupying positions very near to those assigned to lines in the spectra of the solar corona and of the aurora. It may, therefore, be anticipated that yet other elements will be discovered in the air.

Helium, etc.

Shortly after the discovery of the Röntgen rays, the discovery, if possible more remarkable, was made by Henri Becquerel that uranium salts have the power of emitting rays capable—even after traversing thin sheets of glass, ebonite, and metals—of producing photographic effects, as well as of rendering air a conductor of electricity. Thorium compounds were subsequently found to emit similar rays. The early experiments appeared to show that the intensity of the effect was proportional to the amount of uranium present, the metal being more active than any of its salts; but it was then found that certain uranium minerals—pitchblende and chalcolite—were more active even than the metal. Led by this fact, M. and Mme. Curie undertook the investigation of these materials, and succeeded in showing that at least two radio-active "elements" are present in them. One of these, polonium, occurs along with bismuth in the precipitate produced by sulphuretted hydrogen in a solution of the mineral in acid. The other, radium, occurs in the barium chloride prepared from pitchblende. Barium chloride so obtained is not only characterized by great radio-activity, but also affords a spectrum in which there are a number of lines not hitherto noticed in the spectrum of any element. Moreover, according to Mme. Curie, the atomic weight of radio-active "barium" increases as the intensity of the radiant effect increases, a substance exerting an activity 3000 times that of uranium giving the value 140, while in one exerting an activity 7500 times as great the value is as high as 145·8. Her latest determination, made with a substance which, from its spectrum, appeared to contain rather more radium than barium, gave the value 174. Quite recently (*Proc. Roy. Soc.* 1900, p. 409) Crookes has shown that the uranium salts of commerce may be purified until free from radio-activity, one method being to re-crystallize uranium nitrate from ether, in which it is readily soluble. Crookes proposed to term the radio-active constituent — which becomes concentrated in the residue—provisionally Ux. It closely resembles "radium," but its exact nature remains to be determined. According to Crookes, polonium is distinguished from radium by the inability of the rays which it emits to penetrate glass. Radium compounds are self-luminous even after they have been kept for months in the dark. Hitherto only uranium and thorium minerals have been observed to exhibit radio-activity, and apparently the property is common to all of these. As a small proportion of radium raises the atomic weight of barium considerably, it is evident that the "element" must have a high atomic weight; its constant and exclusive association in nature with the two elements of highest atomic weight known is therefore particularly remarkable.[1] It will be noticed that in the case of the rare-earth metals, the elements from air and the radio-active elements, the discovery of new elements has frequently been consequent on the introduction of novel methods rather than on the discovery of new materials: in fact, in only one case, that of germanium, has a previously untouched material been dealt with.

Radio-active elements.

Classification of Elements.

Before discussing the bearing of the new discoveries of elements, it is necessary to consider briefly the rectifications effected in our knowledge of atomic weights within recent years. It must be remembered that although atomic weight is the factor of primary importance in the classification of the elements from the point of view of the periodic law, it can obviously only serve as a basis of classification in cases in which it is clear that the value has been ascertained with a sufficiently close approach to accuracy. It is therefore one of its chief recommendations that the law itself affords a means of correcting atomic weights; indeed its acceptance as a valid generalization has been most materially promoted by the manner in which Mendeléeff's early proposals to alter the values assigned to a number of the rarer elements have been justified. To understand this, it is only necessary to bear in mind that when the elements are arranged in the order of atomic weight, instead either of an irregular or of a continuous variation in properties, a more or less obviously regular periodic variation is noticed—a given property coming to a maximum, then gradually diminishing to a minimum, from which point it again rises to a maximum. Consequently, at intervals throughout the series, elements are met with having similar properties. These elements serve as guide-posts, and in constructing a table are placed in corresponding positions. This principle being recognized, it is possible to locate correctly elements of which the atomic weights are but approximately known. Thus osmium, iridium, and platinum were at the outset placed by Mendeléeff in advance of gold, although their then accepted weights were superior to that of gold, for the reason that the other platinum metals, as well as iron, cobalt and nickel, came in advance of the superior terms of the family in which gold is included. Determinations made by Seubert completely justified Mendeléeff's action, while

Rectification of atomic weights.

[1] According to Debierne, pitchblende contains a radio-active "element" of the iron group, resembling thorium in its properties—actinium. Hofmann has separated from a number of rare-earth minerals an element resembling lead, but distinguished by radio-activity, the equivalent of which is about 65, and the atomic weight perhaps about 260.

Krüss, Mallet, and Thorpe and Laurie have shown that the value long accepted for gold needs but slight correction. Again, although the values assigned to titanium ranged from 48 to 57, Mendeléeff gave the preference to the former number as placing titanium relatively to silicon in the same position that vanadium bears to phosphorus, and it was shown by Thorpe in 1885 that 48 is the correct value.

Tellurium alone is regarded by some as an exception. Being a member of the sulphur family it should come between antimony and iodine, just as sulphur comes between phosphorus and chlorine, and consequently its atomic weight should be lower than that of iodine. This has not yet been found to be the case,[1] but there are special difficulties attached to the determination of the atomic weight of this element, and there is reason to suppose that the determinations are affected with unperceived constant errors. At the time Mendeléeff's first essay was published in 1871, only the equivalents were known of a number of the elements, and it is therefore noteworthy that, solely from a consideration of their properties, he came to the conclusion that it was necessary to take as the atomic weights other multiples of the equivalents than those commonly adopted in the case of beryllium, yttrium, indium, lanthanum, cerium, didymium, thorium and uranium. Excepting in the case of lanthanum his proposals have all been justified. Results such as these certainly justify his statement that the periodic law enables us to master the facts relating to atomic weights, whereas before it was formulated atomic weights were purely empirical numbers, which could never be directly tested by considering the values themselves but only by critically examining the methods by which they were ascertained. The work done by Stas, and those who have been fired by his example, in seeking to place the determination of atomic weights on the most exact basis possible, will be more appropriately referred to later.

It is impossible to overlook the importance of the discovery of so many new elements as have been referred to; obviously we cannot be too cautious in any conclusions we may deduce as to the number likely to exist, and especially in imposing any narrow limit. Moreover, the discovery of elements like argon, helium, etc., destitute of positive chemical properties, opens out an altogether fresh field of view, and at the same time greatly increases the difficulty of the discussion. What positions are to be assigned to them in the periodic series? On what basis are they to be classified? As all the elements previously known are chemically active substances, and as there is nothing to foreshadow the existence of inert elements, chemical considerations afford no help in such a case, and it is only possible to classify them on the basis of their atomic weights. Their molecular weights can be deduced from their densities, but what of their atomic weights—the data by which alone their position can be decided? Rayleigh and Ramsay have found the ratio of specific heat at constant pressure to that at constant volume in argon to be 1·66 : 1, which is the theoretical ratio for a gas in which all energy imparted at constant volume is expended in effecting translatory motion; they therefore assume that, like mercury, argon is a monatomic element. Helium, according to Ramsay, for a similar reason is also monatomic; in fact, all the companions of argon in air appear to exhibit "monatomic" behaviour. On this view the atomic weight of helium is about 4, whilst that of argon is about 40. The former could be placed without difficulty between hydrogen and lithium, but as the value 40 belongs to calcium, a place cannot be found for the latter. The element most nearly resembling argon is nitrogen. As we know it in atmospheric air, this is by far the least active of the elements, and yet we are satisfied that atomic nitrogen is gifted with intense affinities. The inactivity of molecular nitrogen, N_2, may be ascribed to the exhaustion consequent on the union of two atoms which attract and bind each other so firmly that little opportunity is left for them to exercise external influence. It is only necessary to apply and somewhat extend this view to find an explanation of the apparently absolute indifference manifested by helium, argon,[2] and similar gases. None of the non-metallic elements are known as monatomic molecules under any ordinary conditions; in fact, only metallic elements affect a monatomic state except at very high temperatures, and as the known *gaseous* elements—hydrogen, oxygen, nitrogen, fluorine, chlorine—all occur as diatomic molecules, it is permissible provisionally to make the assumption that this is true of helium and argon. Helium then follows hydrogen, and argon fluorine, both being appropriately placed after elements of exceptional activity. A difficulty of another kind, to which Crookes has specially drawn attention, occurs in the case of the rare-earth group of elements, of which, as already indicated, besides the considerable number now known, there is reason to believe many more exist. The differences they exhibit, judged by chemical standards, are extraordinarily slight; often there is at most a minute difference in basicity or solubility which makes it possible to separate one from the other by a process of fractionation repeated perhaps many hundred times. Are such slight differences to be regarded as proof of chemical individuality? Crookes thinks not. His views on didymia have already been referred to. Another case is that of yttria. Starting from as definite a substance as possible, prepared in such a manner that it would be commonly regarded as pure, he has succeeded, by long-continued fractionation, in separating from it six distinct fractions, each of which affords a spectrum in which the dominant band is a different member of the set of bands in the phosphorescent spectrum of the original material. Crookes does not consider, however, that the yttria is in this way separated into distinct earths. To explain these results, as well as those obtained in other similar cases, he has introduced a novel conception—that of *meta-elements*: that is to say, he would modify and widen the conception of an element, and would substitute that of an elementary group composed of meta-elements. His conception of an element may be gathered from the following passage:—

Sufficiency of the periodic theory.

Definition of an element.

> In defining an element, let us not take an external boundary, but an internal type. Let us say, *e.g.*, the smallest ponderable quantity of yttrium is an assemblage of ultimate atoms almost infinitely more like each other than they are to the atom of any other approximating element. It does not necessarily follow that the atoms shall all be absolutely alike among themselves. The atomic weight which we ascribe to yttrium, therefore, merely represents a mean value around which the actual weights of the individual atoms of the "element" range within certain limits. But if my conjecture is tenable, could we separate atom from

[1] Steiner, however, by analysing tellurium diphenyl, $TePh_2$, has arrived at the value 126·4 (*Ber. deut. chem. Ges.* 1901, p. 570).

[2] In the very stable gases the atoms in the molecule are combined very firmly, and therefore little internal work is done on heating them; in the less stable, the combination being looser, more work is done internally on heating. The ratio C_p/C_v, on this assumption, should be greater for the more stable gases, as appears to be the case judging from the values given by Clausius:—

O_2	N_2	H_2	Cl_2	Br_2
1·40	1·41	1·41	1·30	1·29

If helium and argon are He_3 and A_2, and the atoms are gifted with a very high degree of mutual affinity, the molecules might well be so stable that no internal work is done on heating the gases.

atom, we should find them varying within narrow limits on each side of the mean (*Trans. Chem. Soc.* 1888, p. 491).

Exception may be taken to this view, if only on the ground that it is somewhat premature. Belief in atomic weights as constants was never more firmly held than at the present time, the refinements introduced by Stas and later workers who have followed in his footsteps having, in all cases, led to results which serve to confirm and in no wise to weaken the conception. In fact, the views expressed by Clerk Maxwell in the article MOLECULE (*Ency. Brit.* vol. xvi.) still represent current opinion. Then, although much weight must be given to his arguments, it is in no way certain that the complexity of the rare earths is so great as Crookes would have us believe. As he and others have shown, the spectra on which he relies are excessively sensitive, traces of a foreign substance, and even the association of two earths, often sufficing to produce marked changes in them. But until the question has been far more thoroughly worked out from the chemical side, no valid conclusion can be drawn; the resolution of didymia and the recent discovery of victorium, etc., show that the means at our disposal are not yet exhausted. Moreover, the fact that the reputed elements in the rare earths differ so slightly in properties is not after all an argument of real weight, as it cannot be contended that differences such as have been observed are insufficient to characterize an element. Our powers of perception seem, indeed, to have been blunted by constantly dealing with elements widely different in general properties, and we are consequently unprepared to give willing recognition to species which cannot well be distinguished by chemical tests.

Crookes favours the opinion that there would be a difficulty in finding place within the periodic system for the large number of elements of which the existence in the rare earths is foreshadowed. But is this the case? It is true that the latest table put forward by Mendeleeff in his Faraday lecture (*Trans. Chem. Soc.* 1889, p. 656) contains only a small number of blank spaces, but as he remarked on that occasion, "although but a recent scientific generalization, it has already stood the test of laboratory verification, and appears as an instrument of thought which has not yet been compelled to undergo modification; but it needs not only new applications, but also improvements, further development, and plenty of fresh energy." Now that so many new elements are being discovered, the time for its development is at least approaching, if not already at hand.

Classification of elements.

TABLE OF THE ELEMENTS.

1 H	2 He	3	4	5	6	7 Li	8	9 Be	10 Ne	11 B	12 C	13	14 N	15	16 O
17	18	19 F	20 A	21	22	23 Na	24 Mg	25	26	27 Al	28 Si	29	30	31 P	32 S
33	34	35 Cl	36	37	38	39 K	40 Ca	41	42 Kr	43 Sc	44 45 46 47 48 Ti	49	50	51 V	52 Cr
53	54	55 Mn	56 Fe 57 58 59 (Co (Ni	60	61	62	63 Cu 64 65 Zn	66	67 X	68 69 70 Ga	71 72 Ge 73	74	75 As	76	77 Se
78	79	80 Br	81	82	83	84 85 Rb	86 87 Sr	88	89	90 Yt	91 Zr 92 93	94	95	96 Nb	97 Mo
98	99	100	101 102 Ru 103 Rh 104 105 Pd	106	107	108 Ag	109 110 111 112 Cd	113	114 In	115 116 117 Vc	118 Sn 119 120	121 Sb	122	123	124 Te
125	126	127 I	128	129	130	131 132 133 Cs	134 135 136 137 Ba	(138 La (140 Ce (141 Pr (144 Nd	[150 Sm	156 Gd	163 Tb	166 Er	173 Yb]	183 Ta	184 W
			191 Os 192 193 Ir 194 195 Pt	196	197	198 Au	199 200 Hg ? R		[204 Tl	207 Pb	208 Bi] 232 Th				240 U

If the periodic generalization give any clue whatever to the nature of the elements and the character of their interrelationship, it certainly tends to justify the conclusion that a genetic relationship exists between them. It is, in fact, impossible for any one fully imbued with the facts of organic chemistry to avoid being struck by the obvious, although often distant, analogies presented by the elements to genetically-related carbon compounds—analogies which are the more remarkable in that the exact mass relationships met with in the case of such compounds are not apparent among the elements. But as so many arguments have been advanced in support of the view that the elements undergo decomposition at high temperatures, it is perhaps well to note here that the evidence of genetic relationship among them is entirely inferential. Judging from the chemist's point of view, no valid proof of the occurrence of elementary dissociation under terrestrial conditions has yet been given, while as to its occurrence under solar or stellar conditions, until the interpretation which it is sought to put upon spectroscopic observations is accepted by those who should be best able to appreciate their force, the subject is one on which we can only hold our judgment entirely in abeyance. The discovery of helium justifies the belief that several new elements may yet become known having lower atomic weights even than oxygen. Therefore supposing that genetic relationships exist, since in a large proportion of cases corresponding elements among those having small atomic weights differ in atomic weight by very nearly 16 units, and since successive elements differ in so many cases by about a single unit, the assumption may be made that the series from hydrogen to oxygen should comprise a period of 16 terms. It then becomes a question whether the remaining elements can be arranged below these. An attempt to answer this is made in the preceding Table; the results are both remarkable and encouraging.

The first line or period calls for no special comment. Noteworthy points in the second period are the appearance of magnesium in a column in advance of that containing beryllium, and of phosphorus as the analogue of an unknown element coming between nitrogen and oxygen. No serious objection can be taken to such results, as beryllium in some respects more closely resembles aluminium than magnesium, and nitrogen and phosphorus, though they are in many ways analogous elements, also differ in important particulars. In the third period the *homology* difference 16 changes at the twelfth term, and owing to a sudden increase in the *progression* difference becomes 20 between silicon and titanium. Proceeding by units, vanadium and chromium take up their proper positions, but scandium, it will be noticed, occupies position 43, whereas the atomic weight at present assigned to it is 44; as it occurs together with elements of much higher atomic weight it is not unlikely that the value is over-estimated. In the fourth period many points of interest are brought out. Proceeding from chromium by units, manganese and iron take their proper places, but it then becomes impossible to proceed by units, as copper and zinc would be thereby entirely thrown out of position. If, however, the assumption be made that cobalt and nickel are members of the iron group, *i.e.*, *immediate homologues* of iron instead of terms in the progression series (also that perhaps they are "isomeric" elements), order may be restored by proceeding from them, copper being thus brought into the eighth or magnesium group, of which it is not an inappropriate occupant; but zinc must then be reckoned in the same family. It will be seen that "steps down" again occur in two (the eleventh and twelfth) groups in place of the one in the previous period; if, however, the atomic weight of gallium be over-estimated by about two units, progression might occur as in the previous period. The subsequent values are arranged so as to secure the proper position for bromine, the atomic weight of which is certainly known with a close approach to accuracy. Arsenic is in consequence placed in the fourteenth group instead of in the fifteenth, next to selenium, and the weight assigned to this latter element is two units below the value at present accepted, which is certainly an anomalous value, bearing in mind the fact that the difference between sulphur and chlorine is more than three units. Little can be said of the fifth period as it contains so few elements. In the sixth period the conditions appear to be similar to those in the fourth, but the tendency to the development of extended families is even more marked. The value 124 is assigned to tellurium in order to bring iodine into position, and antimony is in consequence thrown somewhat out of its usual position; in addition, the atomic weight assigned to it is a unit higher than the preferred value deduced from Cooke's determination. In the seventh period the probable existence of families of immediate homologues is again forced upon the attention. Thus cæsium, like rubidium, does not follow in the immediate order of progression; nor does barium, but like zinc, strontium, and cadmium, seems to belong to an *extended* family of which the superior terms are missing. The mystic elements of the cerium group closely follow barium. Whether the period terminates shortly afterwards with a final term having an atomic weight near to 154, or whether a great development of the rare-earth elements occur in it, so that the period terminates with tantalum and tungsten, it is impossible to say. The eighth (or ninth) period comprises the heaviest of the platinum metals and a number of other heavy metals; it clearly comes to an early close. The last period (the ninth or tenth) has at present only two representatives, and of these uranium must be almost the final term; perhaps radium belongs to this period.

A new periodic arrangement.

Such a treatment of the subject obviously brings into prominence the possible existence of a far larger number of elements than has hitherto been contemplated, and attention is specially directed by it to the probable occurrence of numerous sets of closely-related elements besides the long-recognized three triads which appear in the fourth group (Fe, Co, Ni—Ru, Rh, Pd—Os, Ir, Pt). The extreme importance of extending the search for new elements in every possible direction is thus brought into view.

Atomic Weights.

As atomic weight is the ultimate criterion of position, everything depends on the exact determination of the proportions in which the elements combine. The field of investigation open to the chemist in this direction is immense, and there is none in which he can labour with greater advantage; it is a fortunate circumstance that an enthusiastic and most skilful band of workers in America is engaging in such labours with rare devotion. If the arrangement of elements above adopted be in any way justified, it is clear that considerable alterations must be made in the atomic weights of elements in a number of instances—even in cases in which the determinations have been carried out with such care that the results are commonly regarded with confidence. When the methods which have been adopted are studied, it is obvious that in not a few cases, although extreme care may have been taken in the actual determination of the numerical values, the proof obtained that the material dealt with has been free from all admixture is often far from complete. Much more must be done in

Exact determinations of atomic weights needed.

future to characterize the materials used, either by means of spectroscopic examination or by methods of equivalent delicacy—if indeed such can be found; so-called chemical methods must often prove too coarse for such purposes. The difficulty—it may almost be said the impossibility—of separating the constituents of mixtures of isomorphous substances under limited conditions is well known, but it may well be that some of the materials hitherto regarded as uniform single substances are in reality mixtures of this kind. The need of studying the rare earths from such a point of view is beyond question; indeed, it is time that the opportunities which this group of elements presents of solving some of the most difficult but entrancing problems in chemistry were appreciated. But there can be little doubt that the main sources of error in estimating atomic weights occur in carrying out the operations, and that constant unperceived errors often affect determinations which have been conducted with the most scrupulous care.

Relationships of atomic weights.

The conception that a genetic relationship exists among the elements almost necessarily involves the idea that their atomic weights are in some way commensurable numbers. Prout first gave expression to this view in his well-known hypothesis that the atomic weights of the elements generally are exact multiples of that of hydrogen. Stas commenced his work fully persuaded of the validity of this hypothesis, but his results led him to an entire change in his opinion, and the tendency of all modern investigations has been to disprove it. Nevertheless the feeling remains that the question is still open. Thus Mallet, in his lecture delivered in memory of Stas (*Trans. Chem. Soc.* 1893, 35), after fully discussing the question, said:—

> But the fact that so many well-determined atomic weights, referred to hydrogen as unity, present numbers *nearly approaching* integers, is very striking, and calls for further investigation. The writer of this paper is in a position to quote Stas himself as admitting this much. Having enjoyed the pleasure of a conversation of considerable length with the eminent Belgian chemist at his home in Brussels in the summer of 1887, and having urged upon him the improbability of this near approach to integer values for so many atomic weights being due to chance alone, the writer was answered by the remark, "*Il faut croire qu'il y a quelque chose là-dessous.*"[1]

Apart from Stas's great work, which can now be studied without difficulty in the three volumes of his *Œuvres complètes* published after his death, no more important or more interesting literature dealing with this subject can be consulted than that relating to the numerous and persistent attempts made during recent years to fix the ratio between hydrogen and oxygen. The problem has engaged the attention of workers all over the civilized world, and we are much indebted to the American chemists, and to Morley in particular, who have spared no trouble to arrive at trustworthy results. Stated in very few words, the result uniformly arrived at is that far from being in the integral ratio 1 : 16, which was so long accepted, the two atomic weights stand to each other in the relation of 1 : 15·88. But the difficulty of attaining to finality in such work is well illustrated by the case of nickel and cobalt. These elements have over and over again attracted attention on account of their atomic weights being so nearly alike. Recently Richards, assisted by Cushman and Baxter, has again attacked the problem, and the accounts given of the work are such as to impress the reader with the greatest confidence in the results. A variety of independent methods was used, and the consistency of the results obtained is remarkable. The conclusion ultimately arrived at is that cobalt has a slightly higher atomic weight (59) than nickel (58·7). Unfortunately, however, this does not settle the question, for, as Mallet observes in his Stas lecture—after pointing out that the general tendency of investigation up to that time had been to assign to cobalt a rather higher atomic weight than to nickel—on comparing the properties of the three sets of metals—Fe, Co, Ni—Ru, Rh, Pd—Os, Ir, Pt—cobalt plainly occupies a position intermediate between iron and nickel, and therefore its atomic weight should be lower than that of nickel. No better example can be given of the severity of the struggle that is being waged between theory and practice, and of the difficulty with which the victory is to be won.

Those desiring to study the subject of atomic weights more fully should consult F. W. Clarke's *Recalculation of the Atomic Weights*, issued by the Smithsonian Institution in 1897. In this invaluable monograph reference is made to all that had been done in this department of chemistry. The subject is kept up to date in the annual reports published in the *Journal of the American Chemical Society*.

Molecular Weights.

The conception the chemist forms of the properties of an element is a very complex one, and is based not only on the study of the element as it occurs in a separate form, but of every available compound. The series of impressions thus obtained are ultimately combined into an *ideal*, which in the chemist's mind constitutes the "character" of the element, and it is such a series of ideals that he has before him when considering the periodic system. He is, in fact, to a great extent guided by instinct. But in the case of elements, as in that of individuals, the determination of character is often attended with very great difficulty, a true estimate being only slowly arrived at, and when at last such an estimate is formed, it can only be very partially expressed in words. It is therefore justifiable to say that imagination and even sentiment play an important part in chemistry, and that if too rigidly and narrowly interpreted, facts may become very misleading factors.

Properties and molecular composition.

One of the greatest difficulties in the way of forming a correct estimate of the properties of an element arises from the extraordinary manner in which properties are dependent on molecular composition; the task is equivalent to that of studying individuals through observations of crowds in which they are barely distinguishable. Familiar instances are afforded by oxygen and ozone, and by ordinary yellow and red phosphorus. No two substances are more unlike in behaviour than are oxygen and ozone, yet both are composed of the same "stuff," the difference being that the one has diatomic (O_2) and the other triatomic (O_3) molecules. Again, the inactivity of nitrogen, as we know it, is altogether

[1] In view of this pronouncement, it may be well to direct attention to the opinion expressed by Mendeléeff in 1871 in his original essay on the periodic law (*Liebig's Ann.* sup. viii. p. 200): "Even if it be allowed that the matter of elements is entirely and uniformly the same, there is no reason to presuppose that n parts by weight of an element, or n atoms, in being changed to an atom of the second element, would produce the same n parts by weight; or that the atom of the second element will be n times heavier than in the first case. The law of the conservation of weight can be regarded as a special case of the law of the conservation of energy, or of motion. Weight is, of course, caused by a special kind of motion of matter, and no reason exists for denying the possibility of a transformation of these motions in the formation of elementary atoms into chemical energy or one or other form of motion. Two of the phenomena that are to be observed in elements, viz., the constant weight of atoms and the impossibility of further decomposing them, have hitherto been in intimate, even historical connexion; if then a known element should decompose or a new one be formed, these phenomena might be attended by an increase or reduction of weight. In this way, moreover, the difference in the chemical energy of various elements might to a certain extent be explained. But in giving expression to this theory, I intend nothing further than this, that there is a certain possibility of bringing the opinion tacitly entertained by chemists of the composite character of the elements into harmony with the non-acceptance of Prout's hypothesis."

remarkable in view of the impression which a study of nitrogen compounds conveys that the element is a highly active one. An extreme instance is afforded by carbon. No conception of the properties of this element can be obtained by studying it in any of the forms in which it is ordinarily met with, and the reason is not far to seek. As ordinary amorphous carbon is converted by oxidation into mellitic acid, $C_6(CO_2H)_6$, a derivative of benzene, it may be assumed that it contains at least 12 atoms in its molecule; but mellitic acid contains a ring composed of 6 atoms of carbon—the benzene ring, and for the reason, among others, that there is an obvious tendency on the part of carbon to form such rings, it is not improbable that each of the six atoms associated with the ring in mellitic acid was originally present in the carbon in a benzene ring which underwent destruction during oxidation. On this assumption the carbon molecule contains at least 42 atoms of carbon. What is true of elements is equally true of compounds—especially of oxides. Thus, whereas carbon and silicon yield comparable chlorides of simple composition, CCl_4 and $SiCl_4$, their oxides are totally different, carbon dioxide being gaseous, whilst silicon dioxide is a non-volatile solid that fuses with difficulty. The difference is undoubtedly due to the fact that the molecule of the latter is complex, x in the formula $(SiO_2)_x$ having possibly a high value. Another striking illustration of the dependence of properties on molecular composition is afforded by the two oxides of nitrogen, NO_2 and N_2O_4; the former is an intensely coloured gas characterized by an absorption spectrum of extraordinary complexity, whereas the latter is a colourless crystalline solid. Although the force of such facts has long been recognized, they are by no means sufficiently brought under the notice of students. Even in the case of gases, although Avogadro's theorem is accepted as the basis of our system, its consequences are too often disregarded in the text-books, many of which are disfigured by the appearance of H, O, and N as symbols of hydrogen, oxygen, and nitrogen, for example. Canizzaro's striking Faraday lecture, delivered in 1872 (*Journ. Chem. Soc.* pp. 941-967), dealing specially with the application of Avogadro's theorem, may be consulted with advantage by all who wish to gain correct views on such a question.

Ultimately all peculiarities such as have been referred to must be traceable to peculiarities inherent in the elements; in order that this may be done, and that the extent to which properties depend on molecular composition may be ascertained, the determination of molecular weight becomes an operation of the first importance, and it is not to be forgotten that the determination of molecular weight is a necessary step in the determination of atomic weight. Very great improvements in the methods of determining gaseous densities have been effected in recent times, chiefly by Victor Meyer, and whereas formerly it was only possible to deal with gases, methods are now available for the determination of the molecular weights of liquids and of solids in solution. The form of apparatus introduced by Victor Meyer (in 1877) is known and in use everywhere. It consists of a cylindrical bulb attached to a long narrow stem, which is closed at the upper end by a stopper. Near this end a side tube is sealed on through which gas can escape and be collected. By surrounding the bulb and part of the stem with the vapour from a liquid of constant boiling-point, or by placing it in a furnace, the temperature may be raised to any desired point. The only limit is that imposed by the material of which the apparatus is constructed; if porcelain or platinum be used, observations can be conducted at very high temperatures. At the time of his death Meyer was engaged in attempts to construct vessels which would permit of experiments being made at temperatures far higher than those which platinum will withstand. In using the apparatus, the bulb is heated to a constant temperature, which is easily ascertained by watching whether air—or whatever gas the apparatus may contain—escapes from the side tube; the stopper is then withdrawn, a weighed quantity of the substance to be examined is deftly introduced into the tube, and the stopper reinserted. When the substance reaches the bottom of the bulb it quickly volatilizes, and displaces the gas from the bulb; this is collected and measured. There is no need to notice the temperature. The gas collected is measured under the prevailing atmospheric conditions; its volume is that of the vapour derived from the substance, assuming this to have been gasified under atmospheric conditions.

Meyer's method.

By means of this apparatus, Victor Meyer, in conjunction with Carl Meyer, was led in 1879 to make the altogether unexpected discovery that chlorine has a much lower density at high than at low temperatures. The experiment was made by dropping a known weight of platinous chloride into the bulb; this underwent decomposition into solid platinum and gaseous chlorine. At temperatures between 1200° and 1500° the value obtained was only about two-thirds of that to be expected on the assumption that ordinary chlorine was dealt with. Crafts and Meier, who repeated the Meyers' experiments, using ordinary chlorine, did not confirm their results. But both parties were right. It is now generally admitted that when the halogens are strongly heated the ordinary diatomic molecules undergo dissociation into monatomic molecules, *e.g.*,

Molecular dissociation by heat.

$$J_2 \rightleftarrows J + J.$$

This change takes place comparatively readily in the case of iodine, much less easily in the case of bromine, and only to a very slight extent when ordinary gaseous chlorine is heated. When platinous chloride is strongly heated, however, the chlorine is initially separated from the compound in the monatomic state, and hence it is that much lower values are then obtained. The same is true of platinous bromide as compared with ordinary bromine. The result is one of great interest theoretically, and justifies the assumption often made that in the nascent state substances may exercise different and more powerful effects than they do ordinarily. Meyer found that the complex (tetratomic) molecules of phosphorus and arsenic also undergo simplification at a white heat—the values approaching those calculated for diatomic molecules. When zinc and bismuth are volatilized, they—like mercury and cadmium—afford monatomic molecules; thallium, however, yields diatomic molecules. Numerous attempts have been made to determine the vapour densities of the alkali metals, but unfortunately they attack both platinum and porcelain vessels, and it is difficult to place confidence in the results.

The "freezing-point" and "boiling-point" methods referred to later have been applied to a number of the (heavy) metals in the form of alloys or amalgams. The results seem to show that, in most cases, the liquid metal consists of monatomic molecules. Speaking generally, in fact, there seems to be a far greater tendency on the part of non-metals than of metals to form complex molecules. It is more than probable that many of the properties connected with, and indeed characteristic of, the true metallic state have their origin in this circumstance. It is also not unlikely that important variations in the properties of metals, such as are occasioned by the presence of small amounts of foreign substances, may be the outcome of changes in molecular structure. Osmond has made this assumption in the case of iron, for example, to explain the existence of hard and soft varieties, and it is

difficult to account for the extraordinary behaviour of iron in any other way.[1]

Temperature and molecular composition.

Numerous experiments have been made by Victor Meyer and others to determine, with the aid of his apparatus, the molecular weight of metallic chlorides at high temperatures, such knowledge being of great importance in discussing the valency of metallic elements. The results as a whole favour the view that in many cases the chlorides have the simplest possible composition at high temperatures, whilst they undoubtedly form more complex molecules at temperatures near to their boiling-point; stannous chloride, for example, is represented by the formula $SnCl_2$ at high, but by Sn_2Cl_4 at low temperatures. The case of aluminium is of special interest. This element occurs below boron in the periodic system and therefore should behave as a triad, but, as shown by Deville many years ago, the vapour of aluminium chloride not far above its boiling-point would seem to consist of molecules of the formula Al_2Cl_6 (compare Crafts, *Trans. Chem. Soc.* 1900, p. 993). Determinations made at much higher temperatures, however, give lower values, and the conclusion that aluminium is really a triad metal is apparently confirmed by the observations first made by Odling and Buckton in 1865, and supported by later experiments (cf. Quincke, *Zeits. phys. Chem.* 1889, p. 164), that aluminium methide, even at a temperature only 10° above its boiling-point, has a vapour density 20 per cent. lower than the value corresponding to the formula $Al_2(CH_3)_6$, and that as the temperature is raised the density approaches to that required by the formula $Al(CH_3)_3$. But such inquiries need to be carried out in a much more systematic and exact manner than heretofore, especially now that a new field has been opened up by H. B. Baker's recent important observations, which show that ammonium and mercurous chlorides may be volatilized unchanged if only the presence of moisture be most scrupulously avoided; all previous observers had found that both undergo decomposition when volatilized (*Trans. Chem. Soc.* 1900, p. 646).

Valency.

The conception of valency, introduced into chemistry by Frankland in 1852, may be said to be the dominant principle on which our entire system of rational or constitutional formulæ is founded, and therefore the subject is one of the utmost importance. It may be defined as the doctrine of the functional activity of the elements, and includes the consideration not merely of the extent to which, but also of the manner and mode in which, an element or radicle enters into combination with others. The valency of an element is usually defined as merely its atom-fixing power relatively to that of hydrogen—elements being classed as *uni-*, *bi-*, *ter-*, *quadri-*valent, or as *monads*, *dyads*, *triads*, *tetrads*, according as their atoms unite with one, two, three, four atoms of hydrogen or their equivalent. In this form the conception is not only a narrow one, but a totally inadequate expression of the facts. Proof is not wanting that this is gradually being realized, and it may be hoped that ere long the complex character of the function will be more clearly recognized. The first step will then have been taken towards a truer appreciation of the phenomena. An admirable although brief summary of the historical development of the conception of valency is to be found in the lecture delivered by Professor Japp in memory of Kekulé (*Trans. Chem. Soc.* 1898, p. 97).

[1] A valuable summary of our knowledge of the metals, from the points of view referred to in this paragraph, by Mr. F. H. Neville, is to be found in the Report of the British Association for 1900. A table of "intermetallic" compounds is given in this Report which is of interest as bearing on intermetallic valency.

Views of valency.

The view that has met with almost general acceptance is that put forward by Frankland, according to which, whilst each element exhibits a maximum valency, it may manifest one or more subordinate valencies, the affinities in abeyance in cases in which only the lower valency is manifest mutually satisfying each other. By a logical extension of this view elements have been divided into those of odd and those of even valency, and it has been held that all elements belong either to one or other of these classes; it will be shown later, however, that this is not justified in practice. Kekulé, whose services in this field rank with those of Frankland, maintained that valency could not vary. He considered that it was necessary always to make use of *monad* elements in determining valency, and moreover that the only compounds on which valid arguments could be based were those which could be volatilized without undergoing decomposition. In discussing this question Professor Japp goes so far as to say: "Of all the doctrines which we owe to Kekulé, that of fixed valency is probably the one that has met with least acceptance even among chemists of his own school. At the present day it is, so far as I am aware, without supporters." But he adds, "yet Kekulé held it to the last." Such a fact cannot be overlooked. That he went too far in asserting that valency could not vary is probably true, but the essential feature in his objection—that in many cases valency was over-estimated by the Frankland school—cannot be so easily disposed of. Kekulé, it is to be remembered, although not the originator of our system of formulæ expressive of structure, may yet fairly be said to have done so much to promote and extend their use that he is to be regarded as practically the father of modern structural chemistry. He saw clearly that structure is the determining factor to be taken into account in all such discussions, and hence it was that he would only allow *monad* elements to be used in determinations of valency. In objecting to the use of compounds such as ammonium chloride and phosphorus pentachloride as criteria of valency, Kekulé took a further step, the importance of which still remains unappreciated, by dividing compounds into two classes—*atomic* compounds and *molecular* compounds. In the former the components are held together by atomic affinities or true valencies; the latter are composed of atomic compounds held together by "molecular affinities." Views such as these have not proved acceptable, probably because chemists have been unwilling to base any distinction on stability, having in mind the great differences in stability met with among compounds, and also because they have been unwilling to believe in the existence of different orders of affinity. The discovery by Thorpe in 1875 of a highly stable phosphorus pentafluoride is undoubtedly supposed to have placed Kekulé's objection out of court.

Difficulties of determination.

The first difficulty that arises in determining the valency of an element is in the selection of a measure. In the case of elements capable of forming volatile hydrides an unexceptionable standard is at hand in hydrogen, but few come under this category. Hydrocarbon radicles such as methyl (CH_3) are so entirely comparable with hydrogen that they form an equally efficient standard, and as many elements form methides which do not furnish volatile hydrides, some assistance may be obtained by calling such radicles into requisition. But in cases to which these criteria are inapplicable the difficulty becomes very great; indeed, it is doubtful if a trustworthy standard can then be found. A difficulty of another order is met with in determining whether the atom-fixing power of an element is to be

regarded as a constant or variable quantity—or perhaps it is better to say, in determining the maximum valency of an element. In substance this difficulty arises from the difficulty previously referred to of obtaining and applying a satisfactory standard of valency. A third, and perhaps the greatest difficulty of all arises from the circumstance that valency is a dependent variable, the degree in which it is manifest depending on the conditions under which the element is placed.

Saturated molecules.

Apparently the only saturated molecules known to us at present, *i.e.*, molecules destitute of all power of exercising an external influence, are those of gases such as helium and argon. Even hydrogen is to some extent unsaturated, to judge from its behaviour towards the metals platinum and palladium. On account of its properties generally, however, and of the extreme difficulty with which it is compelled to assume the liquid state, it may be said to follow helium closely; consequently it may be supposed that the hydrogen atom is a strictly univalent atom, and that when it is associated either with itself or with another radicle its affinity becomes all but neutralized.

Tested by their power of combining either with hydrogen or methyl, the elements generally (in so far as these tests are applicable) may be resolved into the four groups of which the four hydrides HCl, H_2O, H_3N, H_4C are types. But, except in the last of these groups, the compounds produced are unsaturated. Hydrogen chloride and ammonia very readily liquefy in presence of water, in which they are intensely soluble; and water, considering its composition in comparison with that of hydrogen chloride and ammonia, and the fact that the analogous sulphur compound is gaseous and but slightly soluble in water, is altogether remarkable on account of its high boiling-point, its high capacity for heat, and its extraordinary power of dissolving oxygenated compounds generally and also chlorides, bromides and iodides. Apparently the only plausible—if not the only possible—interpretation of these peculiarities is that the three hydrides in question are all eminently unsaturated compounds. Assuming this to be the case, their attractive power may be regarded as exercised either (1) by the molecules as wholes; or (2) by their constituents independently, although not necessarily to equal extents; or (3) by one or other of the constituents.

The study of carbon compounds appears to justify the belief that in very many cases the activities which they display proceed rather from centres than from the molecules as wholes. Taking into account the estimate we are able to form on general grounds of the properties of hydrogen, on the one hand, and on the other of elements such as chlorine, oxygen and nitrogen, it therefore seems probable that in the hydrides of these elements the attractive power is exercised entirely by the element which is associated with the hydrogen; that chlorine in hydrogen chloride, oxygen in water, and nitrogen in ammonia are each possessed of considerable residual affinity. It is to be noted that this residual affinity is by no means indiscriminately exercised. To put the point in conventional terms, whereas oxygen is prepared to behave as a dyad to all comers—to associate with them by means of its two affinities—fluorine alone being scorned, it is prepared to exhibit residual affinity only in presence of a select few; and most interesting of all, it seems to accord preferential treatment to itself and its near allies, the halogens. The behaviour of oxygen is all the more remarkable when it is contrasted with that of sulphur, the element with which it is most nearly allied; as tested by its power of combining with other substances, in comparison with water, sulphuretted hydrogen is absolutely inert, and yet sulphur commonly ranks as an element of higher valency than oxygen. The peculiarity of oxygen referred to is specially manifest in the properties of ordinary water; the production of a substance so remarkable among hydrides, it may almost be said, can only be explained by the assumption that the residual affinity of the oxygen in the molecule of the dihydride OH_2 compels molecule to unite with molecule. To what extent complication proceeds we cannot yet say—the estimates vary; but of one thing we are certain, that placid as the fluid is in appearance, it must be pictured as at all times the seat of an extraordinary turmoil of dissociative changes. The view that oxygen is not to be regarded as capable of acting only as a dyad, but that it can also manifest a higher valency, has been definitely advocated in various quarters of late years—notably by Meldola, by Brühl in explanation of the properties of hydrogen peroxide, and by Collie (cf. *Trans. Chem. Soc.* 1899, p. 715); but in all these cases the oxygen has been pictured as acting as a tetrad, not merely as displaying residual affinity.

Residual affinity.

The argument which leads us to regard the oxygen in water and many other compounds as possessed of residual affinity would lead us also to conclude that this is also manifested—although in very different degrees—by the chlorine in hydrogen chloride and by the nitrogen in ammonia. The question then arises whether the union of these two compounds, when ammonium chloride is formed, takes place in such a way that the elements become redistributed and separately centred around the nitrogen atom so that this acts as a pentad; or whether merely the residual affinity of each molecule comes into operation. This is the old historic question which was discussed by Kekulé and his contemporaries in the 'sixties, and decided by him in the latter sense, but which the general verdict of chemists has decided in favour of the doctrine of varying valency. In the interval numerous facts have come to light which bear on the problem although they do not solve it. Baker's recent observation, already referred to, may be held to meet Kekulé's objection that ammonium chloride cannot be volatilized unchanged; but as the compound at once breaks down in presence of a mere trace of water, it is a question whether the objection does not retain its force. An argument of real weight in favour of nitrogen being regarded as a true pentad in the ammonium compounds has been furnished by the discovery of derivatives of the hypothetical amine oxide H_3NO, corresponding with those which have long been known of the equally hypothetical phosphine oxide H_3PO; their existence was first recognized by Wernick and Wolffenstein in 1898. Such compounds are formed on oxidizing tertiary amines—dimethylaniline, for example—by means of hydrogen peroxide, and by the action of methyl and ethyl iodides on hydroxylamine. They are highly basic substances, which combine directly with acids (cf. Bamberger, Dunstan and Goulding, *Trans. Chem. Soc.* 1899, p. 792).

Structure of ammonium compounds.

On the assumption that the ammonium salts are molecular compounds, a quaternary ammonium derivative formed by uniting an amine Nabc with the iodide Id should differ from one produced from the amine Nabd and the iodide Ic. Experiments to test this assumption were made in 1875 by Meyer and Lecco, who on the one hand combined ethyldimethylamine with ethyl iodide, and on the other methyldiethylamine with methyl iodide; finding the products to have identical properties, they expressed the opinion that the ammonium derivatives were to be regarded as atomic compounds. Similar experiments made by Ladenburg at about the same date led to inconclusive

results. Lossen pointed out at the time that Meyer's results did not necessarily justify the interpretation he gave to them, inasmuch as the differences likely to arise in such a case might be so slight as to escape detection, particularly as crystallographic identity—on which Meyer and Lecco had placed special reliance—was, as a matter of fact, to be expected. At a later date, owing to the introduction of stereo-chemical considerations, the problem assumed a different aspect, and it became clear that the existence of isomeric asymmetric optically-active ammonium compounds was to be expected. The existence of such compounds was rendered probable, but not proved, by observations made by Le Bel in 1891, and has lately been established beyond question by Pope and Peachey (*Trans. Chem. Soc.* 1899, p. 1127), who have succeeded in resolving benzylphenylallylmethylammonium iodide into two powerfully optically-active isomerides. Although the problem is not solved by this important discovery, as it is conceivable that a molecular compound might also exist in isomeric optically-active forms, it is brought nearer solution, as a possible method of determining the structure of ammonium derivatives is at last placed in our hands. Yet it is evident that there may, and indeed will, be exceptional difficulty in arriving at a conclusion, and that the utmost caution must be used in interpreting even negative results, as the possibility must be foreseen of interchanges of position readily taking place within the molecule. Le Bel has laid particular emphasis on this, but from a point of view which is open to question.

In the case of compounds of non-metallic elements generally with halogens, the halogen is invariably displaced with great readiness by the use of alkalies. It is therefore highly remarkable that the compound $N(CH_3)_4I$, for example, should not be in the least affected by even the strongest caustic alkali, and that the halogen in such compounds behaves much as does that in alkylic haloids. This would seem to be a strong argument in favour of the view that the halogen is not simply associated with the nitrogen, but retained in combination with the hydrocarbon radicle. An even stronger case may be based on the similar behaviour of the phosphonium haloids, seeing that the compounds of phosphorus with halogens are so readily attacked even by water. It may be, however, that it is an effective answer to this argument to say that such behaviour affords proof of the error of the current view which asserts that when an alkali acts on ammonium haloids the halogen is attacked by the metal; in reality hydrogen is attacked by hydroxyl, the halogen only indirectly "falling a victim" to the metal, so that in the absence of hydrogen there can be little or no action. The case is one which well illustrates the difficulty of interpreting facts.

A class of facts which more than any other favours the view that the ammonium derivatives are molecular compounds may now be referred to. The basic qualities of ammonia, it is well known, are invariably diminished by the introduction of other radicles in place of hydrogen, and the extraordinary variations in basicity manifest amongst its derivatives cannot fail to arrest attention. Aniline, for example, is a very weak base in comparison with ammonia. But the chloranilines are still weaker, trichloraniline being so feeble that although soluble in acids it is precipitated on adding water. A more remarkable case is that of phenylhydrazine, $C_6H_5.NH.NH_2$, which yields only monacid salts; and hydrazine itself, $H_2N.NH_2$, although capable of forming diacid salts, has a marked tendency to combine with only a single equivalent of acid.

A large number of compounds are now known in which several nitrogen atoms are united in a ring, frequently in conjunction with carbon. The nitrogen atoms seem to be united within the ring, on the one side by one and on the other by two affinities, so that the three affinities are entirely engaged within the ring. It is remarkable that the nitrogen in such compounds is in many cases entirely destitute of basic properties, and in fact inactive to an extraordinary degree. The same may be said of the nitrogen in compounds such as azobenzene, as the few compounds these form with acids are decomposed by water. But the most striking example of inactivity is afforded by the remarkable compound diazoimide, $N_2.NH$—which may or may not have a ring structure; not only is this compound destitute of basic properties, but it actually behaves as a weak acid.

Therefore it cannot be asserted that nitrogen is a "basic" element. It is basic, as a rule, only in the *aminic* condition; the "ammonium function" is a strictly dependent function and highly discriminative.

Valency of the halogens.

The determination of the valency of the halogen elements is of primary importance, as we are practically forced to rely upon them as standards in many cases. They commonly rank as well-defined monads, but as it is clear that iodine may exercise triadic functions, the remaining halogens can scarcely be denied the rank of potential triads. The question to be settled is whether any effects they may produce beyond the functions of a true monad are to be ascribed to residual affinity, or whether they are actual triads. At present the evidence is inferential, as there are no valid methods available of determining the structure of the compounds coming under consideration—for example, phosphorus pentachloride and the double chlorides generally. In all such instances we have to deal with at least two unknowns. Chemists have long been in the habit of dividing double chlorides into two classes—one comprising mere "double salts," of which very little proper notice was taken; the other compounds of a somewhat higher order of stability, such as the platinichlorides and aurichlorides, which have been regarded by many as atomic compounds, and in conjunction with compounds such as OsO_4 have been quoted as proof that platinum may function as an octad. Obviously, in the present state of our knowledge, the only fact of which they afford proof is that chlorides may combine. The supposition that the constituents in double chlorides generally may be held together through the agency of the chlorine atoms is one which cannot be dismissed from consideration; we do not hesitate to explain the formation of double cyanides, which are analogous compounds, by such an assumption, and, moreover, the existence of compounds such as the chlorates and perchlorates, and the extraordinary inertness of a part of the halogen in some of the cobaltamine compounds, almost compel belief in the existence of stable rings containing halogen atoms in which the halogen acts as a linking element. The application of this view to fluorine is of particular importance. There can be no question that this element is possessed of residual affinity in a far higher degree than any of the allied elements. The vapour of hydrogen fluoride near to its boiling-point (19°) consists of complex molecules (Mallet), which, as Thorpe and Hambly have shown, are only completely resolved into simple molecules at a temperature near to the boiling-point of water (*Trans. Chem. Soc.* 1889, p. 163). Double fluorides of remarkable stability are formed with exceptional ease. The properties of some of these are worthy of special consideration—notably hydrogen silicon fluoride, a compound analogous in composition to hydrochloroplatinic acid. In consequence of its relation to carbon the valency of silicon may be regarded as established. If silicon be a tetrad, we are, however, almost compelled to assume that in hydrofluosilicic

acid two molecules of hydrogen fluoride are associated with the molecule of silicon tetrafluoride through the agency of fluorine atoms; and it is worth while noticing that the stability of silicon tetrafluoride in presence of water is increased in a remarkable manner through its association with hydrogen fluoride. In view of these considerations, it is impossible to accept phosphorus pentafluoride as proof that phosphorus is a pentad. The still more remarkable compound sulphur hexafluoride, a gas which is not acted upon even by potash, recently discovered by Moissan (*C. R.* 1900, 130, p. 865), in like manner cannot be regarded as proof that sulphur is a hexad. It may almost be said that its extraordinary inertness is only compatible with the view that the sulphur and fluorine atoms form a closed chain or ring.

Valency of sulphur.

Sulphur is commonly supposed to be capable of acting not only as a dyad, as in sulphuretted hydrogen, but also as a tetrad on the evidence afforded by the sulphonium compounds, and as a hexad in consequence of the existence of the oxide SO_3. The sulphonium compounds are the sulphur analogues of the quaternary ammonium compounds, and according as the latter are regarded as atomic or molecular compounds, so must the former be equally so regarded. Most important observations bearing on this problem have been recently made by Pope and Peachey (*Trans. Chem. Soc.* 1900, p. 1072), who have shown that it is possible to obtain the sulphonium compound which is formed on combining methylethyl sulphide with bromacetic acid in isomeric optically-active forms—a discovery which appears to prove that sulphur can function as a tetrad much as carbon does. Inasmuch as we are at present unable to determine the structure of sulphur trioxide, its existence cannot be accepted as proof that sulphur functions as a hexad. As bearing on this subject, the following striking passage may be quoted from Mendeléeff's Faraday lecture (p. 653):—

> The periodic law has demonstrated that the maximum extent to which different non-metals enter into combination with oxygen is determined by the extent to which they combine with hydrogen, and that the sum of the number of equivalents of both must be equal to 8. Thus chlorine which combines with 1 atom, or 1 equivalent of hydrogen, cannot fix more than 7 equivalents of oxygen, giving Cl_2O_7; while sulphur, which fixes 2 equivalents of hydrogen, cannot combine with more than 6 equivalents, or 3 atoms of oxygen. It thus becomes evident that we cannot recognize as a fundamental property of the elements the atomic valencies deduced from their hydrides; and that we must modify, to a certain extent, the theory of atomicity if we desire to raise it to the dignity of a general principle capable of affording an insight into the constitution of all compound molecules. In other words, it is only to carbon, which is quadrivalent with regard both to oxygen and hydrogen, that we can apply the theory of constant valency and of bonds, by means of which so many still endeavour to explain the structure of compound molecules.

Mendeléeff in these remarks altogether leaves out of account the possibility that the oxygen atoms in the oxides are not always separately attached, and apparently he does so advisedly; yet the properties of ruthenium and osmium tetroxide and of the perchlorates, for example, almost necessitate such an admission. As an empirical generalization, the limit he fixes to oxidation is of remarkable interest and importance, and it is noteworthy, bearing in mind the resemblance fluorine bears to oxygen, that the sum of the equivalents in the highest fluoride is the same as in the highest oxide of sulphur. May it be that the same "law" applies to the oxides and fluorides of non-metallic elements?

It remains to point out that an argument of great weight in favour of the view that iodine functions as a triad is supplied by Victor Meyer's discovery in 1889 of the iodonium compounds, which apparently bear the same relation to iodine that the sulphonium compounds bear to sulphur, and the ammonium compounds to nitrogen. Diphenyliodonium hydroxide, $I\begin{cases} C_6H_5 \\ C_6H_5 \\ OH \end{cases}$, is readily soluble in water, forming a strongly alkaline solution. On adding potassium iodide to a solution of the base, the corresponding iodide is thrown down as a yellow precipitate closely resembling lead iodide. When heated, this iodide is very readily converted into iodobenzene, heat being developed. It is very difficult, indeed impossible, to apply the molecular compound hypothesis to such substances.

From the above sketch, in which only a few of the main points are touched on, it will be obvious that the problems to be solved are many and difficult. At present we have little but shadowy impressions to guide us; certain dogmas are taught in the schools, and these influence our judgment, if indeed we can be said to exercise any judgment in the matter. It is time the facts were more carefully correlated, and that systematic inquiries were instituted, as the determination of the valency of elements may be regarded as in a measure a determination of their structure. Fortunately a new beginning has been made in this direction by the recent extension of stereo-chemical conceptions to elements other than carbon; indeed, the facts brought to light are already sufficient to carry the problem a stage farther. As sulphur is found to yield optically-active sulphonium derivatives, and therefore to resemble carbon, it must be supposed that this element can act as a tetrad; and on similar grounds the nitrogen in the ammonium compounds must be allowed to rank as a pentad. But seeing that the formation both of ammonium and of sulphonium compounds takes place only within very narrow limits, and that, as previously pointed out, nitrogen is basic only under special conditions, it is clear that in the case of the four affinities of the sulphur and of the five of the nitrogen atom, two of the former and three of the latter differ greatly from the remainder, and it would seem both in magnitude and character. A similar argument applies to other elements the valency of which apparently varies. If such a conclusion be warranted, the problem after all remains very much what it was when the question was raised by Kekulé.

Helmholtz on valency.

In recent years the attempt has been made—largely on the authority of Helmholtz (Faraday lecture, *Trans. Chem. Soc.* 1881, p. 277)—to give a more precise form to the conception of valency, by regarding it from an electrical standpoint—by assuming that definite indivisible charges of electricity, positive or negative, are associated with the atoms of matter, the number of charges corresponding with the number of units of affinity manifested by the atom, *i.e.*, its valency. These charges are supposed to condition the formation of compounds, the atoms clinging to the charges, and the charges of opposite sign clinging to each other. This hypothesis is the basis of the ionic dissociation hypothesis, to be discussed later, which has become so popular in recent years. But the new view is but a paraphrase of the old view. If the nitrogen atom, for example, carry five unit charges, it is difficult to understand why two of them should so often remain in abeyance; on the other hand, if only three charges are associated with the atom, it becomes necessary to admit that the unit charge may be divided—a supposition which is contrary to the hypothesis. The hypothesis does not take into account the fact that the *fundamental* molecules, even of so-called atomic compounds—water molecules, for example,—rarely, if ever, behave as saturated, but more or less readily and firmly unite with other molecules to form molecular aggregates. Helmholtz, seeing the difficulty, said that he did not suppose that the existence of other molecular forces, working directly from atom to atom,

was to be excluded. But, apart from the fact that a hypothesis which requires so much helping out is of little practical use from the chemist's point of view, it seems necessary to admit that whatever may be the nature of chemical affinity, the same forces are active throughout—that what sometimes is termed residual affinity is of the nature of ordinary affinity, and that the difference is in quantity rather than in quality.

Structure and Isomerism.

The study of structure is correlative with that of valency; in fact they are strictly interdependent studies, our views on valency being founded on the success with which we are able to apply them in deducing satisfactory structural formulæ. Of late years chemists have devoted their attention almost exclusively to the investigation of carbon compounds, to such an extent as even to provoke the complaint that they are guilty of unduly neglecting the study of other elements. But even if true there would be slight reason to deplore this. In consequence of the extraordinary activity displayed by workers in organic chemistry, our knowledge of carbon compounds has reached a high degree of development, and materials are fast being accumulated from which it will be possible ultimately to deduce precise conclusions as to the manner in which properties are dependent on structure; since it is now clear that the properties of the carbon compounds are primarily functions of their structure, and only in a minor degree dependent on their composition. The number of carbon compounds already known is legion, and there are still infinite possibilities before us. The technique of the subject is also highly developed, and new combinations are readily effected; it is easy, therefore, as a rule, to test any hypothesis that may be framed, and ultimately to secure evidence which is sufficient either to prove or disprove its accuracy. But in the case of all other elements a far less plastic material is dealt with, and the field of investigation is a comparatively narrow one; it is therefore less easy to avoid a dogmatic construction of the evidence. The difficulty of dealing even with such simple compounds as the chlorides has already been referred to. To deal with the oxides is still more difficult. Indeed, there can be little doubt that our knowledge of the structure of inorganic compounds generally is far less definite than is often supposed to be the case, and that much is taught in the text-books for which there is no justification. To take two examples, the alkalies and acids. Caustic soda and potash are now invariably represented by the formulæ NaOH, KOH, but there is no evidence which can be called evidence that these are correct: they are but an expression of a prevailing fashion, being used because the view is held that the relationship of the alkalies to water is—or ought to be—that represented by such formulæ, and because of the existence of alcohols. It is, at least, as probable that they are but hydrates of the oxides, *e.g.*, $Na_2O.OH_2$. Again, sulphuric acid is always represented as $SO_2(OH)_2$; the arguments on which this formula rests, however, are equally applicable to the old Berzelian formula, $SO_3.OH_2$. The statement commonly made that by the action of phosphorus pentachloride sulphuric acid is first converted into SO_2HCl and then into SO_2Cl_2, and that thereby proof is obtained of the existence of two OH groups in the acid, to begin with, is half wrong, as the second product is pyrosulphuryl chloride, $S_2O_5Cl_2$, not sulphuryl chloride, SO_2Cl_2. Moreover, the production of the compound SO_2HCl cannot be held to *prove* that the acid contains the hydroxyl group; as this compound is readily obtained by combining sulphuric anhydride with hydrogen chloride, its production may be a consequence of the removal of "water" from the acid by the action of the pentachloride, and the consequent union of the residual oxide with hydrogen chloride formed by the interaction of water and phosphorus pentachloride. It is not impossible that SO_3HCl is a molecular compound, and not an acid chloride, as the corresponding compound formed by combining ethyl chloride with sulphuric anhydride behaves as a mild form of the latter, *i.e.*, as a sulphonating agent, not as an acid chloride. Lastly, it may be pointed out that the properties of sulphuryl chloride, SO_2Cl_2, are altogether peculiar, and not those of an acid chloride; as a rule it acts as a chlorinating agent, consequently its conversion into sulphuric acid by water affords no proof of the constitution of the acid. It may well be that water is initially "chlorinated" by it, and that in consequence the SO_2 group becomes oxidized to SO_3, which then unites with water, forming sulphuric acid.

Difficulty of determining structure.

It is unnecessary to pursue such arguments farther. It is sufficient to point out that in many cases our views of structure are of the nature of preconceived opinions, being based on a too narrow interpretation of the facts. It is time that students were made more fully aware of the precise value of the formulæ they are in the habit of using, as it is essential that the chemist should preserve a free and balanced judgment. The dogmatic treatment too frequently accorded to our subject is absolutely subversive of true scientific method and serves to retard progress.

Passing to carbon compounds, the greatest advance to be noted in our knowledge of structure is that due to the introduction of geometrical conceptions by van't Hoff and Le Bel independently in 1874, which has given rise to the now well-known doctrines of stereoisomerism, *i.e.*, isomerism due to differences *in the arrangement of the atoms in space*. In this doctrine it is assumed that the molecule is a stable system of material points, and that the radicles associated with a carbon atom occupy fixed positions; it is further supposed that they are situated in the manner represented by taking the tetrahedron as the model of the carbon atom and grouping the four radicles with which it is associated in all saturated compounds at the four corners of the model—of which the carbon atom may be supposed to occupy the centre of gravity. On this assumption, a compound CR'_4 can exist in only one form, so long as any two of the radicles are identical, but when all four are unlike two forms are possible. The models of these two forms are two tetrahedra which cannot be superposed but bear to each other the relation of right to left hand; the two forms are therefore said to be *enantiomorphously* related, and as neither planes nor centre of symmetry can exist in such forms, the carbon atom which is their central feature is termed an *asymmetric* carbon atom.

Stereo-isomerism.

Of greatest importance is the explanation this doctrine affords of cases of isomerism such as that met with in the two tartaric acids, the separation of which from racemic acid was Pasteur's great achievement and the one which first gave him fame. Pasteur, indeed, in discovering the relationship of these acids and their possible structure, clearly foreshadowed the hypothesis (cf. Frankland, Pasteur Memorial Lecture, *Trans. Chem. Soc.* 1897, p. 691). It is now known that in all cases in which carbon compounds manifest the power in solution of rotating the plane of polarized light—as do the two tartaric acids—they contain one or more asymmetric carbon atoms. On the other hand, it has been shown that in the case of a large number of compounds represented by a formula containing an asymmetric carbon atom, but initially produced in an optically-inactive form, it is possible, by methods such as were introduced by Pasteur, to resolve the inactive product into two isomerides of equal but opposite optical

activity.[1] The formation of optically-active nitrogen compounds foreseen by Le Bel and established by Pope and Peachey, and the still more recent discovery of such compounds derived from the metal tin and from sulphur by these latter chemists (*Proc. Chem. Soc.* 1900, p. 42; *Trans. Chem. Soc.* 1900, p. 1072), have afforded proof that the doctrine of asymmetry may be extended to elements other than carbon, and it may be confidently expected that these are not the only cases in which it will be found to be applicable. The extraordinary value of the doctrine of asymmetry will be appreciated when its application to compounds such as those of the sugar group—which are all optically-active—is understood, especially when it is borne in mind that prior to the introduction of the theory it was impossible to explain in any satisfactory manner several cases of isomerism occurring in this group, and this too at a time when the number of compounds included in the group was far smaller than is now the case.

Isomeric Glucoses.

Among the many investigations into minute structure carried out in recent years, none ranks higher in importance or is more full of interest than that of E. Fischer on the sugars, in the course of which he has been led not only to synthesize glucose, but also to prepare a large number of new isomeric hexoses, and to place their constitution beyond all doubt with the aid of the van't Hoff–Le Bel theory. As a monument of experimental skill the inquiry stands unrivalled, and no better illustration can be given of the perfection to which analytic and synthetic methods have been carried by organic chemists. The carbohydrates—a class of compounds of supreme importance on account of the part they play as structural and food materials in the economy of plants and animals—stand in close genetic relationship, and glucose (dextrose) being the end term of the series, and the product into which most of the more complex members of the group are resolved by hydrolysis, has long attracted the attention of chemists. At an early date it was discovered that both glucose and fructose (lævulose)—the two isomeric hexoses of the formula $C_6H_{12}O_6$ which are formed on hydrolysing cane sugar—are derivatives of the paraffin hydrocarbon normal hexane, C_6H_{14}, in which the six carbon atoms are known to be arranged just as the links are in a simple branchless chain. Both yield mannitol, $C_6H_{14}O_6$, a well-known natural product, on reduction. Mannitol is proved to be a hexhydric alcohol, $C_6H_8(OH)_6$, by its conversion into a hexanitrate, and as it is a highly stable compound (alcohols containing several hydroxyl groups attached to one carbon atom being unstable), there can be no doubt that the six atoms of oxygen which it contains, and which were originally present in the hexoses, are each separately associated with a carbon atom. When mannitol is distilled with a solution of hydrogen iodide, it is converted into hexylic iodide, $C_6H_{13}I$, which on further reduction yields the hydrocarbon, normal hexane. Glucose behaves as an aldehyde on oxidation, being converted into monobasic gluconic acid, so that one of the oxygen atoms is present as COH; consequently its formula may be written :—

$$CH_2(OH).CH(OH).CH(OH).CH(OH).CH(OH).COH.$$

The behaviour of fructose, on the other hand, is that of a ketone rather than that of an aldehyde; but two ketoses can be derived from an alcohol such as mannitol :—

Mannitol, $CH_2(OH).CH(OH).CH(OH).CH(OH).CH(OH).CH_2(OH)$

Ketoses, $CH_2(OH).CH(OH).CH(OH).CH(OH).CO.CH_2(OH)$

Ketoses, $CH_2(OH).CH(OH).CH(OH).CO.CH(OH).CH_2(OH)$

It was not until 1885 that Kiliani succeeded in discriminating between these two formulæ, as well as in proving the correctness of the formula commonly assigned to glucose. The method he adopted consisted in, as it were, attaching a label to the CO group, and subsequently determining the position of the label. The label used was carboxyl, CO_2H, the group characteristic of acids, which was attached by affixing hydrogen cyanide to the CO group and then hydrolysing the cyanogen group :—

$$:CO + H.CN = :C(OH)(CN)$$

$$:C(OH)(CN) + 2OH_2 = :C(OH)(CO_2H) + NH_3.$$

To determine the position of the carboxyl group the acids were then reduced, *i.e.*, the OH groups were displaced by hydrogen by means of hydrogen iodide, and they were thus converted into acids of the acetic series of the formula $C_7H_{14}O_2$ (heptylic acids). The acid from glucose proved to be the normal acid, and that from fructose butylmethylacetic acid, proving that the CO group in glucose was at the end of the chain, but that it formed, as it were, the second link in fructose :—

$CH_2(OH)$	CH_3	CH_3
$CH(OH)$	CH_2	CH_2
$CH(OH)$	CH_2	CH_2
$CH(OH)$	CH_2	CH_2
$CH(OH)$	CH_2	$CH.CO_2H$
$CH_2(OH)$	$CH_2.CO_2H$	CH_3
Mannitol.	Normal heptylic acid.	Butylmethylacetic acid.

Fischer's researches.

E. Fischer's entry on the scene dates from the year 1884, when he made the all-important discovery of phenylhydrazine, $C_6H_5.NH.NH_2$ or $Ph.NH.NH_2$. Although not the Rosetta stone which enabled him to decipher the minute structure of glucose and its congeners, this compound made possible for the first time the separation and identification of such compounds. Its use and value depend on the fact that keto-compounds generally are converted by it into *hydrazones*, which are usually well-defined crystalline substances :—

$$:CO + Ph.NH.NH_2 = :C:N.NHPh + OH_2.$$

In the case of the hexoses, which are readily oxidized, the action, however, usually proceeds a stage farther, an *osazone* being formed by the oxidation, at the expense of the phenylhydrazine, of the "alcohol" group contiguous to the hydrazo-group, and the action on the new keto-compound thus produced of another molecule of phenylhydrazine; thus :—

$CH_2(OH)$	$CH_2(OH)$	$CH_2(OH)$
$CH(OH)$	$CH(OH)$	$CH(OH)$
$CH(OH)$	$CH(OH)$	$CH(OH)$
$CH(OH)$	$CH(OH)$	$CH(OH)$
CO	$C:N.NHPh$	$C:N.NHPh$
$CH:N.NHPh$	CHO	$CH:N.NHPh$
I.	II.	III.

The first of these formulæ represents the intermediate product formed from glucosehydrazone; No. II., that derived in like manner from fructosehydrazone; No. III. represents *glucosazone*, the final product whether glucose or fructose be used. The production of one and the same substance from the two hexoses is a result of peculiar importance as bearing on their structure, for it will be obvious that it affords the proof that a greater part—the four upper tiers, as it were—of their molecules is identically constituted.

On reference to the formula of glucose, it will be noticed

[1] For a full discussion of the doctrine and its consequences see van't Hoff's *Arrangement of Atoms in Space*. English translation by Eiloart (Longmans, Green, and Co.).

that each of the four carbon atoms in the four CH(OH) groups is combined with four different radicles, so that there are four *asymmetric* carbon atoms in the formula. The number of modifications of an asymmetric compound—which is not itself symmetric—is 2^n, where n is the number of such carbon atoms; it is therefore to be supposed that 16 isomeric aldohexoses of the formula $C_6H_{12}O_6$ can exist. At the time Fischer began to work at the group only one was known besides glucose—galactose, which is obtained together with glucose on hydrolysing milk sugar. In 1894, when Fischer summarized the results of his work, he was able to speak of no fewer than eleven of the sixteen, and to define their structure precisely.

Synthesis of fructose.

The next chapter of discovery to be considered relates to the synthesis of fructose and glucose, one of the most memorable achievements in chemistry in view of the part these play in plant economy. Butlerow, a distinguished Russian chemist, as far back as 1861, by digesting trioxymethylene, the solid polymeride of formic aldehyde, H_2CO, with lime, obtained a sugar-like substance, methylenitan, to which he assigned the formula $C_7H_{14}O_6$. Attention was specially directed to this research by Baeyer, in 1879, in the course of the celebrated paper in which he discussed the formation of sugar in the plant. Baeyer maintained that formic aldehyde must be regarded as the primary product formed by the reduction of carbon dioxide in the plant, and as that from which glucose and similar substances are gradually built up. Owing to the difficulty of preparing formic aldehyde, the subject was left untouched for a considerable time until Löw, in 1886, greatly improved the method of producing the aldehyde—so much so, that it is now manufactured on a very large scale, and used in making certain aniline dyes and also as an antiseptic agent. Löw carefully repeated Butlerow's work, and obtained results which he regarded as confirmatory of Baeyer's suggestion; he described the product as a sweet, unfermentable syrup, of the formula $C_6H_{12}O_6$, and termed it *formose*. Löw, however, assigned the formula $C_{18}H_{22}N_4O_2$ to the osazone prepared from this formose, whereas that of glucosazone is $C_{18}H_{32}N_4O_4$. To explain this discrepancy, E. Fischer repeated Butlerow's and Löw's experiments, and arrived at the conclusion that the main product was in reality a compound of the same composition as glucose, though resembling it only distantly in properties, for which formose was a very suitable name. At the same time he discovered in the product a relatively small proportion of an isomeric substance which was subsequently identified as the α-acrose to be referred to later. Meanwhile, Löw had continued his experiments, and by using magnesia in place of lime, had obtained a fermentable product which he named methose. In Fischer's hands this also proved to be α-acrose. This substance was discovered by Fischer and Tafel in 1887, and was first obtained by cautiously adding baryta to a solution of acrolein dibromide, prepared by combining the aldehyde acrolein, CH_2:CH.COH, with bromine. A better method of producing it, subsequently discovered, is to oxidize ordinary glycerol by means of bromine and alkali, and to subject the product to the action of very dilute alkali at 0°. Glycerol yields two compounds when oxidized—the corresponding aldehyde and the corresponding ketone, and apparently α-acrose is formed from these by "condensation" in the manner indicated in the equation :—

$$CH_2(OH).CH(OH).COH + CH_2(OH).CO.CH_2(OH) = CH_2(OH).CH(OH).CH(OH).CH(OH).CO.CH_2(OH).$$

It should be mentioned, however, that it is only one of several products.

The osazone prepared from α-acrose was found to resemble most closely that obtained from glucose and fructose, acrosazone differing only from glucosazone in being optically inactive. This observation showed that a most important step had been taken towards synthesizing the natural hexoses, as it justified the conclusion that α-acrose was merely the inactive form of either glucose or fructose—a view which was ultimately confirmed, but only after years of work. In the first place, it was necessary to reproduce the hexose from the osazone, the form in which alone it can be isolated from the crude synthetic product. Ultimately it was found that the action of phenylhydrazine on the hexoses could be reversed by means of muriatic acid, the group N.NHPh being thereby removed and displaced by oxygen, giving rise to an *osone* or *onal*—a compound combining in itself the properties of aldehyde and ketone, which on reduction by means of zinc dust and acetic acid is converted into a ketose; thus—

$CH_2(OH)$	$CH_2(OH)$	$CH_2(OH)$
$\dot{C}H(OH)$	$\dot{C}H(OH)$	$\dot{C}H(OH)$
$\dot{C}H(OH)$	$\dot{C}H(OH)$	$\dot{C}H(OH)$
$\dot{C}H(OH)$	$\dot{C}H(OH)$	$\dot{C}H(OH)$
C:N.NHPh	$\dot{C}$:O	$\dot{C}$:O
$\dot{C}$H:N.NHPh	$\dot{C}$H:O	$\dot{C}H_2(OH)$
Glucosazone.	Glucosone.	Ketose.

The compound prepared from acrosazone was found to have the properties of fructose, to be fermentable by yeast, to give lævulinic acid when boiled with muriatic acid, and to be converted by the action of sodium amalgam into α-acritol, a substance indistinguishable from mannitol except by its inactivity toward polarized light. As illustrating the difficulties met with in the research, it may be mentioned that starting from a kilogram of glycerol, only 0·2 gram of α-acritol could be obtained, in consequence of the number of the operations and the bad yields afforded by some of them. The character of α-acritol was ultimately deciphered by a method of indirect approach. Prior to Fischer's investigations, the attempt had often been made to reconvert mannitol and the isomeric alcohol dulcitol—which, besides being a natural product like mannitol, is formed on reducing galactose from milk sugar—into sugars by subjecting them to oxidation, but the results obtained were inconclusive owing to the difficulties met with in isolating the products. It was here that phenylhydrazine again proved to be an invaluable agent. With its aid Fischer and Hirschberger were able to show in 1887 that when mannitol is oxidized by means of nitric acid, it yields, besides fructose, an isomeride of glucose, mannose, which is the true aldehyde of mannitol, glucose belonging to a stereoisomeric series. Mannose and glucose are, however, most intimately related, as both ultimately yield glucosazone when subjected to the action of phenylhydrazine; hence it follows that they differ only in respect of the first asymmetric carbon atom above the COH group.

The investigation was assisted by the discovery made at this stage that mannose, the existence of which had so long lain hidden, was easily procurable from natural sources—Tollens and Gans obtaining it by hydrolysing salep mucilage, and Reis from so-called reserve cellulose, vegetable ivory turnings being a particularly suitable material from which to prepare it. On oxidation, mannose, like glucose, yields a monobasic acid—mannonic acid, which is a stereoisomeride of gluconic acid. When the aqueous solution of this acid is evaporated, the acid loses the elements of a molecule of water and is converted into a lactone, $C_6H_{10}O_6$, which crystallizes well. Now it had been observed by Kiliani that when arabinose—a sugar belonging to the pentose group, *i.e.*, one containing

five atoms of carbon—is combined with hydrogen cyanide, and the cyanide is hydrolysed, an acid isomeric with ordinary gluconic acid is obtained, and Kiliani had prepared from this acid the corresponding lactone. Kiliani's lactone and that obtained from mannonic acid were found by Fischer to be extraordinarily similar, but to differ in optical activity; by mixing the two lactones in equal proportions he obtained an optically-inactive product.

The final step was taken at this stage. It was found that the lactones referred to could all be converted into corresponding sugars by combining them with hydrogen by means of sodium amalgam, the mannolactone giving ordinary mannose, the isomeric lactone an isomeric mannose of equal but opposite activity, and the inactive lactone an inactive mannose. Corresponding mannitols were obtained by subjecting these aldoses to further reduction, and it was found that the inactive mannitol was identical with *a*-acritol. Hence it followed that the *a*-acrose separated from acrosazone was an inactive mixture of ordinary fructose with an isomeride of equal but opposite rotatory power. A separation was effected by destroying the ordinary fructose by fermentation with beer yeast, and then adding phenylhydrazine. An osazone was thus obtained which was the stereoisomeride of glucosazone prepared from ordinary fructose.

Although fructose had been obtained, it yet remained to prepare glucose. Bearing in mind the relation of mannose to glucose, it was to be expected that the one would be convertible into the other, but it could be foreseen that owing to their instability it would be difficult in practice to effect the conversion. Fischer, therefore, preferred to attempt to convert the corresponding monobasic acids into each other, as these were more stable, and Pasteur's researches already provided a method, viz., that used in preparing lævotartaric acid from ordinary dextrotartaric acid. He soon found that ordinary gluconic acid could be obtained from mannonic acid, and *vice versâ*, by heating their solutions with quinoline under pressure at 140°. The final step in solving the problem was then easily taken by converting ordinary gluconic acid into its lactone and reducing this latter.

Synthesis of Glucose.

Having thus succeeded in preparing substances identical with natural dextrose and lævulose entirely by artificial means, and starting from formic aldehyde—which can itself be produced from carbon dioxide, the material from which the plant derives its carbon—Fischer devoted his attention to the preparation of other stereoisomerides of glucose in order to obtain the data necessary to determine the exact configuration of the individual compounds. To understand his methods, it is necessary to bear in mind the manner in which the sixteen possible hexaldoses are structurally related. An asymmetric carbon system in which the four radicles attached to the carbon atom are arranged in a given order—say clockwise—may be termed a positive (+), and one in which they are arranged counter-clockwise a negative (−) system. When there are two such systems in a compound, four different arrangements are possible, provided the compound as a whole be asymmetric, viz.—

Configuration of the hexaldoses.

$$+\left(\begin{matrix}+ & -\\ - & +\end{matrix}\right)-$$
$$+\left(\begin{matrix}+ & -\\ - & +\end{matrix}\right)-$$

But if, as in the case of tartaric acid,

$$(CO_2H).CH(OH).CH(OH).(CO_2H),$$

the compound is symmetric, being composed of two like systems, two of the four forms (those included in brackets) are identical, and the number of stereoisomerides is reduced to three; moreover, in this latter case only two of the forms will manifest optical activity, the third being inactive, as it consists of two equal systems of opposite sign. In the case of the hexaldoses, which are all represented by unsymmetrical formulæ, symmetry is produced when the terminal groups become identical, as in the formation either of the corresponding hexhydric alcohol or of the corresponding tetrhydric di-acid:—

Hexhydric alcohol .	$CH_2(OH).[CH(OH)]_4.CH_2(OH)$
Hexaldose . .	$CH_2(OH).[CH(OH)]_4.COH$
Tetrhydric di-acid .	$CO(OH).[CH(OH)]_4.CO(OH)$.

Consequently, whereas there are sixteen possible hexaldoses, there are only ten corresponding hexhydric alcohols and ten di-acids. In the following table the possible configuration of the four asymmetric systems are arranged so as to indicate the pairs of forms (5 11, 6 12, etc.) which give rise to one and the same substance when the molecule becomes symmetrical.

				11	12	13	14	15	16
				+	+	+	+	+	−
				+	+	+	−	−	+
				+	−	−	+	−	−
				−	+	−	−	−	−
+	+	−	−	−	+	−	−	−	−
+	−	+	−	+	−	−	+	−	−
+	−	+	−	+	+	+	−	−	+
+	+	−	−	+	+	+	+	+	−
1	2	3	4	5	6	7	8	9	10

Besides proving that the hexaldoses can be reproduced by reducing the lactones formed from the monobasic acids into which they are first converted by oxidation, Fischer has shown that it is possible to effect a similar reversal even in the case of the dibasic acids which are formed by continuing the oxidation. This discovery is of fundamental importance, as it gives a means of dealing, as it were, with both extremities of the molecule, and even of reversing the positions of the terminal groups in the hexaldoses. Taking the case of the saccharic acid, $CO_2H.[CH(OH)]_4.CO_2H$, formed on oxidizing ordinary glucose, if the configuration be one of those represented under 1, 2, 3, or 4 in the above table, it must be a matter of indifference which of the two CO_2H groups is reduced to $CH_2(OH)$ and which to COH—the result will be the same; but not so in any other case. Experiment has shown that the hexaldose obtained from ordinary saccharic acid is not glucose, but an isomeride now known as gulose. The optical isomeride of this gulose is obtained by making use of the gluconic acid which is the optical isomeride of that prepared from ordinary glucose. The importance of such a result is obvious; not only is the series extended, but it is placed beyond question that configurations 1–4 do not occur in either glucose or gulose, and in view of the simple relation which mannose bears to glucose, and seeing that the difference resides in the asymmetric system adjoining the COH group, it becomes possible to establish the configuration of glucose, gulose and mannose.

Since d-glucose[1] and d-gulose both yield d-saccharic

[1] To distinguish the isomerides of opposite optical activity, it is usual to prefix the letters d- and l-, but these are used only to indicate the genetic relationship, and not the character of the optical activity; ordinary fructose, for example, being represented as d-fructose—although it exercises a lævorotatory power—because it is derived from d-glucose.

acid on oxidation, the configuration in this and the corresponding l-acid must be sought from among those numbered 5–10 in the above table. Nos. 7 and 8 can be at once ruled out, however, as acids so constituted would be optically inactive and the saccharic acids are active. If the configuration of d-saccharic acid were given by either 6 or 10, bearing in mind the relation of mannose to glucose, it would then be necessary to represent d-mannosaccharic acid by either 7 or 8—as the forms 6 and 10 pass into 7 and 8 on changing the sign of a terminal group; but this cannot be done as mannosaccharic acid is optically active. Nos. 6 and 10 must, in consequence, also be ruled out. No. 5, therefore, represents the configuration of one of the saccharic acids, and No. 9 that of the isomeride of equal opposite rotatory power. As there is no means of distinguishing between the configuration of a dextro- and lævo-modification, an arbitrary assumption must be made. No. 5 may therefore be assigned to the d- and No. 9 to the l- acid. It then follows that d-mannose is represented by No. 1, and l-mannose by No. 4, as mannose is produced by reversing the sign of the asymmetric system adjoining the terminal COH group.

Configuration of isomeric glucoses.

It remains to distinguish between 5 and 11, 9 and 15 as representing glucose and gulose. To settle this point it is necessary to consider the configuration of the isomeric pentoses—arabinose and xylose—from which they may be prepared. Arabinose being convertible into l-glucose and xylose into l-gulose, the alternative formulæ to be considered are—

$$CH_2(OH) - - - + COH$$
$$CH_2(OH) + + + - COH.$$

If the asymmetric system adjoining the COH group, which is that introduced in synthesizing the hexose from the pentose, be eliminated, the formulæ at disposal for the two pentoses are—

$$CH_2(OH) - - - COH$$
$$CH_2(OH) + - - COH.$$

When such compounds are converted into corresponding dibasic acids, $CO_2H.[CH(OH)]_2.CO_2H$, the number of asymmetric carbon atoms becomes reduced from three to two, as the central carbon atom is then no longer associated with four, but with only three different radicles. Hence it follows that the "optical" formulæ of the acids derived from two pentoses having the configuration given above will be—

$$COOH - 0 - COOH$$
$$COOH + 0 - COOH,$$

and that consequently only one of the acids will be optically active. As a matter of fact, only arabinose gives an active product on oxidation; it is, therefore to be supposed that arabinose is the $- - -$ compound, and consequently—

$$CH_2(OH) - - - + COH = \text{l-glucose}$$
$$CH_2(OH) + - - - COH = \text{l-gulose.}$$

When xylose is combined with hydrocyanic acid and the cyanide is hydrolysed, together with l-gulonic acid, a second isomeric acid, l-idonic acid, is produced, which on reduction yields the hexaldose l-idose. When l-gulonic acid is heated with pyridine, it is converted into l-idonic acid, and *vice versâ*; and d-gulonic acid may in a similar manner be converted into d-idonic acid, from which it is possible to prepare d-idose. It follows from the manner in which l-idose is produced that its configuration is $CH_2(OH) + - - + COH$.

The remaining aldhexoses discovered by Fischer are derived from d-galactose from milk-sugar. When oxidized this aldhexose is first converted into the monobasic galactonic acid, and then into dibasic mucic acid; the latter is optically inactive, so that its configuration must be one of those given in the sixth and seventh columns of the table. On reduction it yields an inactive mixture of galactonic acids, some molecules being attacked at one end, as it were, and an equal number of others at the other. On reducing the lactone prepared from the inactive acid, an inactive galactose is obtained from which l-galactose may be separated by fermentation. Lastly, when d-galactonic acid is heated with pyridine, it is converted into talonic acid, which is reducible to talose, an isomeride bearing to galactose the same relation that mannose bears to glucose. As it can be shown that d-galactose is $CH_2(OH) + - + - COH$, d-talose is $CH_2(OH) + - + + COH$.

Apart from the value they possess as extending our knowledge of a particular group of compounds, and because they furnish a complete justification of the doctrine of isomerism due to asymmetry, Fischer's researches supply evidence which cannot be gainsaid that the systems with which the chemist has to deal are intrinsically of a high order of stability, and that the changes they undergo are rarely, if ever, simply the outcome of a state of "intramolecular wobble"; in fact, they afford clear proof that such changes are dependent on and conditioned by extra-molecular or catalytic influences. It will suffice to call attention to a single example in illustration—that afforded by the conversion of gluconic into mannonic acid, and *vice versâ*. If in the case of a series of compounds such as the penthydroxypentanecarboxylic acids any tendency to "wobble" existed, it is to be supposed that of the numerous possible configurations one would prove to be the most stable, and that eventually this would be produced whichever of the isomerides were subjected to the influence of a degree of heat sufficient to cause a change. But nothing of the kind occurs, the change being strictly limited and confined to a particular region within the molecule—to a region which, on various grounds, is to be regarded as particularly susceptible to external influences. The change, in fact, affects only the carbon atom to which the carboxyl group is attached, and it is easy to understand and explain its character. There is every reason to suppose that in the first instance the carboxyl group combines with water—for it will suffice to regard the effect as produced by water alone—and becomes converted into the group $\cdot CO(OH) + OH_2 = \cdot C(OH)_3$. By the removal of one of the OH groups in conjunction with an atom of hydrogen from the contiguous CH.OH group, an ethenoid compound is formed containing the group $\cdot C(OH):C(OH)_2$. In the final stage this compound combines with water, but in two ways, the ethenoid linkage being split partly on the one side and partly on the other, so that two stereoisomeric acids are formed, but in unequal proportions, owing to the unequal influence exercised by the $C_4H_5(OH)_4$ and OH groups attached to the one member of the pair of ethenoid carbon atoms.

Intra-molecular stability.

The glucoses are much more sensitive to change than are the acids to which they give rise. Lobry de Bruyn has, in fact, shown that when merely left in contact at ordinary temperatures with weak alkali they undergo change in a manner precisely similar to that in which the more stable acids are changed on heating with water. Thus glucose, mannose and fructose are reciprocally converted the one into the other, and although, owing to the formation of acid products, actual equilibrium is never established, the state of reciprocal transformation is practically that represented by the symbols—

$$\text{glucose} \leftrightarrows \text{fructose} \rightleftarrows \text{mannose.}$$

It is easy to conceive that changes may take place with

such readiness that their complex character and the part played by the catalyst may be entirely overlooked, so that they may come to be regarded as simple intramolecular changes.

Dynamic isomerism.

Much discussion has taken place on the subject of dynamic isomerism during recent years, and the view has even been advocated that substances may exist in an unsteady state, having at one moment one configuration and an altogether different one at another. Although there is no reason to suppose that such is the case, and the evidence to the contrary is almost conclusive, as a matter of convenience it is well to distinguish isomerides which are so sensitive that they change spontaneously under the influence of necessarily adherent impurities so soon as the conditions are such as to render change possible. Such substances have been called tautomeric; they are more appropriately distinguished as dynamic isomerides, being dynamically equivalent compounds. The conditions which limit the stability of isodynamic compounds have been fully discussed by Lowry (*Trans. Chem. Soc.* 1899, p. 211). The point of chief importance to be borne in mind in connexion with such compounds is that in the fluid state they occur in admixture in dynamic equilibrium, and can only exist separately in a stable condition when in the solid state at temperatures below the stability limit, although the proportion of one of the forms present when equilibrium is reached may be infinitesimal, and the substance consequently appear to be homogeneous. The recognition of dynamic isomerides has an important bearing on the determination of structure from chemical considerations. The outcome of the discussion which has arisen on the subject has been to emphasize the need of extreme care in basing final conclusions on chemical considerations alone, as well as to show the value of physical properties as determinants of configuration. What is of even greater importance, it has drawn attention to the fact that what were formerly regarded as direct products of substitution are in reality very frequently, if not always, simply end products of a series of changes involving, in the first instance, addition—not displacement—and attended with an alteration in type. Ethylic acetoacetate may be referred to as a compound of special interest in connexion with the question under discussion. Under most conditions its behaviour is such as to require its representation as a ketonic compound, $CH_3.CO.CH_2.CO_2Et$, but in some cases compounds are obtained from it which are clearly derivatives of an *enolic* form, $CH_2.C(OH):CH.CO_2Et$, *i.e.*, a form which is both an ethenoid and an *ol* or alcohol. It is easy to understand how the one form may pass into the other—in the case of the action of sodium ethylate, for example. Instead of hydrogen being displaced by sodium, the ethylate is attracted to the ketonic oxygen—a compound being formed from which alcohol separates, leaving the sodium in combination with the oxygen. The oxygen therefore ceases to be ketonic and becomes "hydroxylic"; thus

$$MeCO.CH_2.CO_2Et + NaOEt = MeC(ONa):CH.CO_2Et + EtOH.$$

When the product is subjected to the action of an alkylic iodide the operation is reversed, and the ketonic type is reverted to; thus

$$MeC(ONa):CH.CO_2Et + MeI = MeCO.CHMe.CO_2Et + NaI.$$

Structure of hydrocarbons.

In the year 1875 chemists had prominently under their notice only two types of hydrocarbons—open chain hydrocarbons, such as those of the paraffin, ethylene and acetylene series, and cycloid or closed chain hydrocarbons, such as benzene, naphthalene and anthracene. Not only has our knowledge of these types been considerably extended in the interval, particularly in the case of benzenoid hydrocarbons, but other distinctly different types have been discovered. The chief interest attaching to these discoveries has lain in the fact that they have disclosed remarkable differences in behaviour depending on the size and structure of the cycloids. The study of the dimensions and characters of such compounds has in consequence assumed considerable importance. It has gradually been placed beyond doubt that the formation of cycloids can only occur in many cases within certain narrow limits, and many facts have been put on record which tend to show that the "affinity" exercised by carbon and other elements in cycloids is a distinctly directed or directive effect. It appears probable, indeed, that considerations inherent, perhaps, in the van't Hoff–Le Bel doctrine of "tetrahedral" carbon may find application, although in quite a different manner, in this field as well as in that of stereoisomerism.

Poly-methylene rings.

It was long supposed that the simplest ring obtainable contained six atoms of carbon, and the discovery of trimethylene by Freund in 1882 came somewhat as a surprise, especially in view of its behaviour with bromine and hydrogen bromide. Trimethylene is formed on withdrawing the bromine from trimethylene bromide.

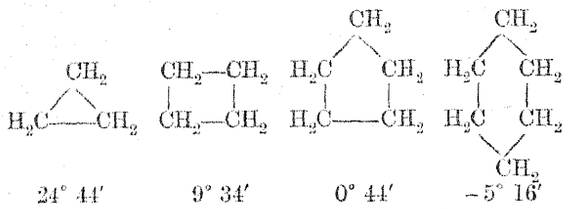
$$BrCH_2.CH_2.CH_2Br - 2Br = \begin{array}{l} CH_2 \\ H_2C\text{——}CH_2 \end{array}$$

In comparison with the isomeric ethenoid (ethylene or ethene-like) hydrocarbon propylene, $CH_3.HC:CH_2$, it is remarkably inert, being only very slowly attacked by bromine, which readily combines with propylene. But on the other hand, when digested with a saturated solution of hydrogen bromide it is readily converted into normal propyl bromide, $CH_3.CH_2.CH_2Br$. The separation of carbon atoms united by single affinities in this manner at the time the observation was made was altogether without precedent. A similar behaviour has since been noticed in other trimethylene derivatives, but the fact that bromine, which usually acts so much more readily than hydrogen bromide on unsaturated compounds, should be so inert when hydrogen bromide acts readily is one still needing a satisfactory explanation. A great impetus was given to the study of poly-methylene derivatives by the important and unexpected observation made by W. H. Perkin, junr. in 1883, that ethylene and trimethylene bromides are capable of acting in such a way on the sodium derivative of ethylic acetoacetate as to form tri- and tetra-methylene rings. Perkin has himself contributed largely to our knowledge of such compounds. Penta- and hexa-methylene derivatives have also received considerable attention, and the presumed presence of rings of this kind in camphor and allied compounds has led to an increased interest being taken in their study. The uniform result of all inquiries up to the present time has been to show that the instability of the trimethylene ring is exceptional.

Baeyer's strain hypothesis.

Von Baeyer has sought to explain the variations in stability manifest in the various poly-methylene rings by a purely mechanical hypothesis (*Ber. deut. chem. Ges.* 1885, 2279). Assuming the four valencies of the carbon atom to be directed from the centre of a sphere towards the four corners of a regular tetrahedron inscribed within the sphere, the angle at which they meet is 109° 28′. Baeyer supposes that in the formation of carbon "rings" the valencies become deflected from their positions, and that the tension thus introduced may be deduced from a comparison of this angle with the angles at which the strained valencies would meet. He regards the amount of deflection as a measure of the stability of the "ring." The readiness with which ethylene is acted on in comparison with other types of hydro-

carbon, for example, is in harmony, he considers, with the circumstance that the greatest distortion must be involved in its formation, as if deflected into parallelism each valency will be drawn out of its position through ½.109° 28′. The values in other cases are—



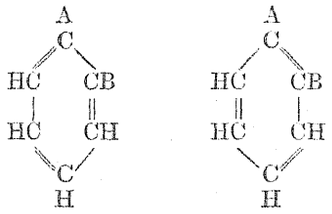
24° 44′ 9° 34′ 0° 44′ −5° 16′

The general behaviour of the several types of hydrocarbons is certainly in accordance with this conception, and it is a remarkable fact that when benzene, apparently the most stable of all cycloids, is reduced by heating with hydrogen iodide, it is not, as was long supposed to be the case, converted into hexamethylene, but into methylpentamethylene (cf. Markownikoff, *Liebig's Annalen*, 1898, 302, 1); and by no means a few other cases of the conversion of six-carbon rings into five-carbon rings have been recorded in recent years. Similar considerations will apply to rings containing other polyad elements besides carbon, but it is impossible to discuss these cases at present on account of the inadequacy of the evidence as to the "valency" of such elements. As an illustration it may be pointed out, however, that in the case of the two known types of lactones—the half-acid, half-alcoholic ethers formed from hydroxy-acids by internal condensation—the γ-lactones, which contain four carbon atoms and one oxygen atom in the ring, are more readily formed and more stable (less readily hydrolysed) than the δ-lactones, which contain one oxygen and five carbon atoms in the ring. That the number of atoms which can be associated in a ring by single affinities is limited there can be no doubt, but there is not yet sufficient evidence to show where the limit must be placed.

Baeyer has suggested that his hypothesis may also be applied to explain the instability of acetylene and its derivatives, and the still greater instability of the polyacetylene compounds. The objections to all such "explanations" is their purely "mechanical" character, and in using them it is necessary to bear this in mind. More especially must it be remembered that what is needed is not so much an explanation of instability as of the greater activity of certain types of compound. This dynamical side of the problem has hitherto been practically entirely left out of account, it being impossible to deal with it with the means at present at our command.

Kekulé's benzene formula.

In the case of closed chain hydrocarbons in which the carbon atoms are not fully saturated with hydrogen as they are in the poly-methylenes, conditions prevail which have the effect of introducing limitations, so that apparently there are but few forms possible. Of these the benzene ring, composed of six atoms of carbon, is the most stable, this ring, or collocations of such rings, being produced particularly in changes occurring at very high temperatures—as in the formation of coal-tar for example. The question of the intimate structure of benzene is therefore of special interest. It has been a subject of constant discussion since Kekulé in 1865 enunciated the conception that the six carbon atoms are directly united together in a closed chain, each of them being also united with a single hydrogen atom, so that the cycloid consists of six CH groups, and is therefore a symmetrical structure. This has been proved to be the case in the most absolute manner possible. Each carbon atom in the ring is, *ex hypothesi*, associated with neighbouring carbon atoms in such a manner that at least two of its affinities are engaged—one on either side—and a third affinity of each atom is in combination with hydrogen. To account for the disposal of the fourth affinity Kekulé suggested as most probable that the carbon atoms were united alternately by one and two affinities, and to the present day this hypothesis is regarded with favour. Two great objections have been urged against it, however. The first is that di-derivatives in which the radicles are associated with contiguous carbon atoms—so-called ortho-compounds—should differ according as these carbon atoms are associated by a single or by two affinities. No such difference has been observed. This objection has always been felt to be of the greatest weight. To dispose of it, Kekulé suggested that the distribution of the affinities within the ring must be supposed to vary, so that at one moment the configuration will be that represented by the first, and at the next that represented by the second of the following figures :—

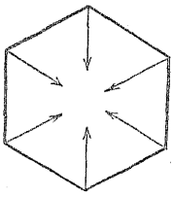


On this assumption the compound AB is a mixture in equal proportions of substances which cannot be separately dealt with. The explanation has never been regarded as satisfactory, no independent evidence having been obtained which would make it necessary to admit that such an oscillation of the affinities can and does take place. On the contrary, the results of modern inquiry appear uniformly to favour the view that when such changes occur they are not the result of mere internal oscillation, but are occasioned by catalytic influences, and take place only because the molecule becomes included with other bodies in a system. An argument of far greater weight against the ethenoid formula of benzene is furnished by the behaviour of benzenoid compounds generally in comparison with that of ethenoid compounds. Ethylene, and practically all of its derivatives, are eminently unsaturated compounds, combining—under appropriate conditions—with bromine, the halhydrides, &c., with the greatest readiness. Benzene, therefore, if it contain these ethenoid linkages, should be even more active than ethylene. But such is not the case, the behaviour of benzenoid compounds generally being rather that of saturated than of unsaturated compounds, as in most cases they afford substitution derivatives. This argument becomes convincing when dihydro- and tetra-hydro-benzene are taken into account. These behave as ethenoid compounds, being prone to change and combining as readily as the corresponding open chain derivatives do with various other substances. It cannot, therefore, be argued that the association of several ethenoid linkages in a ring has the effect of reducing their activity.

Other benzene formulæ.

The diagonal formula advocated by Claus, in which the affinities are represented as united in pairs across the ring, although not open to the criticisms which apply to Kekulé's formula, has met with but little support; there would seem, in fact, to be an instinctive objection to the assumption that affinities can act across one another. This difficulty is got over in the "centric" formula proposed by the writer (*Phil. Mag.; Trans. Chem. Soc.* 1887, 264), and shortly afterwards by v. Baeyer, in which the fourth affinity of each carbon atom is assumed to be only *directed* towards the centre of the ring—no one of the carbon atoms being regarded as

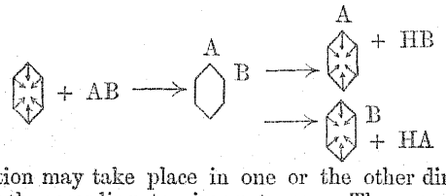
connected with any other carbon atom not contiguous to it in the ring, although each is supposed in a measure to exercise an influence over each and all the other carbon atoms. This conception is represented by the following symbol :—



Notwithstanding its vagueness, the centric symbol appears to be better adapted than any of those hitherto proposed as a means of formulating the behaviour of benzene.

Whatever its structure, the benzene complex has altogether peculiar properties. The hydrocarbon itself, under certain conditions, combines readily enough with chlorine and bromine, forming a hexachloride and hexabromide; but none of its homologues and scarcely any of its derivatives furnish similar compounds. Under all "ordinary" conditions benzene and its homologues yield substitution derivatives. When subjected to the action of either chlorine or bromine, benzene responds somewhat sluggishly, but much depends on the catalyst used in determining the interchange; comparatively little heat is developed. The homologous hydrocarbons, as a rule, are far more easily acted on by halogens. The benzene hydrocarbons are also readily converted into nitro-derivatives by nitric acid, and into sulphonic acids by sulphuric acid, the action of both agents taking place more readily in the case of the higher than of the lower terms of the series. There is every reason, however, to suppose that substitution is not directly effected. In the case of mono-derivatives, probably the centric mechanism breaks down initially, and a compound is formed by the union of the agent with contiguous carbon atoms of the hydrocarbon; this change is immediately followed by one in the reverse direction in which one of the radicles thus introduced into the molecule becomes separated together with an atom of hydrogen. For example :—

Properties of the benzene complex.



The action may take place in one or the other direction, or in both, according to circumstances. Thus, on nitrating benzene by nitric acid ($HO.NO_2$) alone, both nitro-benzene and phenol are produced, the latter, of course, undergoing further nitration, as it is readily acted on; but if the nitration be effected in presence of sulphuric acid, the separation of water from the compound first formed by the union of the benzene with the nitric acid is promoted owing to the affinity of this agent for water, and consequently nitro-benzene is practically the sole product.

The mono-derivatives of benzene are all convertible into higher derivatives, and in some cases are far more readily acted on than is the original hydrocarbon; but the benzene hydrocarbons are not peculiar in this respect, as it is well known that even in the paraffin series the higher terms are much more readily acted on than are the lower ones, and that the alcohols, for example, are readily attacked under conditions under which the hydrocarbons from which they are derived are unaffected. As it is to be supposed that in most, if not in all cases, the available energy of the system becomes reduced in the formation of the substitution derivative, it is rather to be expected that if acted on in the same way, *i.e.*, if the nature of the process be the same, substitution derivatives would be less amenable than the parent compounds. The fact that this is not always so may, therefore, be regarded as proof that the radicle introduced into a hydrocarbon in some cases itself plays an important part in conditioning change, and is itself attractive. This view derives much support from the study of the behaviour of phenol and aniline, both of which are extraordinarily sensitive in comparison with benzene—the mere addition of bromine in excess to an aqueous solution of either giving rise immediately to a precipitate of the tribromo-derivative, although benzene itself is but slowly and imperfectly converted into monobromo-benzene when placed in contact with an excess of the halogen. In like manner the nitration of phenol is readily effected by means of dilute nitric acid, being without difficulty extended to the formation of the tri-nitro compound, while to nitrate benzene it is necessary to use a fairly concentrated acid, and nitration is with difficulty extended beyond the formation of the di-derivative. Again, phenol is rapidly sulphonated by ordinary concentrated sulphuric acid, which acts but very slowly on benzene. In the case of the carbinols—the alcohols derived from the open chain hydrocarbons—the action of acids is to form an ethereal salt; ordinary alcohol, for example, yields ethylic hydrogen sulphate. Being alcohols the phenols should behave similarly, and there is reason to suppose that they do. The explanation of their apparently different behaviour is to be found in the fact that in the case of the sulphates derived from the carbinols there is no tendency for the SO_3 group to separate from the oxygen atom of the carbinol, and eventually to enter into combination with the hydrocarbon radicle; in the case of the sulphate derived from the phenol, however, such a change readily occurs, it being necessary, for example, to heat the salt $KSO_3.OC_6H_5$ only moderately to convert it into the sulphonate $HO.C_6H_4.SO_3K$. On this account the formation of the sulphate from the phenol is easily overlooked.

Function of radicle in substitution.

But it is necessary to go further in order to explain the behaviour of benzenoid derivatives generally, and to consider the cases in which the formation of intermediate compounds such as the sulphate cannot take place. The behaviour of the mixed ethers formed from phenols by introducing alkylic radicles in place of the hydroxylic hydrogen is specially suggestive. These compounds resemble phenol in being more amenable to treatment than is benzene, but they are very distinctly less active than phenol. The difference is most striking, however, when corresponding derivatives are contrasted. Phenol is converted by sulphuric acid into phenolparasulphonic acid, $HO.C_6H_4.SO_3H$. If bromine be added to an aqueous solution of this compound, diorthobromophenolparasulphonic acid is produced almost immediately; if an excess of bromine be used, the sulphonic group is also displaced by bromine, tribromophenol being formed, but this action does not set in until the whole of the phenolsulphonic acid has been dibrominated. The corresponding sulphonate derived from methylphenyl ether, $CH_3.O.C_6H_5$, formed by introducing methyl in place of the hydrogen in the OH group in the phenolparasulphonic acid, behaves in a remarkably different manner towards bromine, yielding no trace of dibromo-acid, but only the monobrominated acid. But only a part of the compound is thus acted upon; from the remainder the bromine simply displaces the sulphonic group. Acid radicles have a still more marked effect, bromine being without action on benzoylated phenolparasulphonic acid $(C_6H_5.CO).O.C_6H_4(SO_3H)$ under conditions

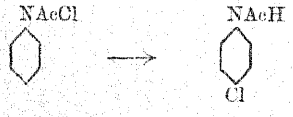
under which the unbenzoylated acid is entirely converted into tribromophenol.

Results such as these show that the introduction of various radicles in place of the hydroxylic hydrogen most materially affects the character of the influence exercised by the oxygen in phenol, and they afford a clue to the manner in which the action takes place. It can scarcely be doubted that initially the oxygen attracts the bromine to itself, and that when the bromine has thus been made a part of the molecule, it is capable—under proper conditions—of producing further changes, and eventually of displacing hydrogen in the hydrocarbon portion of the molecule. "*Ce n'est que le premier pas qui coûte*"—everything depends on the bromine becoming introduced into the molecule. The affinity of oxygen for bromine—and it may be supposed for other agents—is evidently of a somewhat fickle character; it varies greatly according to the nature of the groups with which the oxygen is associated, some rendering the oxygen altogether indifferent.[1]

The properties of anilineparasulphonic acid are modified in precisely the same way as are those of phenolparasulphonic acid by introducing hydrocarbon and acid radicles in place of the hydrogen atoms in the NH_2 group. Thus dimethylanilineparasulphonic acid yields only a monobromo-derivative, whereas the unmethylated acid is at once converted into tribromaniline by bromine; in this case the sulphonic group does not become displaced. If, however, acetyl or benzoyl be introduced in place of one of the hydrogen atoms of the NH_2 group, bromine is at once able to displace the sulphonic group, parabrom-acet- or benz-anilide being formed together with the monobrominated sulphonic acid. Evidently, therefore, the influence of nitrogen, like that of oxygen, varies greatly according to the nature of its associates.

Assuming that the first stage in the formation of the substitution derivative from the phenol or amine consists in the attraction by the oxygen or nitrogen of the particular agent used, it remains to determine what are the consequent changes. With this object in view, the behaviour of acetanilide on chlorination is especially deserving of study. Initially this compound exchanges its aminic hydrogen for chlorine, and probably a change of this kind invariably takes place when amines are chlorinated. The compound thus produced, phenylacetylchloramine, $C_6H_5.N(C_2H_3O)Cl$, when carefully purified, is a fairly stable substance, but if it be brought into contact with a trace of hydrogen chloride, it is rapidly converted into parachloracetanilide, much heat being developed; on this account, in preparing it and similar compounds it is necessary to avoid the presence of hydrogen chloride. The transference of chlorine from the nitrogen atom into the hydrocarbon radicle

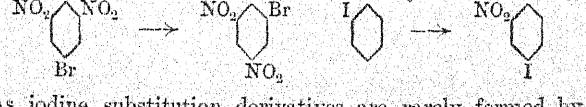
Changes involved in chlorination, etc.



which is provoked by hydrogen chloride, would seem to be dependent on the combination of the chloramine with hydrogen chloride, whereby a condition of extreme instability is engendered. Probably the first change to follow this is one in which the atom of chlorine associated with the nitrogen atom escapes together with an atom of hydrogen from the hydrocarbon complex. It may be supposed that this would lead to a "wave of disturbance" being generated within the ring, and that for the moment the nitrogen atom would also be unsaturated; as a consequence, the centric mechanism might break down and lapse into the ethenoid condition. If, at such a moment, hydrogen chloride were again to combine with the molecule, a compound might be formed which could undergo decomposition in such a way that the chlorine atom remained in the orthoposition, the hydrogen atom separating with the chlorine atom attached to the nitrogen atom—or the two chlorine atoms might attract each other, in which case the chloramine would be reduced. As a matter of fact, only a relatively small proportion of orthochloracetanilide is formed, the para-compound being always the chief, and under most conditions, the sole product; it therefore seems probable that when the conditions permit, instead of the two chlorine atoms actually separating from the system in the manner pictured, they attack the para-position, removing the hydrogen atom and taking its place. With regard to the possible reduction of the chloramine, although unobserved in the case of phenylacetylchloramine, such an action actually does take place in some cases, parachlorophenylacetylchloramine, for example, being converted into parachloracetanilide and chlorine by the action of a concentrated solution of hydrogen chloride, although if heated with water and a trace of hydrogen chloride it undergoes isomeric change into dichloracetanilide. No more striking proof could well be given that the hydrocarbon radicle is insensitive to direct attack by chlorine, and that its chlorination is effected indirectly.

That sulphonation involves a similar series of changes there can be little if any doubt, as acetanilide behaves towards sulphonating agents just as it does on chlorination; when cautiously dissolved in moderately strong fuming sulphuric acid, it is in the first instance converted into the sulphaminic acid $C_6H_5.N(C_2H_3O)(SO_2H)$. If the liquid mixture be at once poured into water, and the solution boiled, only aniline para-sulphonic acid is obtained, but if the mixture be preserved at a low temperature and allowed gradually to hydrate, and then boiled with water, besides para-acid a considerable amount of ortho-acid is also produced. In this case, as on chlorinating acetanilide, the ortho-compound is formed when the substituting radicle is, as it were, let down gently; otherwise the para-derivative is alone produced.

As compounds such as dimethylaniline, $C_6H_5.N(CH_3)_2$, are chlorinated, sulphonated, &c., without difficulty, it cannot be supposed that the introduction either of chlorine or of the sulphonic group into the aminic group is an essential preliminary to the introduction of either the one or the other of these radicles into the nucleus. The explanation given above, in fact, does not necessarily require the direct transference of the radicle from the aminic group into the nucleus, but it is clear that such a direct transference may take place, in view of the fact that nitrosomethylaniline, $C_6H_5.N(CH_3)(NO)$, for example, is entirely converted into paranitrosomethylaniline, $NO.C_6H_4.NH.CH_3$, by the action of hydrogen chloride, inasmuch as it can scarcely be doubted that if the NO group ever became separated from the molecule, it would not be entirely returned. A similar argument may be based on the complete conversion of diorthonitroparabromophenol into orthoparadinitroorthobromophenol by the action of bromine; and on the formation from orthiodanisol of pariodorthonitranisol on nitration



As iodine substitution derivatives are rarely formed by

[1] The discovery of diethylperoxide, $C_2H_5.O.O.C_2H_5$, a relatively stable compound, by Baeyer and Villiger, has afforded direct proof that the "activity" of oxygen is much reduced by association with hydrocarbon radicles.

the direct action of iodine, the latter change is a particularly striking proof of the transference of a radicle from one position to another within the molecule. That such transferences are but the end result of a series of changes more or less of the character of those pictured above is more than probable.

In the case of phenol and aniline, whatever the agent used in effecting substitution, the entering radicle as a rule always takes up either the para- or the ortho-position relatively to the OH or NH_2 group; in fact, when this is not the case, and a meta-derivative is formed, it is probably because—as will be explained later—the compound no longer acts as an OH or NH_2 derivative. In other cases in which para- and ortho-derivatives are exclusively formed, the influence exercised by the radicle present in the mono-derivative may obviously be regarded as of the same order as that exercised by either oxygen or nitrogen, and it is a logical extension of this argument to assume that the process by which the higher derivative is formed is similar in character, whether the mono-derivative contain OH, NH_2, Cl, CH_3, or any other radicle which conditions the entry of the second group into the para- and ortho-positions only. If this conclusion be accepted, it follows that CH_3 and other hydrocarbon radicles must be regarded as possessed of considerable attractive power, as the homologues of benzene are so much more readily acted on than benzene itself.

Certain radicles, notably acid radicles such as NO_2, SO_2H and CO_2H, condition the formation of meta-di-derivatives, mono-derivatives of benzene containing these radicles yielding but a small proportion of the ortho- and para-compounds. Thus nitrobenzene is almost entirely converted into metabromonitrobenzene when brominated, although when bromobenzene is nitrated the chief product is parabromonitrobenzene, no meta-compound being formed. Agents generally act on all mono-derivatives which afford meta-di-derivatives less readily than on benzene; hence it may be inferred that radicles such as NO_2 have little if any power of attracting "acid" agents such as the halogens, nitric and sulphuric acids, &c. It may further be supposed that not only do they not attract, but that they actually protect the ortho- and para-positions against attack, exercising an inhibiting power similar to, but even stronger than, that which—as previously pointed out—the oxygen and nitrogen of phenol and aniline appear to exert when associated with acid radicles. Consequently, if mono-derivatives containing acid radicles are acted on by agents which are sufficiently powerful to act on the hydrocarbon ring, they behave much as benzene behaves, but the position attacked is that which is least exposed to the influence of the acid radicle—that is to say, the meta-position. Proof of the correctness of this argument is afforded by the fact, that if an agent be used which is attracted by the acid radicle, substitution no longer takes place in the meta-position; thus when nitrobenzene is heated with powdered caustic soda it is converted into orthonitrophenol. On the other hand, if the basic or acid-attracting power of aniline be sufficiently lowered or neutralized, as for instance by combination with sulphuric acid or by benzoylation, meta-derivatives are formed in no inconsiderable proportion on nitration and sulphonation.

It will be obvious that the issues raised by the study of the formation of substitution derivatives from benzene are many and complicated, and that, in order to get behind the facts, it is necessary to take many considerations into account. In studying phenol and aniline, the peculiarities of oxygen and nitrogen must be reckoned with as much as those of benzene; on the other hand, much is learnt of the manner in which these elements exercise their functions by studying phenol and aniline. It is too often forgotten that phenol is a derivative of oxygen, and aniline a derivative of nitrogen, and that these compounds are not merely to be regarded as derivatives of benzene; in point of fact, it is only when they are considered from the former point of view that their benzene function can be properly understood, and that it becomes apparent how false an estimate is usually formed of this function. In the formation of benzenoid derivatives, in cases in which the attack proceeds from a radicle in position 1, the para-derivative is almost invariably the chief if not the sole product, and so much is this the case that attention has been called, over and over again, to the need of giving expression to the fact in the formula of benzene. The centric symbol, more than any other, may be said to indicate and almost to require such a result. For if the view be taken that, as explained above, addition precedes substitution, whatever change takes place in region 1, it is to be supposed that the *opposite* centric valency will be the one most affected; and if the effect be—as it most probably is—to release it either partially or entirely, region 4 will, as a rule, prevail over the other regions as a centre of activity into which the entering group will be determined. From this point of view the formation of ortho-derivatives is to be regarded as a consequence of the immediate contiguity of regions 1 and 2. But contiguity constitutes a disadvantage as well as an advantage, as it renders the possibility of reversal greater, and it is only in cases in which reversal occurs with comparative difficulty that the ortho-compound is formed in any considerable proportion. Thus the fact that phenol yields only a small proportion of the ortho-bromo-, but a considerable proportion of the ortho-chloro-derivative, may be ascribed to the circumstance that when once introduced chlorine is both more firmly held and less liable to be displaced by a reversal of the interchange.

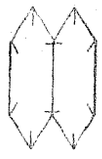
Value of centric formula.

Although similar to benzene in general behaviour, the hydrocarbons formed by the "fusion" of two or more benzene rings all exhibit distinctive properties; the study of these is of special interest and importance in considering the manner in which properties are correlated with structure. Naphthalene, anthracene and phenanthrene may be taken as examples.

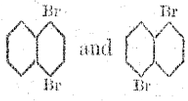
Polycycloid hydrocarbons.

Naphthalene, $C_{10}H_8$, is proved beyond question to consist of two benzene rings with one pair of carbon atoms in common. It is also certain that the two rings are alike, and that the compound as a whole is symmetrically constituted; consequently naphthalene is represented by the double hexagon symbol, and for all practical purposes this symbol is sufficient. As in the case of benzene, the determination of the inner structure of the molecule is a matter of great difficulty. It is noteworthy, in the first place, that naphthalene is much more sensitive to attack than is benzene; as no distortion of either ring is involved in the "fusion" of two rings, this fact is not in harmony with v. Baeyer's mechanical hypothesis. If the carbon atoms are represented as alternately singly and doubly linked, as in Kekulé's formula of benzene, there would be no fewer than five pairs of doubly-linked carbon atoms in the molecule. The behaviour of naphthalene cannot, however, be said to be that which a compound so constituted would be likely to exhibit, although it is distinctly more ethenoid in character than that of benzene. To apply the centric hypothesis to naphthalene, it is necessary to assume that one of the affinities of each of the two central carbon atoms common to the two rings *acts into* both rings, as pictured in the symbol, which is an assumption involving a somewhat wide departure from all ordinary views as to the manner in which affinity acts. Nevertheless the

symbol is one with the aid of which alone, perhaps, the general behaviour of naphthalene may be satisfactorily expressed. In the first place, it harmonizes



with the fact that the two rings are in complete sympathy, the one responding to every change made in the other. Then, on account of the relatively slight — because divided—influence which would be exercised upon the two rings by the two affinities common to both, the remaining four centric affinities of each ring would presumably be less attracted into the ring than in the case of benzene; consequently they would be more active outwards, and combination would set in more readily. When, as in the formation of naphthalene tetrachloride, for example, the one ring becomes saturated, the other might be expected to assume the normal centric form and become relatively inactive. This is absolutely the case. On the other hand, if substitution be effected in the one ring, and the affinities in that ring become attracted inwards, as apparently happens in the case of benzene, the adjoining ring should become relatively more active because the common affinities would act less into it. Hence, unless the radicle introduced be one which exercises a special attractive influence, substitution should take place in preference in the previously unsubstituted ring. In practice this usually occurs; for example, on further bromination, α-bromonaphthalene yields a mixture of the two dibromonaphthalenes



and ; and when nitronaphthalene is either brominated, or nitrated or sulphonated, the action is practically confined to the second ring. An alternative centric formula for naphthalene is that proposed by Bamberger.

Instead of representing it as a dicyclic hydrocarbon, formed by fusion of two benzene rings, this indicates that it is a monocycloid composed of ten atoms of carbon. The formula has the advantage that it may be constructed from tetrahedral models of the carbon atom; but it involves the assumption that the molecule has within it a mechanism, equivalent in a measure to a system of railway points, which can readily close up and pass into that characteristic of benzene.

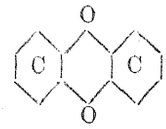
The isomeric hydrocarbons anthracene and phenanthrene, $C_{14}H_{10}$, are to be regarded as formed by the fusion of three benzene rings in the manner represented by the symbols

Anthracene.

Phenanthrene.

Their behaviour, and therefore their inner structure, is very different, however, and particularly noteworthy in comparison with that of naphthalene. In both cases the median ring is most easily acted on; but whereas phenanthrene behaves as a symmetrical compound, the behaviour of anthracene is that of an unsymmetrical compound, one of its lateral rings being far more readily attacked than the other. For example, both hydrocarbons at once combine with bromine, forming unstable dibromides, which are readily resolved into hydrogen bromide and monobromo-substitution derivatives; the further action of bromine leads to the production of a di-substitution-derivative. The action then stops in the case of phenanthrene, unless forced, but dibromanthracene readily combines with bromine, forming dibromanthracene tetrabromide. In both cases the dibromo-substitution derivatives are formed by the displacement of the hydrogen atoms in the median ring. The following formulæ afford a satisfactory expression of these facts, it being understood that the hexagons marked C have the centric structure:—

An entire change of properties is produced by saturating the two carbon atoms of the median ring in anthracene, and there can be little doubt that the lateral ethenoid ring lapses into the centric state, a symmetrical compound being produced. Thus anthracene dihydride has more of the properties of a saturated hydrocarbon, and anthraquinone



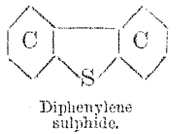
is characterized by extreme inertness; moreover, when the latter is attacked both lateral rings are equally readily acted upon. On the other hand, the behaviour of phenanthraquinone in no way differs in principle from that of phenanthrene. It is noteworthy that although the lateral rings in phenanthrene are in the condition of ortho-di-derivatives of benzene, they do not display the activity of ortho-homologues of benzene—which is a fact not without bearing on the question as to the character of the influence exercised by hydrocarbon radicles in promoting substitution. It has been previously pointed out that the evidence favours the view that the open chain hydrocarbon radicle in a benzenoid hydrocarbon has an attractive influence comparable with that exercised by oxygen in phenols and by nitrogen in amines; as it is not to be expected that the median closed chain which in phenanthrene occupies the place of the two separate radicles in an ortho-di-derivative of benzene would have any such influence, the behaviour of phenanthrene lends considerable support to this view. The argument may be one on which no great stress should be laid; it is advanced mainly with the object of calling attention to the way in which the study of polycyclic hydrocarbons may serve to elucidate questions of general importance. The bearing of individual facts on the broad problems of chemistry is too commonly overlooked nowadays, and it is very necessary that chemists should seek to appreciate more fully than they do at present the general interdependence of chemical phenomena, and to correlate their observations more carefully with the existing body of facts.

Heterocycloids.

It remains to consider the behaviour of mixed cycloids in which multivalent elements other than carbon are included; this is in many respects very remarkable. Pyridine and thiophene may be taken as examples. Pyridine, C_5NH_5, is derived from benzene by the displacement of one of the CH groups by an atom of nitrogen. The effect of this change is to lower materially the activity of the cycloid in comparison with that of benzene. Although the nitrogen in pyridine exhibits marked basic properties, apparently it has little or no influence—such as is exercised by the nitrogen in aniline—in promoting the introduction of substituting groups into the ring in place of hydrogen, substitution being effected only with difficulty. The arguments which favour the adoption of the centric formula for benzene apply with even greater force to pyridine, and render such a formula for this compound almost a necessity, but the adoption of the centric formula for pyridine has important consequences, as it involves the conclusion that the addition of a nitrogen affinity to five carbon affinities not only

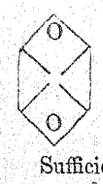
has no disturbing effect, but apparently even strengthens the affinity of these latter for each other.

The case of thiophene is even more remarkable. In this compound two of the CH groups in benzene are displaced by a single atom of sulphur. Notwithstanding the great difference in composition, in general chemical behaviour the two compounds are almost indistinguishable, corresponding derivatives manifesting the most remarkable similarity, extending even to their boiling-points. Thiophene is more readily acted upon by halogens than is benzene, being attacked even by iodine, but it shows no tendency to combine with them, and yields only substitution derivatives. The most striking circumstance in connexion with thiophene, however, is the complete inertness of the sulphur atom, which shows no tendency to combine, and cannot even be oxidized; yet it cannot well be present otherwise than as a dyad. This behaviour appears the more remarkable when thiophene is compared with the corresponding compounds furfurane and pyrrole, containing respectively oxygen and the imido (NH) group instead of sulphur, these latter being far more active substances and remarkably sensitive to the action of acids. Whether the oxygen and imidogen exercise a special attractive influence, such as has been previously referred to, which sulphur cannot exercise, or whether the difference originates in a difference in constitution, cannot at present be decided, though the former appears to be the more probable explanation. It is noteworthy that in diphenylene sulphide (dibenzothiophene)—a compound which bears the same relation to thiophene that anthracene bears to benzene — the sulphur behaves normally in the sense that it is oxidizable, like the sulphur in open chain sulphides such as ethyl sulphide $(C_2H_5)_2S$. As thiophene in no way exhibits the behaviour of an ethenoid compound, it is appropriately represented by the centric formula in the margin. But it is conceivable that the sulphur, although acting only as a dyad, has its extra affinities *twisted inwards* into the ring: hence their inactivity. No such condition need prevail in diphenylene sulphide, as there would be no carbon affinities directed inwards in the median ring if the lateral rings had a centric structure. This, again, is an example of the manner in which an instructive comparison may be made between single and complex cycloids. The difference between a "strutted" benzenoid system and a flaccid saturated cycloid is well shown in the fact that, although it is impossible to obtain an anhydride from metaphthalic acid, hexhydrometaphthalic acid, like glutaric acid, is without difficulty converted into an anhydride; and the same kind of difference appears to exist between thiophene and dibenzothiophene.



Diphenylene sulphide.

In concluding this section, the question may be raised whether the centric structure may still be preserved in compounds formed from benzene by satisfying two of the centric units of affinity. In the case of the derivatives of dihydrobenzene, C_6H_8, such as the dihydrophthalic acids, there can be little doubt that the compound has lapsed into the ethenoid form, as these readily combine not only with bromine, but also with the halhydrides. But quinone, on the other hand, is a relatively inert compound, and it is therefore not improbable that it retains the centric structure, and may consequently be so represented—as in the margin.



Sufficient will have been said to indicate the nature of some of the chief problems presented by cycloid compounds. The number of varieties, especially of heterocycloids, made known since 1875 is very large, but apparently these may all be referred to a very limited number of fundamental types, and it is therefore justifiable to assume that their formation is governed by comparatively simple laws.

Open chain compounds.

In comparison with that of the closed chain compounds the behaviour of open chain compounds is in principle far simpler. In the case of saturated compounds substitution appears to take place directly, but there is no evidence to show the precise manner in which it is effected; in fact, little more can be said than that it occurs the more easily the higher the molecular weights. Whether or not at the moment of collision of the interacting molecules weak associations are established between them cannot at present be determined: the most that can be said is that it is by no means improbable that such is the case, and that the assumption is one which apparently would bring the behaviour of saturated into harmony with that of unsaturated compounds generally. A point of importance to be noted in this connexion, however, is the fact that the occurrence of several carbon atoms in association usually constitutes a position of weakness in the molecule. For example, to take the simplest case, propane, $CH_3.CH_2.CH_3$, is chiefly attacked in the median CH_2 group, a larger proportion of isopropyl chloride, $CH_3.CHCl.CH_3$, than of the isomeric propyl chloride, $CH_3.CH_2.CH_2Cl$, being formed when the hydrocarbon is chlorinated. In the case of a hydrocarbon of the type CHR'_3, the hydrogen atom of the CH group is still more sensitive to attack than that in the CH_2 group of the type $CH_2R'_2$. Facts such as these serve to suggest that even in what are conventionally regarded as saturated compounds carbon exercises an attractive influence similar to that pictured above as exercised by oxygen, nitrogen, etc. Such a conclusion is in harmony with that already arrived at with reference to the influence exercised by saturated hydrocarbon radicles in the case of the homologues of benzene.

Effect of negative radicles.

Effects similar to those produced by the association of several carbon atoms are observed to follow the introduction of negative radicles such as chlorine, bromine, or OH, the rule being that negative radicles tend to accumulate. Thus the primary alcohols of the formula $R'.CH_2(OH)$, are converted into aldehydrols, $R'.CH(OH)_2$, by most oxidizing agents; and bromethane, $CH_3.CH_2Br$, when heated with bromine, yields chiefly ethylidene bromide, $CH_3.CHBr_2$. But there are many apparent exceptions to this rule. Thus, although aldehyde, $CH_3.COH$, is entirely converted into acetic acid, $CH_3.CO_2H$, when oxidized by bichromate mixture—the aldehydrol being presumably converted into the acid-hydrol, $R'.C(OH)_3$, which breaks up into acid and water—when oxidized by nitric acid it yields glycollic acid, $CH_2(OH).CO_2H$, and glyoxal, COH.COH. Similarly, if bromethane be brominated in presence of ferric bromide, it is converted into ethylene bromide, $CH_2Br.CH_2Br$; in fact, experiments made by V. Meyer and his pupils have shown that when bromides or chlorides are brominated in presence of ferric bromide, or chlorides chlorinated by means of antimony pentachloride, instead of a second atom of halogen becoming attached to the one carbon atom, it associates itself with the contiguous atom. In the case of the more complex hydrocarbons, by continuation of this treatment, the action may be extended from atom to atom along the chain—hexane, for example, giving a hexbromide in which each carbon atom is associated with a bromine atom. Such departures from the rule, however, but serve to prove it. In seeking to explain such variations, it is necessary to bear in mind that variations in the course of the interchange may be conditioned by the use of different agents, and that intermediate unperceived changes occur in all such cases. A catalyst such as ferric bromide plays an

all-important part, not merely in facilitating the occurrence of change, but also in determining its course. Probably it acts in more ways than one, both determining the initial attack by coupling halogen with hydride and also promoting the separation of halhydride (hydrogen bromide or chloride). If it be assumed that the catalyst combines either with the halogen atom or with the carbon atom with which this latter is associated, it would in a measure protect the hydrogen also associated with the carbon atom, and project the attack, as it were, upon the hydrogen atom associated with the contiguous carbon atom. In such cases it may well happen that an ethenoid compound is either potentially or actually formed as an intermediate product. Thus when aldehyde is oxidized in presence of nitric acid, perhaps a nitrate is first produced which loses water, and the compound thus formed then combines with the elements of the water molecule in the reverse order, giving rise to a derivative of glycol,

$$\begin{array}{lll} CH_3 & \rightarrow CH_2 & \rightarrow CH_2(OH) \\ \dot{C}H(OH)(O.NO_2) & CH(ONO_2) & \dot{C}H_2(ONO_2), \end{array}$$

which on oxidation yields glycollic acid, $CH_2(OH).CO_2H$.

Reversible changes often unperceived.

That oscillatory reversible changes are of far more frequent occurrence than is commonly supposed cannot be doubted, and there is every reason to suppose that many apparently obscure or abnormal cases are to be explained as consequences of such changes. One or two such instances may be referred to in illustration. It is well known that paraffin radicles are readily introduced into benzene and its homologues by the interaction of the benzene and an alkylic chloride in presence of aluminium chloride —one of the most remarkable of condensing agents. It is a peculiar property of this agent, however, that very frequently the entering radicle takes up the meta- rather than the ortho- or para-position, which is that assumed when milder agents producing similar effects—such as ferric chloride, and in some cases sulphuric acid—are used. Aluminium chloride, however, is not only a most powerful synthetic agent, but—as its discoverers, Friedel and Crafts, have shown—equally powerful as an analytic agent, destroying as readily as it builds up. Apparently reversal takes place much more readily in the case of para- or ortho- than of meta-compounds. To take a specific case, that of the butylation of toluene—the initial product is probably a mixture of para- and meta-butyltoluene in which the former largely preponderates, but the action being reversible in the manner expressed by the equation $C_6H_5.CH_3 + BuCl \rightleftarrows C_6H_4(Bu).CH_3 + HCl$, and the para-compound being chiefly attacked as the action proceeds, the meta-compound is formed in an increasing proportion—so that ultimately little or no para-butyltoluene remains.

Regarding the behaviour of saturated compounds towards agents generally from the point of view discussed in this section, it is obviously analogous to that of benzenoid compounds; in fact there is no need to draw any radical distinction between the two classes. In both cases action takes place initially in much the same way, but different secondary changes supervene, chiefly owing to the fact that in saturated compounds, usually two, and sometimes three hydrogen atoms are associated with the carbon atom which is the centre of attack, but never more than one in the case of the benzenes.

Ethenoid compounds.

The primary change in all interactions in which the ethenoid compounds are concerned appears always to be one involving the conversion of the ethenoid, by combination with the agent, into a saturated (paraffinoid) compound. The action probably takes place in two stages—in the first, the two molecules associate as wholes; in the second, the two radicles, into which the agent is resolved, become distributed and combine with the ethenoid carbon atoms. Such changes occur, as a rule, very readily; indeed, there is reason to suppose that the combining power of ethenoids has been considerably underrated. Their activity must be ascribed to the "attractiveness" of the two contiguous carbon atoms united by ethenoid affinities, a form of union which leaves these atoms endowed with considerable residual affinity. Whatever the nature of this form of union may be, it has clearly less than twice the force of that by which carbon atoms are held together in paraffinoid compounds; consequently the use of the terms, "united by double bonds" and "by two affinities of each" is to be deprecated. The same may be said of the conventional method of formulating such compounds. Julius Thomsen has argued from his thermochemical observations that the two carbon atoms in ethylene are even less firmly united than are those in the corresponding paraffin ethane, and that the carbon atoms in acetylene have a negative affinity, but, as the writer has pointed out (*Phil. Mag.* Feb. 1887), the argument is based on a fallacy. In point of fact, although the ethenoid configuration is an unstable one, there is no reason to suppose that the carbon atoms are less firmly united than they are in ethane, but quite the contrary; the only conclusion to be safely deduced from chemical considerations is that the ethenoids are unsaturated, and in consequence capable of entering readily into interactions. The problem to be solved in connexion with them is the precise manner in which the carbon valencies operate effectively in such compounds; as yet we have no clue. A noteworthy property of the acetylenes is that of forming metallic derivatives—a property only observed in this class of hydrocarbons. It is commonly supposed that the hydrogen is directly displaceable by the metal, but it is more probable that it is only indirectly displaced, and that the formation of metallic derivatives from such hydrocarbons is an outcome of their highly unsaturated condition—not of any specific property of the hydrogen—which renders them capable of associating with metallic compounds. The formation of sodium acetylide, for example, may be represented in the following manner:—

$$C_2H_2 + NaOH = C_2H_2(OH)Na = C_2HNa + HOH.$$

In like manner it may be said that the displacement of the hydrogen in water by sodium is due to the attraction of the sodium by the oxygen, and merely a secondary phenomenon.

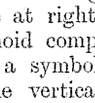
Complexity of carbon molecule.

If the facts taught by the study of carbon compounds generally are considered from the point of view of the lessons they convey as to the valency of that element, and as to the manner in which carbon combines with carbon, it is clear that the immense variety of compounds may be referred to four simple types—the paraffinoid, the ethenoid, the acetylenoid and the benzenoid—the first two including both open and closed chain forms. In other words carbon atoms tend to combine—to exert their four units of affinity—in only four different ways. The maximum stability is attained in the cycloids, especially in benzenoids. When the tendency of carbon to form benzenoids of a high degree of complexity, and the great stability of these is taken into account, it appears to be almost a necessary consequence that the carbon molecule should itself be highly complex. Apparently it should be possible to "fuse" cycloid upon cycloid, much as cell may be added to cell in a honeycomb, and the stability of the system should increase rather than diminish with increased complexity, provided the conditions which obtain in a compound like anthraquinone

are satisfied, *i.e.*, that the cycloids be so arranged as to give rise only to centric and saturated (paraffinoid) hexacycloids, and to exclude the formation of ethenoid rings such as presumably occur in anthracene. It is possible even to go farther, and from this point of view to explain the differences observed between the different forms of carbon. The diamond may well be a complex of the anthraquinone type, while both graphite and amorphous carbon may more nearly resemble anthracene in structure, the low stability of the former as compared with the latter being due to the presence in amorphous carbon of a greater number of ethenoid rings. Such assumptions would probably also serve to account for the colourlessness of the diamond, and for the opacity of the allotropic forms. For like reasons it is probable that amorphous carbon will be found to be the most, and diamond the least, refractive of the three forms. In order that the marginal affinities in a system of cycloids extending laterally may be satisfied, it is obviously necessary to assume that the cycloids may be arranged in two or more planes, *i.e.*, in layers. It is conceivable that in a system in which the marginal elements were all either centric or ethenoid, the marginal affinities to be satisfied would all lie in a single plane; but if the marginal elements were partly paraffinoid they would not all lie in a single plane. It is well known that the diamond as well as amorphous carbon at high temperatures is converted into graphite, which is the most stable of the three forms: it may well be that the change which takes place is that of a system of centric and paraffinoid elements into one in which the marginal paraffinoid elements become either centric or ethenoid.

The conception that the carbon atom may be symbolized by a tetrahedron affords an explanation of numerous cases of isomerism besides those in which an asymmetric arrangement of the radicles such as would condition optical activity is to be postulated. In the case of ethenoid derivatives, in which a pair of carbon atoms are associated by two affinities of each, the affinities uniting the two atoms lie in one plane, whilst the remaining four affinities lie in a second plane at right angles to the first. Hence an ethenoid compound may be represented by such a symbol as is shown in the margin, in which the double vertical line indicates the "double bond" between the carbon atoms.

Cis- and trans-isomerism.



In such a case isomerism will arise if merely the position of R_3R_4 relatively to R_1R_2 be varied, the radicles lying in the one case on the same, and in the other on opposite sides of the plane uniting the two carbon atoms. Isomerides of this kind are not optically-active, as the radicles are all situated in one plane. So simple a difference in structure often involves a considerable difference in properties, as in the case of maleïc and fumaric acids, for example. Of these the former alone yields an anhydride, and is therefore represented as the cis-form by symbol 1, fumaric acid, the trans-form being represented by symbol 2

$$(1)\ \begin{matrix} CH.COOH \\ \| \\ CH.COOH \end{matrix}; \qquad (2)\ \begin{matrix} CO_2H.CH \\ \| \\ CH.COOH. \end{matrix}$$

Cis- and trans-isomerism occurs, it is supposed, not only among ethenoid compounds, but also in the case of saturated ring systems generally; in fact, the ethenoid compounds present but a special case of this kind of isomerism. In a ring system — whether composed of carbon atoms alone or of such in conjunction with other polyad elements—the affinities of the atoms which are united within the ring lie in the plane of the ring, and the two remaining affinities of each carbon atom lie in planes at right angles to the ring plane. Numerous instances of this kind of isomerism are presented by the benzene-carboxylic acids, which have been studied more particularly by von Baeyer.

Enough will have been said to make clear the use that is made of the conception that the affinities of carbon are directed effects. The hypothesis has been of the utmost service, as with its aid it is possible to give a rational explanation of every case of isomerism hitherto described. But after all the model used is but a model, and probably a very imperfect expression of, if indeed it in any way approaches to, the actual state. There is little doubt that what is true of carbon is true of many if not of all the other polyad elements.

Chemical Change.

Chemical text-books teem with equations representing changes as occurring between *pairs* of substances, so that from the outset of his career the student becomes imbued with the notion that such expressions are faithful representations of the facts—especially as he witnesses many experiments in which *apparently two* substances are caused to interact; he is rarely made aware that the materials used are always more or less impure—that a *pure* substance in fact is, and must ever be, an ideal conception, and he is still less rarely led to reflect on the possible influence of "impurity" as causative of change. Yet, of late years, instance after instance has been brought forward of a "third substance" playing an all-important and indeed determinative part in conditioning the chemical interchange; so much is this the case that it is now seen to be more than probable that every interchange involves the co-operation of a "third" substance.

Presence of third substance necessary.

Many years ago Wanklyn stated (*Chem. News*, xx. 271) that dried chlorine is without action on sodium even when the latter is heated; but until Cowper pointed out, in 1883 (*Trans. Chem. Soc.* 1883, p. 153), that while dried chlorine is without action on copper and a number of other metals, the moist gas at once attacks them, the influence of moisture in promoting such interactions did not attract attention. In 1884 the important discovery was made by H. B. Dixon (*Phil. Trans.* 1884, p. 617), that a dried mixture of carbonic oxide and oxygen gases does not explode, but that a mere trace of steam renders it explosive, the rate at which the explosive wave travels in such a mixture being dependent, up to a certain point, on the amount of moisture present. H. B. Baker then showed (*Phil. Trans.* 1888, p. 571) that when moisture is, as far as possible, excluded, carbon, sulphur and phosphorus can be heated in an atmosphere of oxygen without undergoing visible combustion. Holt and Sims subsequently observed that dried oxygen does not oxidize either sodium or potassium (*Trans. Chem. Soc.* 1894, p. 432). In 1893 H. B. Baker extended his experiments to compounds, and made the very remarkable discovery that neither does oxygen combine with nitric oxide nor ammonia with hydrogen chloride when the gases are very carefully dried. The same observer has found that the reverse effect—the occurrence of decomposition—is also affected by the presence of moisture, it being possible, for example, to vaporize ammonium chloride and mercurous chloride without their undergoing decomposition if moisture be rigorously excluded. The utmost care, however, must be taken to secure such a result, it being necessary, for instance, in determining the density (by V. Meyer's method) to use an apparatus constructed of hard glass, since soft glass apparently retains sufficient moisture to invalidate the experiment. In some cases, although it has not been found possible to prevent the

occurrence of change, evidence that moisture exercises a determining influence is afforded by the observation that the rate of change is affected by the withdrawal of moisture. Thus Pringsheim, Dixon, and Baker have all found that the rate at which hydrogen and chlorine interact is diminished by carefully drying the gases. Experiments made by V. Meyer, in conjunction with Krause and Askenasy (*Liebig's Ann.* 264, p. 85; 269, p. 49), show that the same mixture of hydrogen and oxygen sealed up in a number of bulbs and heated to various temperatures behaved irregularly, interaction occurring in some to a far greater extent than in others placed under apparently the same conditions. Such results may be regarded as proof that even the interaction of hydrogen and oxygen is determined by a third substance.

Apparent exceptions.

But there are a number of cases in which the attempt has been unsuccessfully made to check the occurrence of change by removing moisture (cf. Cowper, *loc. cit.*; H. B. Baker, *Trans. Chem. Soc.* 1894, p. 611); of none of these can it be asserted, however, that the precautions taken have been sufficient to preclude the assumption that with still greater care positive results would be obtained. Among the most, indeed the most, carefully conducted experiments of the kind are those of Shenstone on the production of ozone, and on the interaction of mercury and halogens (*Trans. Chem. Soc.* 1897, p. 471). According to this observer "well-dried oxygen ozonizes exceedingly badly," whence it may fairly be assumed that dry oxygen would not ozonize. On the other hand, when the well-dried gas was ozonized the ozone produced appeared to undergo decomposition very rapidly, while that produced when moist oxygen was used seemed to be stable. Shenstone therefore assumes that water vapour, at the ordinary temperature, retards the reversion of ozone to oxygen in a very remarkable degree. That this should be the case appears highly improbable, and it is necessary to seek for an explanation of the anomaly in some other direction. It is conceivable that a minute amount of "acid" impurity may intervene in the case of the dried gas and determine its decomposition, but that in the wet gas this impurity is rendered more or less harmless by condensation. Such impurity might be derived from the interaction of nitrogen and oxygen under the influence of the discharge, for it is known that "oxides of nitrogen" determine the decomposition of ozone. As regards the interaction of halogens and mercury, Shenstone was unable to detect any alteration in their activity consequent on drying. But when the complex character of his apparatus is taken into account, as well as the fact that it was not all made of hard glass, and that it could not be dried at a high temperature, it is more than probable that he was not able to carry the drying sufficiently far, especially when it is remembered how extraordinarily minute, according to H. B. Baker's later observations, is the amount of moisture required to induce decomposition in the case of mercurous chloride. Chlorine being a far more active agent than oxygen under ordinary conditions, it is to be expected that it will be far more difficult to check the occurrence of change when it is used than is generally the case with oxygen.

There can be little doubt that the evidence is sufficient to justify the conclusion that chemical interactions are not generally of the simple form

$$AB + CD = AC + BD,$$

and that their occurrence is, as a rule, dependent on the introduction of some "third component" into the system. It is even probable that this is a rule absolute. If the attempt be made to determine the conditions which must prevail in order that an interchange may occur, with a view of determining the nature of the "third component," the only conclusion at present possible is that they are essentially those which obtain in a voltaic circuit; in fact, if Faraday's doctrine of the unity of chemical and electrolytic change be accepted it follows that both are determined by like conditions. On this assumption, a circuit of change must comprise three distinct terms or components, one of which must be an electrolyte. On this view, it is easy to understand the occurrence of change in many cases on the introduction of moisture. It is only necessary to bear in mind that as we invariably operate in glass vessels which are to some extent soiled, it is impossible to avoid the presence of traces of acid or "salts," which render the water an electrolyte, and therefore that the introduction of moisture means the introduction of an electrolyte. Thus, in the case of the combustion of carbonic oxide, the system within which change occurs may be regarded as consisting of oxygen, carbonic oxide, and impure, *i.e.* conducting water, which conjoined form a conducting circuit within which the interaction occurs, viz.:—

Nature of third substance.

$$\begin{array}{l|l|l|l} CO & OH_2 & O & CO_2 \\ CO & OH_2 & O & CO_2 \end{array} \quad \begin{array}{|l} H_2O \\ H_2O \end{array}$$

As early as 1830 it was shown by de la Rive that the readiness with which zinc is attacked by an aqueous solution of sulphuric acid depends upon the amount of impurity it contains, and that the acid which acts most readily is that which has the highest electric conducting power. When purified as far as possible zinc is all but insoluble, and therefore it may fairly be supposed that ideal pure zinc would be insoluble in diluted sulphuric acid. It at once dissolves when coupled up with any relatively electro-negative conductor at a rate depending on the resistance in the circuit in which it is arranged and on the electromotive force developed in the interaction. The conditions which determine the dissolution of zinc may therefore be said to be that it forms one of the three components in a conducting circuit comprising itself, a relatively electro-negative chemically inert conductor, and an electrolyte which can exchange its electro-positive constituent for the zinc. The apparent inactivity of "pure" zinc has been ascribed to the circumstance that when placed in acid it immediately becomes coated with a protecting film of hydrogen—varnished, as it were—and that the part played by the impurity is that of depolarizer: that, in fact, it conditions the escape of the hydrogen. That the impurity, to some extent, exercises this latter function there can be no doubt; but, on the other hand, there is every reason to believe that three "components" are required to form a voltaic circuit. It is well known that the electromotive force of a zinc-sulphuric acid-couple (or triplet, to use a far more suitable expression) is a fluctuating value, and that the nature of the conductor is of some importance. Thus a cell containing a polished silver plate as positive element is less effective than one in which the plate is coated with finely divided platinum. It is not difficult to understand this, as the extent to which hydrogen escapes from the positive is much influenced by the character of its surface, and it is well known that finely divided platinum promotes the escape of gases from solution. Therefore when finely divided platinum is thus used, not only is the effect diminished which retention of hydrogen on the surface of the plate would have in increasing the resistance in the circuit, but the extent to which "polarization" or reversal takes place is also considerably diminished. In fact, it must not be forgotten that the action is a reversible one, *i.e.*,

Voltaic and chemical change correlative.

$Zn + H_2SO_4 \longleftrightarrow H_2 + ZnSO_4$, and that the extent to which reversal takes place depends on the power possessed by the positive electrode of conditioning the return of hydrogen into circuit.

In cells of the Daniell type a constant electromotive force is secured owing to the complete prevention of polarization and its consequences, but the depolarizer not only prevents back action and maintains the resistance constant by acting as a scavenger, but also always contributes to the development of energy in the circuit. Change, in fact, is often conditioned by the presence of a depolarizer, an exothermic series of changes being thereby converted into an endothermic series. Thus copper is insoluble in dilute sulphuric acid, its "heat of dissolution" in such acid being a negative value, which may readily be calculated from the known heat of formation of copper oxide and that of copper sulphate and water from the oxide and dilute sulphuric acid; thus

$$Cu + \frac{O_2}{2} = CuO = 37{,}160 \text{ gram. deg. C units}$$

$$CuO + H_2SO_4, \text{ aq.} = CuSO_4, \text{ aq.} + H_2O = 18{,}800 \text{ units}$$

$$H_2 + \frac{O_2}{2} = H_2O = 68{,}360 \text{ units}$$

$$Cu + H_2SO_4, \text{ aq.} = H_2 + CuSO_4, \text{ aq.} = -12{,}400 \text{ units.}$$

In presence of oxygen, however, the metal readily dissolves, the gas acting as the depolarizer,

$$Cu + H_2SO_4, \text{ aq.} + \frac{O_2}{2} = H_2O + CuSO_4, \text{ aq.} = 55{,}960 \text{ units.}$$

A cell consisting of copper, dilute sulphuric acid, and oxygen, therefore, has an electromotive force of about $\frac{55960}{46000} = 1{\cdot}2$ volts. Actually, copper sulphate is manufactured on a very large scale by the action of dilute sulphuric acid on granulated copper in presence of air.

In the case just considered, the third term of the system is not a substance which acts as a conductor in ordinary circumstances; but it is merely one which can become included in the system. It would therefore seem to be necessary, in order that chemical change may take place, that a circuit be established in a system composed of at least three "elements," which is conducting as a whole, and which contains, together with an electrolyte and a substance which sooner or later is attacked by the electrolyte, a third substance which may or may not take a material part in the change.

Gaseous interactions.

In the case of the combustion of carbonic oxide by moist oxygen, Dixon has argued that since carbonic oxide is inert towards oxygen, its oxidation in presence of moisture is a secondary effect, the steam acting catalytically as a carrier of oxygen. It is well known that at a high temperature carbonic oxide decomposes steam ($CO + OH_2 = H_2 + CO_2$), and Dixon supposes that the whole of the oxidation is effected in this way, the hydrogen being alternately oxidized and deprived of oxygen (*Trans. Chem. Soc.* 1898, p. 774). That a part of the carbonic oxide may be oxidized in this simple manner cannot be denied, but probably it is only a minor part; there must be some collisions in which only carbonic oxide and water molecules meet, but considering the proportions in which carbonic oxide and oxygen are present, it must frequently happen that their molecules will together collide with water molecules, in which case the interaction

$$CO + OH_2 + \frac{O_2}{2} = CO_2 + H_2O$$ is bound to occur; especially as it is a change in which heat is liberated, *i.e.* exothermic, whereas the interaction of carbonic oxide and water is one in which heat is absorbed, *i.e.*, endothermic. But apart from the question which is the preponderating change, they may equally be regarded as electrolytic changes, *i.e.*, as taking place only under the conditions which render the occurrence of electrolysis possible—whatever these may be in the case of gases.

In order to test whether the high stability of the oxygen molecule renders a mixture with carbonic oxide inexplosive, and whether oxygen in the "nascent" state is more active, Dixon has made the interesting experiment of exploding a well-dried mixture of carbonic oxide and chlorine peroxide, the result being that much of the former remained unburnt just as when well-dried oxygen is used (*ibid.* 1896, p. 605). As it must be supposed that at the moment of explosion oxygen atoms are liberated, it might be expected that the oxygen from such a source should be specially active. On the other hand, when cyanogen is exploded with an excess of oxygen, it is entirely burnt to carbon dioxide, and Dixon supposes that the carbonic oxide formed in the wave front is slowly burnt behind the wave front. It should be mentioned that a spark of considerable intensity is required to initiate an explosion in such a mixture, and that the presence or absence of moisture apparently makes no difference in the readiness with which the mixture is inflamed. As it cannot be assumed that Dixon dealt with really dry gases, this probably means that a much smaller proportion of moisture suffices in the case of cyanogen to promote the interchange, and the completeness of the oxidation may be ascribed to the fact that cyanogen has a very high "heat of combustion." In the case of the explosion with chlorine peroxide, the chlorine would interfere by decomposing a portion of the water, and the effect of the atomic oxygen in promoting the change would be counterbalanced by the withdrawal of moisture. In general chemical behaviour, carbonic oxide is a far more saturated and less active substance than cyanogen, and water molecules would have less tendency perhaps to couple up with it than with cyanogen. It is desirable to call attention to this point in order to lay emphasis on the need, in discussing chemical interchanges, of taking into account both the compatibility of the various molecules present and the stability of the loose molecular complexes which may form prior to the occurrence of any *interchange*.

Mechanism of chemical interchange.

Although it may be said that a fairly general agreement exists to regard chemical changes as essentially electrolytic in their nature, there is far from being any agreement as to what really takes place—as to the character of the "mechanism" concerned in their occurrence. Williamson, in 1851, in his paper on the "Theory of Etherification," put forward in explanation of "the general process of chemical decomposition," the view that in an aggregate of molecules of any compound there is an exchange constantly going on between the elements which are contained in it. Thus in a drop of hydrochloric acid, supposed to be made up of a great number of molecules of the composition ClH, each atom of hydrogen does not remain quietly in juxtaposition with the atom of chlorine with which it first united, but on the contrary is constantly changing places with other atoms of hydrogen. Supposing the hydrochloric acid to be mixed with some sulphate of copper (of which the component atoms are undergoing a similar change of place), the hydrogen does not merely move from one atom of chlorine to another, but in its turn also replaces an atom of copper. Thus it is that at any moment of time at which we examine the mixture the bases are divided between the acids (*Quart. Journ. Chem. Soc.* 4, 110). Practically the same view was applied by Clausius in 1857 in explanation of the phenomena of electrolysis; but whereas Williamson had spoken only of exchanges going on, Clausius ascribed the occurrence of these to collisions taking place between the molecules of sufficient violence to cause some to split up into their constituents, which then wandered about till

they met with others of the opposite kind and united with them to form new molecules. On the assumption that the electromotive force acts on the molecular fragments during the intervals of freedom but does not produce disruption of the molecules, it is possible to understand that any electromotive force, however small, can produce sensible electrolysis.

Kekulé, in 1858, in discussing the manner in which interchanges are effected, took the very different view that in the first instance the molecules attract each other and become associated, and that atomic affinities then come into operation and cause the redistribution. He pictured the state of affairs in the following manner :—

$a \mid b$ $a' \mid b'$	$a\ b$ $a'\ b'$	ab $a'b'$
Before.	During.	After.

He went so far as to speak of this conception as the simplest and as being universally applicable.

For many years practically no attention was paid to the dissociation hypothesis, and it was not until 1884 that interest was revived in it by Arrhenius, who gave a quantitative form to the hypothesis of Clausius by treating electrolytic conductivity as a measure of the extent to which dissociation may be supposed to have taken place in a solution. A still greater advance was made in 1887 by van't Hoff, who fully discussed the properties of solutions, and showed that the equations for the ordinary gaseous laws are equally applicable to solutions, provided that in the case of conducting solutions the increase in the number of molecules due to the "dissociation" be taken into account.

Ionic dissociation.

In the modern form of the hypothesis, substances which afford conducting solutions (acids, bases and salts) are assumed to undergo disruption or dissociation into separate ions *when dissolved* in water, the extent to which the ionic dissociation is effected depending not only on the substance, but also on the degree of dilution. Neutral substances, on the other hand, such as alcohol, sugar, &c., which do not behave as electrolytes in solution, are assumed to be undissociated. But ionic or electrolytic dissociation differs from ordinary dissociation—in which a compound is resolved into mutually independent simple molecules—in that the two ions into which the electrolyte is resolved are associated with opposite equal electric charges. These electric charges, like matter, are, in a sense, to be regarded as "atomic," a unit charge corresponding to a unit valency, so that each ion is capable of conveying only a certain charge; consequently the electric conductivity of a dissolved electrolyte is quantitatively proportional to the degree of ionization. The dissolved substance in its dissociated state—not the solution as a whole—is therefore the effective conductor. To deduce m, its *molecular conductivity*, the specific conductivity, k, of the solution is multiplied by v, the number of litres containing a gram molecular proportion of the substance. The molecular conductivities are, therefore, values which express the degree of conductivity due to the introduction of equal numbers of molecules of dissolved substances between the electrodes. If m_v be the molecular conductivity of a substance in a solution of dilution v, and m_∞—deduced by extrapolation from the m_v values—that in an infinitely dilute solution, in the case of compounds of univalent ions, the degree of dissociation or ionization i_v in the solution of the concentration v and the molecular conductivity of the dissolved substance are so related that

$$i_v = m_v/m_\infty .$$

In the case of compounds containing multivalent ions a more complex relation obtains. In a system consisting of water together with an undissociated substance and its ions, the ordinary laws of equilibrium govern the relation between the degree of dilution and the extent to which the substance undergoes dissociation; therefore, in the simplest case, that of a binary electrolyte E, the two ions of which are A and B, if e, a, and b are the molecular concentrations of the undissociated material and of its two ions respectively,

$$ab = e\mathrm{K}, \text{ and } a = b$$

where K is a constant. If the total quantity of dissolved material be taken as unity and the dissociated fraction as i,

$$a = b = i/v \text{ and } (1-i)/v = e.$$

Effect of dilution on degree of dissociation.

The relation between the degree of dissociation and the dilution is therefore that expressed by the formula

$$i^2/(1-i) = \mathrm{K}v.$$

The case of dichloracetic acid may be cited as one in which, as van't Hoff points out, the agreement between the calculated and observed results is especially close.

v.	m.	m_v/m_∞ Obs.	m_v/m_∞ Calc.
20	51·6	0·166	0·163
205	132	0·423	0·43
408	170	0·547	0·543
2,060	251	0·806	0·801
4,080	274	0·881	0·88
10,100	295	0·948	0·944
20,700	300	0·963	0·971
∞	311	1	1

Whereas carboxylic acids generally are but slightly dissociated in moderately dilute solutions, strong mineral acids, the alkalies, and most metallic salts—especially those of alkali metals—are highly dissociated. This is well shown in the following table of results originally published by Ostwald in 1885, in which the molecular conductivities are given in arbitrary units :—

v.	HCl.	HBr.	HI.	HF.	Nitric Acid.	Sulphuric Acid.
2	77·9	80·4	80·4	...	77·9	92·7
4	80·9	83·4	83·2	6·54	80·4	96·4
8	83·6	85·1	84·9	7·59	82·8	100·6
16	85·4	86·6	86·4	10·00	84·9	107·4
32	87·0	87·9	87·6	13·14	86·3	116·3
64	88·1	88·9	88·7	17·38	87·4	127·3
128	88·7	89·4	89·4	23·11	88·2	139·2
256	89·2	89·6	89·7	30·30	88·4	150·6
512	89·6	89·7	89·7	39·11	88·8	160·9
1,024	89·5	89·5	89·3	49·49	88·9	169·1
2,048	89·5	88·9	89·0	59·56	88·2	174·4
4,096	88·6	87·6	87·8	69·42	86·6	177·1

It will be noticed that in the case of the three halhydrides, for example, a steady value is very soon reached, dissociation being practically complete at very moderate dilutions in comparison with those necessary to produce anything like the same degree of change in the case of dichloracetic acid quoted above. Moreover, the initial value differs but slightly from the final value—which is an indication that the acids are almost completely dissociated even in concentrated solutions; in fact, if 90 be taken as the limiting value, in the case of the halhydrides, HCl,HBr, and HI as well as in that of nitric acid, about $80/90 = \cdot 9$ of a molecular proportion of the electrolyte is resolved into its ions when dissolved in only 2 litres of water. The different behaviour of hydrogen fluoride is of interest, as this hydride, it is well known, tends to form complex aggregates; apparently these only gradually undergo simplification on dilution, and consequently the electro-

lytic dissociation of the fundamental molecules is considerably retarded. A striking illustration of the influence of composition on the extent to which dissociation takes place is afforded by the substituted acetic acids, thus :—

	i ($v=1000$)	$K \times 10^5$
Acetic acid . . .	0·125	0·0018
Chloracetic acid . .	0·692	0·155
Dichloracetic acid .	0·981	5·1
Trichloracetic acid .	0·999	121·0

It is generally noticeable that the value of the dissociation constant K is subject to great variation as the structure changes; consequently this factor becomes of great importance in diagnosing the structure of electrolytes.

Ethereal salts, cane sugar, and other substances which undergo hydrolysis in presence of acids and alkalies are acted upon at rates which differ not only as the conditions of temperature and concentration are varied, but also according as the change is conditioned by the one or the other hydrolyst. Investigation shows that the relative activity of hydrolysts corresponds with the electric conductivity of their solutions; hence it is assumed that acids, &c., do not act as such in these cases, but that the ions are the active agents. From this point of view, the constant K is the measure not only of the extent to which a substance is dissociated, but also—with certain limitations—of its activity in chemical interchanges. The following results obtained by Ostwald with cane sugar may be cited as proof that the rate at which inversion is effected by the acids referred to, in comparison with that deduced for hydrogen chloride (in $\frac{1}{2}$ normal solution at 25°), is almost proportional to the degree of dissociation :—

	Rate of Inversion.	Degree of Dissociation.
Acetic acid . .	0·0040	0·006
Formic acid . .	0·0153	0·0245
Monochloracetic acid .	0·0481	0·0542
Dichloracetic acid .	0·271	0·272

As the hydrolysis of cane sugar is effected only by acids and not by alkalies or salts, it is customary to regard the action as brought about solely by the hydrogen ions, which are abundantly present in most acid solutions, but not in those of alkalies and salts. It should be noted, however, that although it is true, especially in the case of weak acids, that acids act the more readily the more highly they are dissociated, there is only a roughly approximate numerical proportionality between the inversion velocity and the quantity of hydrogen ions. It is also noteworthy, and difficult to explain, that the catalytic activity of the hydrogen ions is greatly stimulated by the presence of other ions; thus on adding to an acid solution an equivalent proportion of the corresponding potassium salt, the velocity of inversion is increased by some 10 per cent. in the case of strong acids, although it is decreased in the case of the weaker acids.

Ionic hypothesis applied to chemical analysis.

The ionic dissociation hypothesis is held to afford a simple explanation of the phenomena underlying the processes in use in analytical chemistry. Thus it is well known that the tests applied in detecting metallic and also non-metallic radicles are, with few exceptions, of general application—a metal, for example, being detected by the same test whatever the salt may be in which it is present as positive constituent. This must be the case, on the ionic hypothesis, as the chemically active components in a solution are not the dissolved substances, but the ions into which they are resolved on entering into solution. The state of a salt AB is such that the undissociated salt and its ions A and B are in equilibrium; a second salt CD also exists in solution partly as CD and partly as the ions C and D. On mixing two such solutions interchanges occur, and a new state of equilibrium is established in which the salts AD and CB also exist along with AB, AC, A, B, C, and D. The new salts are produced in quantities determined by the concentration, and if the solution be sufficiently dilute, the salts AB, AD, CD, CB are present in negligibly small quantities; consequently the properties of the solution are simply the properties of the dissolved ions, and there is no appreciable change on mixing AB with CD. But this is only true if the products are soluble. If the ions A and D are capable of uniting to form a substance which is insoluble under the conditions of the experiment, the compound AD is removed from the system as rapidly as it is formed, until eventually, when equilibrium is attained, only a very minute proportion of the ions A and D remains in solution. The effect on each other which two electrolytes having an ion in common often exercise by the one diminishing the solubility of the other is easily understood from this point of view. In the case of a saturated solution of a salt AB, the solid present is in equilibrium with the undissociated dissolved salt AB, which, in turn, is in equilibrium with its ions A and B; if now another salt containing either the ion A or the ion B be brought into the solution, the extent to which AB undergoes dissociation is reduced, because the proportion in which the one or the other of its ions is present in the liquid is increased. Consequently AB is partially thrown out of solution. The precipitation of sodium chloride on saturating its solution with hydrogen chloride, and the fact that the solubility of barium sulphate in water is reduced by the addition of either sulphuric acid or barium chloride, may be instanced as cases to which this explanation is applicable. The same principle is applicable in explanation of the lowering of the activity of weak acids by their salts. The fact that chlorine in chlorates, iron in ferrocyanides, &c., are not to be detected by the "ordinary" tests, is ascribable to the fact that they are not present in solution as simple ions, but as complex ions having altogether different and peculiar properties.

Water but slightly dissociated.

The considerable evolution of heat which occurs in neutralizing an acid by an alkali is apparently a contravention of the rule that practically no change occurs on mixing solutions of highly dissociated substances if there be no insoluble product. This, however, is held to be due to the fact that water itself is peculiar in being dissociated only to a very minute extent. Consequently water is the one product formed in the solution, and the heat evolved is to be regarded as that liberated by the combination of its constituent ions, thus :

$$\underset{\text{Ions of acid.}}{(H+X)} + \underset{\text{Ions of base.}}{(Y+OH)} = HOH + X + Y$$

In the case of all strong (*i.e.*, highly dissociated) acids and bases, therefore, the character of the change is independent of the nature of the acid and base. This conclusion is in striking accord with the well-known fact that the strong acids and alkalies all have practically the same heat of neutralization (cp. *Ency. Brit.* vol. v. p. 487). Further evidence of the same kind is afforded by the observation that in dilute aqueous solution all the metallic salts of a strong optically-active acid, such as bromocamphorsulphonic acid, have the same molecular rotatory power, viz., that of the acid ion.

If water be regarded as very slightly dissociated, it is also easy to understand that it should act as a weak acid towards salts of very feeble acids and bases, which, in solution, undergo dissociation to an extent comparable with the degree of dissociation of water; in such cases, the ions A and B of the salt should combine with those of water, and recognizable quantities of the acid and base

derivable from the salt should be produced. The fact that solutions of cyanides smell of hydrogen cyanide is traceable to this cause. Another illustration is the liberation of the very weak base ammonia on boiling solutions of ammonium salts.

Equilibrium in solution.

The study of ionic or electrolytic dissociation, and of the properties of solutions generally, in the main, involves the investigation of homogeneous equilibria, the principles governing which have long been familiar in connexion with the laws of mass action, developed by Harcourt and Esson (1866), and Guldberg and Waage (1867). The discussion of the facts relating to the saturation of solvents with dissolved matter is, however, now recognized as lying within a totally distinct province, and as involving the consideration of heterogeneous systems. Neglect of this fact has proved a constant source of error in the past, while its recognition has led within recent years to far-reaching and fruitful generalizations. The subject has received very full treatment at the hands of van't Hoff in his *Lectures on Theoretical and Physical Chemistry*. Formerly it was the custom to talk of a solution as being saturated *with* a certain dissolved material, but it is now recognized that it must be spoken of as saturated *with respect to* a particular material. The distinction lies in the fact, not formerly appreciated, that for a solution to become saturated it must be in contact with undissolved material. For example, on shaking water with excess of sodium chloride at 14°, each 100 parts of water dissolve 35·87 parts of sodium chloride, and being in contact with the solid salt, the solution is both in equilibrium with, and saturated with respect to, the solid. If the solution be separated from the solid it can no longer be described as a saturated salt solution, because it is no longer in contact with, and consequently not in equilibrium with solid sodium chloride. This modern method of regarding a state of saturation as a condition of equilibrium in a heterogeneous system, *i.e.*, one in which there are at least two regions of different composition or concentration, leads immediately to a rational explanation of the phenomena of supersaturation which long perplexed chemists. Two cases may be cited in illustration. It is possible to dissolve 40 parts of sodium sulphate in 100 parts of water at 30°, and on cautiously cooling the solution to 10° no separation takes place, although at 10°, in contact with the salt, water will only take up 9 parts of sodium sulphate per 100 parts. The solution containing 40 parts of the salt at 10° is commonly said to be *supersaturated*, but it cannot even be said to be saturated in the modern sense of the term. On dropping into it a fragment of the decahydrated salt, this salt at once crystallizes out, heat being evolved, and when, eventually, the temperature is reduced to 10°, the solution contains only 9 parts of the salt in 100 of water; this is because equilibrium has been established between solid and solution. Similarly, the solubility curve of sodium sulphate in water exhibits a break at 33°. The existence of this was long regarded as anomalous, but it occurs because below 33° the solid in contact with the saturated solution is the compound $Na_2SO_4.10H_2O$, whilst above 33° it is the anhydrous sulphate. The hydrated salt decomposes at 33°, losing its water, and this temperature is therefore termed the *transition temperature*. At the transition temperature the solution is in contact and in equilibrium with both hydrated and anhydrous salt.

Super-saturation.

In the case of two salts capable of forming a double salt the conditions are somewhat more complex. The results obtained by Trevor (at 25°) with potassium and copper sulphates may be quoted in illustration. If the solution be in contact with the two salts and be saturated with respect to each, it contains 5·2 per cent. of potassium, and 10·4 per cent. of copper sulphate. But if, instead of being in equilibrium with the single salts, it is in contact only with the double salt $K_2SO_4.CuSO_4.6H_2O$, it contains 11·14 per cent. of the salt in solution. Lastly, the solution may be saturated with respect to the double salt and either of the single salts. At the same temperature, therefore, four different conditions of saturation equilibrium are possible, the condition which obtains depending solely on the salts in contact with the solution. If the temperature be also varied, the conditions become still more complex, owing not only to the changes in solubility, but also because alterations may take place in the degree of hydration and in the composition of the double salts. Thus, in the case of potassium and magnesium sulphates in solution at different temperatures, the conditions under which equilibrium obtains vary according as they lead to the separation of one or other of the compounds H_2O (as ice), K_2SO_4, $MgSO_4.6H_2O$, $MgSO_4.7H_2O$, $K_2SO_4.MgSO_4.6H_2O$, or $K_2SO_4.MgSO_4.4H_2O$.

Solutions of double salts.

It should be pointed out that the great advance made in recent years in studying problems such as those just referred to is mainly due to the application by Willard Gibbs of the second law of thermodynamics to the study of the physical equilibria underlying chemical changes. It is characteristic of the results arrived at with the aid of this law, that they deal only with the difference in condition obtaining between the various parts of a system, and their validity does not depend upon the differences being of any particular chemical or physical type. The principles governing heterogeneous equilibrium have been formally expressed by Willard Gibbs in the so-called *phase rule*. This rule, however, is merely a convenient method of classifying the various cases of equilibrium which may arise, and in itself is of little use in diagnosing the conditions which hold in any particular case. Nernst has applied the principles enunciated by Willard Gibbs with signal success to the consideration of the equilibrium established when a soluble substance is distributed between two practically immiscible solvents in contact. For example—on shaking small quantities of succinic acid with a mixture of ether and water, the ratio $\frac{C_1}{C_2}$ of the amount of acid taken up by the unit volume of ether, C_1, and of water, C_2, respectively, is found to be independent of the total concentration. This is known as the law of constant distribution coefficient. In the form given, it is obeyed only when the dissolved material has the same molecular weight in both solvents. On taking benzene, water, and benzoic acid, which consists of double molecules in benzene solution, the distribution of this acid takes place in such a manner that $\frac{C_1}{\sqrt{C_2}}$ is constant, C_1 being the amount of acid taken up by the unit volume of water, and C_2 that taken up by the benzene. The study of distribution coefficients, therefore, affords valuable information as to the molecular weights of substances in different liquid solvents. Its application to electrolytes in water and in non-dissociating liquids has furnished evidence supporting the electrolytic dissociation hypothesis. The method may even be applied to solids. In the case of isomorphous mixtures it affords evidence that these may properly be regarded as solid solutions of the one substance in the substance with which it is isomorphous. Thus thallium and potassium chlorates are isomorphous, and on crystallizing thallium chlorate from an aqueous solution containing a small proportion of potassium chlorate crystals of the former containing a small proportion of the potassium salt are deposited. Judging

Distribution coefficients.

from the ratio in which the potassium chlorate becomes distributed between the solid solvent ($TlClO_3$) and the liquid, it appears that the molecular weight of potassium chlorate is the same in both the liquid and the crystalline condition.

Extension of gaseous laws to solutions.

One of the most brilliant and fruitful generalizations of recent times has been van't Hoff's extension to dilute solutions of the well-known laws connecting pressure, volume, and molecular weight in gases. Although a liquid exerts no pressure other than that due to its mass upon the surface of a containing vessel, the existence in solutions of a state comparable with that which obtains in gases becomes evident on studying the phenomena of liquid diffusion. If, for example, a solution of sugar be enclosed in a vessel having semi-permeable walls—*i.e.*, permeable by the water, but not by the dissolved substance,—and then the vessel be placed in water, diffusion of water into the solution sets in and continues until a certain pressure is attained: this is termed the *osmotic pressure*, and is found to be proportional to the number of molecules dissolved in the unit volume of liquid. Variations in temperature affect osmotic pressure in the same way that they affect gaseous pressure, consequently Avogadro's theorem is directly applicable to dilute solutions; in other words, equal volumes of dilute solutions (of any one solvent) under like conditions of temperature and osmotic pressure contain equal numbers of molecules. If osmotic pressure could be easily measured, a simple method of determining the molecular weight of dissolved substances would be to determine the osmotic pressures they develop; but, unfortunately, this is not the case, and the determinations are affected by considerable experimental errors. But there are certain properties of dilute solutions which can be easily measured which vary *pari passu* with the osmotic pressure. It has long been known that aqueous solutions of equimolecular concentration of salts such as sodium chloride, potassium chloride, &c., deposit ice when cooled to the same temperature, and van't Hoff has shown that the depression of the freezing-point of a solvent by addition of small proportions of a soluble substance is proportional to the variation in the osmotic pressure. The law that the freezing-point of a solvent is depressed to an extent proportional to the number of molecules of dissolved salt present in unit volume forms the basis of the now well-known freezing-point method of determining the molecular weight of dissolved substances. In a similar manner the vapour pressure of a solvent is lowered by the presence of dissolved material to an extent which is proportional to the osmotic pressure, and in weak solutions the decrease in vapour pressure is directly proportional to the rise in boiling-point of the solvent. On this is based the now familiar method of determining molecular weights by observing the rise in boiling-point of a solvent produced when known small amounts of soluble substances are dissolved in it. Both methods afford anomalous results when applied to aqueous solutions of electrolytes; but these meet with an explanation when the diminution in average molecular weight, *i.e.*, the increase in the number of active molecules, consequent on the occurrence of ionic dissociation, is allowed for.

Ionic hypothesis insufficient.

The ionic dissociation hypothesis is undoubtedly a conception of great beauty, and the success that has attended its application in the case of dilute solutions is of the most striking character. But it would be unscientific to yield to its charms without having fully considered the probability and sufficiency of the explanation which it affords, and the difficulties which stand in the way of its acceptance. Chemistry is so wide a subject, chemical phenomena are so complex and so hard to analyse and interpret, the difficulty of giving a quantitative expression to them is so great, that chemists are but rarely prepared to undertake such a discussion; and it is easy to accept guidance and to yield allegiance to high authority, especially when it is exercised in the most autocratic and dogmatic manner possible hitherto. Unfortunately the advocates of the dissociation hypothesis have declined even to consider the objections which may be raised against it from the chemist's side.

One of the most fundamental objections to the hypothesis is that the number of compounds which are *per se* electrolytes being limited—to only a few fused salts, in fact—the explanation it affords of the occurrence of chemical change is at best only a very partial one. Water and all other liquids appear to be non-conductors in the pure state, and the arguments on which the assumption is based that water is dissociated to a very slight extent all involve reasoning in a circle. Pure water—a *pure* substance—is and must ever be an ideal conception; but as the resistance which water opposes to a current of electricity gradually increases as it is purified, and at last becomes enormously high, the facts warrant no other assumption than that it would be a non-conductor in the simple and pure state. The arguments based on the observation that it is slightly active chemically are of no independent value, since an impurity which would condition conductivity would equally condition chemical activity. The assumption which is made, in order to explain the constancy in the heat of neutralization of strong acids generally by alkalies, that water is only very slightly dissociated, involves a sharp distinction between water and other compounds, and consequently between oxygen and other elements, which is in no way warranted and is in opposition to the periodic generalization. It is generally recognized that oxygen and the halogens present many analogies, so that water should—and does—in many ways resemble the halhydrides; to assume, therefore, that water resists "ionic" dissociation whilst hydrogen chloride suffers almost complete disruption into "ions" is altogether unjustifiable and illogical.

Peculiar influence of water.

When water is mixed, say with hydrogen chloride, a non-conductor *per se*, a solution is obtained which is readily electrolysed. But solvents generally do not act in this manner—in fact, only a limited number have the power of forming conducting solutions, and none is so active as water. To account for the influence of the solvent, F. Kohlrausch, in 1875, put forward the view that the ions which Clausius assumed to be present in a liquid are thereby prevented from coming too frequently into contact and merely recombining, and that consequently they are free during a sufficient length of time to be amenable to the guiding influence of the electromotive force. Parenthetically it may be pointed out that the dissociation postulated by Clausius was supposed to affect only a relatively small number of molecules at any one moment, whereas the dissociation postulated by the ionic hypothesis, in the case of strong acids and metallic salts, affects the major proportion of the molecules. Moreover, the process supposed to attend dissolution is one of a most extraordinary character; it may be likened to the case of a number of individuals jumping into a swimming-bath, and nearly all of them instantly parting with their arms and legs. If the solvent act as a mere screen, any solvent should suffice to render a potential electrolyte a conductor, but this is not the case. Moreover, as a number of substances when fused (silver chloride, stannous chloride, &c.) are conductors in the absence of any solvent, the screen hypothesis is not only an unsatisfactory and incomplete explanation of the facts, but its introduction appears to be uncalled for. Again, if the Clausius hypothesis be accepted, and it be assumed that some of the molecules in a liquid collide with sufficient violence to bring about their decomposition, it is to be expected

that this would happen in liquids generally, although to different extents. Nor is it clear why the disruption should be of so partial a character, and lead only to the production of ions in the case of complex molecules; for example, acetic acid, *ex hypothesi*, is resolved only into H and $C_2H_3O_2$, instead of the molecule being more or less shattered to pieces. From this point of view it is impossible also to understand why only protochlorides and not perchlorides are electrolytes.

The discovery that chemical interchanges are in many cases not of the form $AB + CD = AC + BD$, but require the intervention of a third substance—the presence of an electrolyte being a *sine quâ non*—and that this is probably equally true of decompositions and isodynamic changes, indeed of every case of change, is almost conclusive evidence against the acceptance of the dissociation hypothesis either in the form suggested by Williamson or in that suggested by Clausius; in fact, no satisfactory evidence has been adduced that molecules are *per se* intrinsically so unstable as is suggested, or that they are in the habit of colliding with such violence as to smash each other to pieces.

As solvents generally do not condition electrolysis, but only particular solvents, it must be supposed that the solvent exercises a definite influence, and one which is not of a merely mechanical order[1]; and that the molecules of solvent and solute in some way influence each other, and interact so as to pull each other to pieces as it were—in other words, that electrolysis is a dependent process. It is not a little remarkable that Faraday's prescience guided him to such a conclusion as the following passage (§ 523) in his fifth series of researches shows:—

Electrolysis a dependent process.

> The theory which I have ventured to put forth (almost) requires an admission that in a compound body capable of electrochemical decomposition the elementary particles have a mutual relation to and influence upon each other, extending beyond those with which they are immediately combined. Thus, in water, a particle of hydrogen in combination with oxygen is considered as not altogether indifferent to other particles of oxygen, although they are combined with other particles of hydrogen; but to have an affinity of attraction towards them which, though it does not at all approach in force under ordinary circumstances to that by which it is combined with its own particle, can, under the electric influence exerted in a definite direction, be made even to surpass it. This general relation of particles already in combination to other particles with which they are not combined is sufficiently distinct in numerous results of a purely chemical character . . . and it probably has a direct relation to and connexion with attraction of aggregation both in solids and fluids. It is a remarkable circumstance that in gases and vapours, where the attraction of aggregation ceases, there likewise the decomposing powers of electricity apparently cease, and there also the chemical action of quantity is no longer evident. It seems not unlikely that the inability to suffer decomposition in these cases may be dependent upon the absence of that mutual attractive relation of the particles which is the cause of aggregation.

In fact, when the phenomena generally of chemistry—and not merely the isolated behaviour of electrolytes—are taken into account, there can be little doubt that chemical changes are primarily associative and not dissociative in character, as was seen by Faraday; and that the force at work by which they are initiated is in all probability that which has been termed residual affinity. That this has not been more commonly recognized probably arises from the circumstance that it has been customary as a rule only to consider the end results of chemical operations. The view taken by Kekulé as to the manner in which chemical change is brought about needs but slight alteration to be in harmony with such an argument; it is merely necessary to assume that when the complex formed by the association of the interacting or potentially interacting substances meets with the necessary third component, a conducting system is established, and that so soon as this is formed the change sets in. Residual affinities are in all probability the *polarizing* forces at work in such cases, by which the various components are led to associate and take up compatible positions. This hypothesis involves the assumption that complication, not simplification, precedes chemical change; that complex molecular systems are first formed from the interacting substances, and that these, on breaking down, suffer rearrangement of the parts—such rearrangement taking place in consequence of elements which were previously separate being brought into one common "sphere of activity" within which it is possible for them to interact. The function of condensing and other agents—of catalysts generally—on this hypothesis is that of collecting into one system the various elements necessary for the occurrence of a particular change. Such systems may be regarded as, and in fact would be, closed voltaic circuits. The action of aluminium chloride, for example, in conditioning the formation of homologues of benzene from the two substances benzene and methyl chloride—both undoubtedly dielectrics, which when together alone are entirely without action on each other—may be ascribed to the formation of an unstable compound of both with the metallic chloride. In like manner ferric chloride probably conditions the interaction of bromine and benzene by combining with both, and so bringing them within each other's range in an unstable system.

Association hypothesis of chemical change.

Ordinary cases of chemical change differ from those effected by an electric current merely in being cases of exothermic change which take place without any energy being supplied from without. How the current acts in promoting disruption cannot apparently at present be determined, but it is highly probable that it circulates within complex systems such as have been referred to. A rasping contact may be said to exist between the molecules of the dissolved substance and the solvent, and the action of the current upon each complex may be roughly compared with that of a dredging machine scraping mud from the bottom of a stream. A number of such dredgers arranged in series, each one of which picks up the mud delivered by the machine below, and thus carries it a stage higher up, so that mud only is visibly delivered at the one end of the system, may be taken as a simile of the manner in which the transport of the negative ion is effected; the water taken up in the buckets, but returned into the stream down which it flows, corresponds to the positive ion. But although both are concerned in the process, it cannot at present be determined whether the water or the dissolved substance in an aqueous solution is primarily split up; it is doubtful whether either is ever at once separately resolved into its ions. Probably in the first instance the system is resolved into two parts, one of which escapes—unless it act on the water—while the other being unstable often gives rise to secondary products. A solution of sulphuric acid, for example, appears to yield hydrogen and "oxidized sulphuric acid"; the extent to which this latter persists depends entirely on the conditions, *i.e.*, the concentration, the temperature, and the size and character of the electrode. That water should be the most active among liquids both as a solvent and in promoting electrolysis is in no way surprising, as no other compound exhibits residual affinity in so high a degree. To account for the behaviour of conducting chlorides, it is only necessary to suppose that individual like molecules exercise among themselves an influence similar to that exercised in

[1] It has been contended of late that the superior influence of water is due to its high specific inductive capacity. It is more probable that the power of water to condition electrolysis and its high specific inductive capacity are but correlated properties which have their origin in the high residual affinity of the oxygen.

other cases between the molecules of solvent and solute. The existence of compounds such as potassium triiodide renders it probable that the electrolysis of conducting chlorides, such as silver chloride, is conditioned by the attraction which they exercise for chlorine, and the behaviour of protochlorides in comparison with that of perchlorides is readily explained from this point of view.

Among the objections to the ionic hypothesis in explanation of chemical change, that afforded by the behaviour of enzymes as hydrolytic catalysts is one of the strongest. The hydrolysis of ethereal salts and of carbohydrates such as cane sugar by acids is supposed to be conditioned by the hydrogen ions, but enzymes—which act even more powerfully than acids on the carbohydrates—are not electrolytes, and therefore cannot be supposed to furnish hydrogen ions. Moreover they act selectively, a particular carbohydrate as a rule being hydrolysed only with the aid of a particular enzyme; in fact, there must be a correspondence somewhat like that of key to lock, and there is no doubt that the geometrical configuration of the enzyme relatively to that of the carbohydrate is the determining factor on which its action depends.

Although it is unquestionable, however, that besides being in many respects incompatible with the facts and irrational, the ionic dissociation hypothesis makes demands upon the imagination which it is practically impossible to grant, it is equally beyond question that the substances classed as electrolytes in effect behave as though they were dissociated in solution. What is the explanation of this remarkable circumstance? Can any rational process be imagined comparable with that of ionic dissociation and susceptible of similar treatment? Such an explanation is perhaps not far to seek, and may be found in the fact—too commonly overlooked—that in solvents generally there are always present two sets of molecules *in equilibrium*, viz., simple or fundamental molecules and complex aggregates formed by the association of several such simple molecules. The internal state of a mass of liquid must be pictured as one of intense activity and turmoil—as one in which dissociation is constantly going on, but inter-molecular, not intra-molecular or ionic dissociation. Liquid water, for example, is a mixture of fundamental molecules or *monads* such as are represented by the symbol OH_2 with complexes formed by the union of several of these simple molecules, in proportions depending on the temperature, and these two kinds of molecules are ever changing backwards and forwards the one into the other. The monads are presumably the chemically active molecules, but the complexes have little if any chemical activity. If it be assumed that chemical change and electrolytic conduction in liquids are dominated by the process expressed in the equation of equilibrium

Dissociation of solvent complexes.

$$M_x = xM,$$

M being the symbol of the fundamental molecule or monad, any condition which increases the proportion of monads will render the solvent more "active." The effects produced on dissolving non-electrolytes are wrongly attributed to the dissolved substance; they are in reality due to the solvent monads, and it is the solvent, not the dissolved substance, that alone undergoes alteration in the case of substances which enter into solution as monads. Thus, to take the case of the osmotic pressure developed on dissolving any non-electrolyte in water—if a vessel containing water be divided into compartments by a permeable diaphragm, the equilibrium will be the same on either side, and therefore the pressure will be the same. But if a substance which cannot penetrate the diaphragm be dissolved in the water in the one compartment, its molecules will interpose themselves as screens between those of the solvent, and prevent the reassociation of the monads; consequently these will be present in a greater proportion in the solution than in water. The monads will necessarily exercise an attractive influence over those in and beyond the walls of the diaphragm, and a flow will take place into the compartment containing the dissolved substance until equilibrium is restored. The osmotic pressure developed is therefore a measure of the extent to which the dissociation of solvent complexes into monads takes place. All substances which enter into solution as monads, if non-electrolytes, should produce the same effect when present in equimolecular proportions under like conditions of temperature and pressure—and Avogadro's law should therefore hold for dilute solutions. This is the well-known classic conclusion formulated by van't Hoff. In the case of associated non-electrolytes a disturbing factor is introduced if the molecule only gradually undergo dissociation into monads as dilution proceeds, and the behaviour of such compounds must be irregular. The depression of the freezing-point and the rise in boiling-point brought about by dissolving a substance in a liquid are necessary consequences of the presence of an increased proportion of monads.

Electrolytes, besides acting as mere mechanical screens, also exercise a specific influence in excess of that exercised by non-electrolytes, by themselves combining with solvent molecules. In such cases an attractive influence is exerted not only between the solvent monads, but also between these and the solute monads. If it be granted that electrolysis is the outcome of an interaction of the fundamental molecules of solvent and solute under the influence of an electromotive force, there is no difficulty in understanding the apparent increase in conductivity of electrolytes as the solution is diluted. The apparent effect produced by a dissolved substance must be greatest in a highly dilute solution, because in such a solution the solute is resolved to the maximum possible extent into its fundamental molecules, and these come most fully under the influence of the solvent monads, which are then necessarily present in maximum proportion.

From the point of view of the hypothesis here developed ions need have no separate existence, and the phenomena exhibited by solutions—whether physical or chemical—are mainly influenced by changes in the molecular composition of the solvent, the chief if not the only factor by which the changes are conditioned being the obscure function of the atoms termed residual affinity.

It will be appropriate to introduce here a brief reference to the nature of the chemical interchanges involved in vital processes, whether in plants or animals.

Chemistry of vital processes.

Owing to the great advance in our knowledge, especially of synthetic processes, it is possible to form some conception of their general character, although such changes are necessarily to a great extent enshrouded in mystery. In the main they are of four kinds—reductive, synthetic, hydrolytic, and oxidative. It is generally believed that the first stage in assimilation involves the reduction of carbon dioxide under the influence of light, and that it proceeds *pari passu* with the separation of oxygen, somewhat in the manner formulated in the equation: $CO_2 + H_2O = COH_2 + O_2$; it is difficult, however, at present to regard this as more than a mere statistical expression. To judge from its properties, chlorophyll belongs to the class of quinones. But a quinone cannot cause reduction; on the contrary, it acts as an "oxidizing" agent in consequence of the readiness with which it combines with hydrogen, forming a hydroquinone or quinol. It is, therefore, probable that chlorophyll first undergoes reduction at the expense of some

easily oxidizable substance, and that the reduction of carbon dioxide is effected, wholly or in part, by the quinol of chlorophyll—one at least of these changes taking place under the influence of light. Assuming that formaldehyde, CH_2O, is the immediate product, it is highly probable that this is at once converted into a carbohydrate—in many cases into starch. To appreciate the importance of this change, it is necessary to consider the phenomena of fermentation; it is then obvious that the energy stored up in the carbohydrate system plays an all-important part. Fermentation is certainly at bottom a process of *hydrocatalysis*, and it can scarcely be doubted that the function of the enzyme is to introduce water into the circuit of change—to establish a circuit in which hydrolytic changes can occur, although not of the ordinary kind, but reductive on the one hand and oxidative on the other. Baeyer, in 1870, was the first to point out that the resolution of glucose during fermentation into alcohol and carbon dioxide, and, indeed, the phenomena of fermentation generally, may be accounted for by the assumption that translocation of hydrogen and oxygen atoms is induced through the alternate separation of the elements of water and their addition in a different order—changes which would involve the accumulation of oxygen atoms at certain parts of the molecule, thus constituting points of weakness where disruption of the molecule would inevitably occur. This is shown in the following formulæ, in the second of which the separating elements are indicated by dots:—

Fermentation.

I.		II.		III.
$CH_2.OH$		$CH_2...OH$		CH_3
$CH.OH$		$C.OH...H$		$CH.OH$
$CH.OH$		$C...OH...H$		$C(OH)_2$
$CH.OH$	→	$C.OH...H$	→	$C(OH)_2$
$CH.OH$		$C.OH...H$		$C(OH)_2$
$CH(OH)_2$		$CH...(OH)_2$		CH_3

It will be seen that in the product of rehydration (III.), the terminal groups are fully reduced, whilst there has been an accumulation of OH groups in other parts of the system. In a molecule so constituted, changes might set in similar to those involved in the resolution of oxalic acid into carbon dioxide and formic acid.

The conception is one of remarkable beauty, and undoubtedly a sufficient explanation, as changes precisely similar to those attending fermentation may be effected by simple hydrolysis. Thus glucose may be converted into lactic acid by heating it with alkali, and on boiling fructose with muriatic acid an acid is formed, *i.e.*, lævulinic acid, $CH_3.CO.CH_2.CH_2.CO_2H$, the production of which clearly involves a reduction of some of the $CH_2.OH$ and CH.OH groups, and oxidation of others, in the manner pictured by Baeyer. The changes attending fermentation are presumably functions of the protoplasm—in other words, they probably occur within very complex molecular systems of extreme instability, perhaps under the influence of, in contact with, the very same hydrolyst (enzyme) which, when separated from the cell, is so active in promoting the hydrolysis of cane sugar, or, if not, of substances of a similar nature. On inspecting Baeyer's formulæ it will be noticed that during rehydration the elements of the water molecule become added on to non-contiguous carbon-atoms; this appears to be a special feature of such changes. Supposing that the protoplasmic hydrolyst were to condition the formation of a conducting circuit in which any two of the carbon systems ($CH_2.OH$, CH.OH or COH) of the glucose molecule and water molecules were included, if the total hydrolytic change which could take place in such a circuit were exothermic, even if the change affecting the one group involved an expenditure of energy, water would be "electrolysed," and its hydrogen would effect the withdrawal of OH from the one group and its displacement by hydrogen, while oxygen would be added to the other group, it may be directly, or in consequence of the displacement of H by OH. The different effects produced by different organisms, on this hypothesis, would be the consequence of the hydrolysis affecting different systems. As most, if not all, fermentable compounds are asymmetric, and the enzymes are undoubtedly also asymmetric bodies, the direction of attack would depend on the character of the asymmetry of both hydrolyte and hydrolyst, and only compatible hydrolysts, *i.e.*, those compatible with the hydrolyte, would condition the hydrolysis, *i.e.* fermentation.

If only the conversion of glucose into alcohol and carbon dioxide be considered, there is a danger of regarding fermentation as a purely destructive process, but it must not be forgotten that in some cases products are obtained which afford the clearest evidence of the occurrence of constructive changes. It is, however, probable that some of these are the outcome of interactions occurring, as it were, naturally and independently between products of enzymic change, and that the direct function of the enzyme in fermentation may after all be only to induce simplification, not complication. Thus, to explain the production of isobutyl-carbinol (the inactive amyl alcohol of fusel oil) from glucose, it may be supposed that in the first instance the glucose is resolved by enzymic action into a mixture of glyceraldose, $CH_2(OH).CH(OH).COH$, with the isomeric glyceroketose, $CH_2(OH).CO.CH_2(OH)$, which interact spontaneously, a new hexose, $(CH_2.OH)_2.C(OH).CH(OH)$, $CH(OH).COH$, being formed, and that this in turn becomes transformed by enzymic influences into amyl alcohol. Again, to account for the production of butyric and caproic acids from lactic acid, it may be supposed that the latter is partly reduced by "fermentation" to the aldehyde $CH_3.CH(OH).COH$, and that an interaction then occurs spontaneously between this aldehyde and unchanged acid, giving rise to the complex acid $CH_3.[CH(OH)]_4.COOH$, which on further fermentation yields acetic, butyric, and caproic acids. The formation of fat from carbohydrates is doubtless a process of the same kind, in which at an early stage at least three molecules of glucose, or some substance closely related thereto, become condensed into one, much as three molecules of acetone C_3H_6O, yield a single molecule of phorone, $C_9H_{14}O$; the reduction of the complex so produced is then effected by enzymic influence. Recent observations, however, prove beyond question that the ordinary hydrolytic changes effected by enzymes are reversible, and therefore that the enzymes must be credited with synthetic powers. Croft Hill was the first to observe that glucose is partially converted into a biose by diastase, and he supposed that maltose was formed; later observations seem to show that it yields isomaltose: it may be that both are formed. Emil Fischer and E. Frankland Armstrong have since found that a mixture of glucose and lactose in contact with the kephir enzyme yields a biose closely related to if not identical with milk sugar.

Constructive aspect of fermentation.

Ordinary alcoholic fermentation is a nicely-balanced action in which the products of the presumed "electrolysis" of water are fully utilized, so that neither oxygen nor hydrogen is liberated. In butyric and many other fermentations, however, hydrogen is freely evolved, and in these cases somewhat more highly oxidized products (acids instead of alcohols) are formed; in fact, the evolution of hydrogen involves the occurrence of an amount of oxida-

tion corresponding to the hydrogen liberated, and in excess of that observed when no hydrogen is liberated. The production of butyric and caproic acids, of amylic alcohol, and also that of fat, can only be explained on the assumption that while one set of molecules undergoes reduction another set undergoes oxidation. The separation of oxygen as such has not yet been observed to take place during fermentation, but if hydrogen be evolved as the result of "excessive" oxidation, it would seem to follow that oxygen should be evolved if reduction took place to an extreme extent.[1] It is conceivable, and indeed probable, that the oxygen evolved from plants in sunlight owes its origin to an effect of this kind, and that it may be connected with the reduction of chlorophyll previously referred to as a necessary step in the reduction of carbon dioxide. In other words, the chlorophyll acts, in a measure, as a polarizable electrode or catalyst, against which hydrogen is delivered, and at which the dioxide suffers reduction, being one term in a complex circuit in which hydrolytic change is proceeding. It is a noteworthy fact that a tendency to form fat—the most highly-reduced normal product of vital metabolism—is particularly noticeable in the case of animals, and that oxidative changes occur in these to a far greater extent than in plants.

Nature of vital processes.

It is commonly supposed that interactions such as occur in animals and plants are not to be regarded as mere chemical changes, but that they take place within the protoplasm, and in subjection to its influence. It is possible to accept this interpretation, and yet to regard such processes as cases of chemical interchange pure and simple. The formation of starch and of fat may be taken as examples. It is impossible at present to explain under what conditions and precisely how these are formed, and yet they are so easily formed that it is probable that they are produced in a comparatively simple manner. The formation of starch from glucose is a process in which a large number of molecules of the latter become associated, and one in which, doubtless, molecule must be "presented" to molecule in some very definite manner. It may well be that glucose does not exist in an ordinary aqueous solution in the proper form to undergo consideration. There are at least two isodynamic forms of glucose :

$CH_2(OH).CH(OH).CH(OH).CH(OH).CH(OH).(COH)$
$CH_2(OH).CH(OH).CH.CH(OH).CH(OH).CH(OH).$
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad\backslash\!\!_____O_____/$

Of these the second appears to be a relatively inert form, and this perhaps is the dominant, if not the only form, existing in a dilute solution. It is conceivable that such a molecule might enter into loose combination with a protoplasmic molecule in such a way as to cause its conversion, so to speak, into the more active aldehydic form, in consequence of the OH groups becoming attached to the protoplasm. The aldehydic group would then be in a position to operate freely. It is also possible that in the case of a compound such as glucose the configuration is such that the OH groups mutually interfere, and, as it were, promote a policy of vacillation, and that on one set becoming neutralized by attachment to the protoplasm another set becomes free to act uniformly, so that their activity can be manifested in a direction before impossible.

Physical Properties.

That physical and chemical properties are strictly correlative there is not the slightest doubt, but the exact nature of the relationship is far from understood, more particularly because of the many difficulties in the way of arriving at really comparable values. In the case of gases, as the molecules are widely separated, they may be regarded as independent entities and outside the range of intermolecular attractions. But this is not the case with liquids or solids, and our knowledge of physical properties relates mainly to the liquid state. The molecules in liquids are undoubtedly held together with a degree of firmness—and to an extent—which varies from series to series, and even within series, so that although in the case of liquids composed of molecules which are easily separable, it may be possible to make comparisons at corresponding temperatures at which the character of interrelationship of the molecules is of the same order, or nearly so, for all the substances, in other instances this is impossible. Acetic acid may be cited as an extreme case. As the vapour of this compound, even at temperatures considerably above its boiling-point, is not composed of the fundamental molecules represented by the formula $C_2H_4O_2$, but mainly consists of complex molecules formed by their union, it is impossible to contrast acetic acid properly with compounds which are readily reduced to the unimolecular form. Whenever possible the boiling-point has usually been selected as the temperature at which there is likely to be the closest approach to uniformity of intermolecular conditions, but it is clear that this is by no means always the case. Thorpe and Rodger, who have very carefully studied the relationship between the viscosity of liquids and their chemical nature (*Phil. Trans.* 1894, p. 397), have shown that "temperatures of equal slope"—*i.e.*, those at which $d\eta/dt$ is the same for different liquids—tend to reveal much more definite relations between the values of the viscosity co-efficients (η) and the chemical nature of substances than can be deduced from observations made at the boiling-point.

Variation of atomic values.

At one time there was a strong tendency to believe in physical constants, and to regard the molecular values as the sums of certain fixed atomic values. As the area of discussion has been widened, however, and not only compounds of relatively simple constitution, but also those more complex in structure have been studied, the conviction has gained ground that the "atomic" values are subject to considerable variation. Such variations almost always occur in cases in which they are to be expected on chemical grounds. Thus the nearest approach to constancy is observed in the paraffinoid hydrocarbons, which are remarkable on account of the simplicity and uniformity of their chemical behaviour as well as on account of their inertness. Ethenoid hydrocarbons differ entirely in many of their properties from the paraffinoids, the ethenoid linkage exercising a peculiar physical effect; the extent to which variation occurs within the series, however, cannot be judged of, as the material available for discussion is altogether insufficient. Benzenoid hydrocarbons exhibit an altogether peculiar and variable behaviour.

Not only are the peculiarities of the hydrocarbons reproduced in their derivatives, but in many cases other peculiarities become apparent which are clearly traceable to the influence exerted by the radicle introduced into the hydrocarbon complex. There is reason to suppose that in the case of paraffinoid compounds the hydrocarbon radicle has a practically constant influence, and that the variations observed in ascending the series may be referred to differences in the influence exerted by its associates. In other series probably both radicles are variants. In ethenoid compounds, in which two of the carbon atoms may be regarded as united by two affinities of each, but in such a way that the full force of each affinity is far from being exerted, the affinities are deflected from the mean positions

[1] It has recently been stated by Pakes and Jollyman (*Trans. Chem. Soc.* 1901, 322), that a little oxygen is contained in the gases produced by *B. pyocyaneus* when grown anaerobically.

which they tend to take up in the unrestrained carbon atom, and it may be supposed that the extent to which the affinities of the paired carbon atoms are deflected varies according to the nature of their associates. But the deflection would vary only within narrow limits; consequently, the limits within which the ethenoid "constant" may be expected to vary are narrow. In the case of benzenoid compounds a much wider variation may be possible. In discussing their chemical properties, it has already been pointed out that the centric system must be regarded as a plastic group within which considerable variation of the affinity relationships may take place. Physical properties tell the same tale. To give but one or two examples. No property affords a more sensitive test of changes in structure than the refractive power. If the refractive power of the C_6 group in benzene be calculated by deducting from the molecular refractive power the value of six hydrogen atoms—hydrogen being supposed to have a constant value in all compounds—and the difference be divided by 6, the value for the carbon atom is very nearly 6. If a similar calculation be made for the methylated homologues of benzene, assigning to CH_3 the value that it has in other series, the value for the carbon atom (in the C_6 group) is found to increase from 6 in benzene to 6·15 in trimethylbenzene (mesitylene). If a similar calculation be made for aniline, assuming that NH_2 has the value assigned to it in paraffinoid amines ($7·7 = 5·1 + 2.1·3$), a still higher value is obtained for carbon, viz. 6·3. Whether these variations are to be ascribed solely to variations in the centric system, or whether the associated radicles also vary, it is at present impossible to decide; the question has already been raised in discussing the occurrence of chemical change in the case of benzenoid compounds, and it has been pointed out that there is some reason to suppose that even the CH_3 group has special properties in benzenoid hydrocarbons, but the argument is by no means conclusive.

Special influence of oxygen.

With regard to the alteration in physical properties consequent on the introduction of other elements into hydrocarbons, oxygen exercises a greater effect perhaps than any other, and one which is especially noticeable in the case of properties which are mainly "intermolecular" effects. Thus the introduction of hydroxyl into the paraffins has the effect of converting very slightly viscous compounds of low boiling-point into relatively highly viscous compounds boiling at temperatures far above those at which the parent hydrocarbons are vaporized. There can be little if any doubt that the peculiar physical properties of oxygen compounds are to be correlated with their exceptional chemical activity—that the residual affinity which is possessed by oxygen in most of its compounds in so high a degree, and which conditions the preliminary associations determinative of chemical change, is also operative in causing the fundamental molecules to cling together and form complexes to an extent not met with in compounds of other elements, so that the special peculiarities of oxygen compounds may be ascribed to the oxygen. Whether the properties of the paraffinoid radicle are in any way modified by association with oxygen or other elements is a difficult question to decide. In discussing it geometrical considerations must needs be taken into account. In the normal paraffins and in the corresponding primary alcohols, the carbon atoms are arranged in a branchless chain, but in the secondary alcohols the hydrocarbon radicles have two, and in the tertiary alcohols three branches. The primary alcohols may, therefore, be pictured as simple filaments progressing, it may be, with a wave-like motion. As the hydrocarbon radicle is composed of saturated elements, it may be regarded as practically indifferent to all external attractions, and the activity of the compound may be located at the oxygenated extremity or head, the hydrocarbon radicle being supposed to oscillate about a mean position relatively to the OH group. In the secondary and tertiary alcohols, in which the filaments are branched, the hydrocarbon radicles are brought into closer proximity with the OH group, and they will also tend to oscillate on one side of the mean position taken up by the primary radicle, unless the constituent groups are of such dimensions as to balance one another. Such differences in structure might alone condition a materially different behaviour of the molecules towards each other, which would be apparent in the viscosity, density, and boiling-point relationships. Optical properties, on the other hand, which are mainly conditioned by intermolecular structure, would be but slightly affected; and chemical properties should not be materially altered. As a matter of fact, considerable differences are noticed on contrasting the chemical behaviour of the lower with that of the higher terms of the series in the case not only of the alcohols, but also of the ketones and acids derived from the paraffins. As there is no reason to suppose that the hydrocarbon radicle undergoes any modification, it may be assumed that the oxygen is the inconstant element; but as only the lowest terms differ to any marked extent, it would seem that when a certain point is reached variation can no longer take place. To draw a rough parallel, the oxygen appears to behave much as if it were connected with the hydrocarbon radicle by a spring which cannot be extended beyond a certain limit; in the lower terms of the series the spring is not fully extended, but the limit is soon reached. Differences such as are observed between phenol, for example, and the paraffinoid alcohol, hexylic alcohol, are of interest from this point of view. Although of lower molecular weight, phenol is a crystalline solid at temperatures at which the alcohol is liquid, and as a liquid it is more viscid than the alcohol. Phenol also manifests weak acid properties, which may be regarded as evidence that the oxygen has some power of attracting bases. It has been shown also that phenol exists in many solutions as a double molecule. On all grounds, therefore, it seems probable that the oxygen in phenol has more residual affinity than that in hexylic alcohol. The great increase in viscosity which attends the introduction of several hydroxyl groups is also corroborative of the argument here used. The extreme viscosity of polyhydric alcohols, such as glycerol, is possibly a consequence of the arrangement of the three oxygen atoms in one plane in such a way as to constitute an "oxygen surface." Exact determinations of the viscosity relationships of isomeric asymmetric polyhydric alcohols of known configuration would be of great value as testing a point of this kind. Variations in the physical effects produced by oxygen are particularly apparent in compounds in which oxygen is associated with carbon by two affinities, much in the way that carbon is associated with carbon in ethenoids. Speaking generally, oxygen apparently behaves as though its two affinities took the form of a looped filament, the two ends of which represent its ordinary affinities, and the loop the dependent or residual affinity. The variations it exhibits may then be pictured as variations in the size of the loop, no secondary point of attachment remaining when it is reduced to a mere knot.

"Co-operative effect."

A factor of the highest importance, which in many cases conditions striking physical peculiarities, remains to be referred to, viz., that of co-operative action. If the heat of formation of chlorinated paraffinoid compounds be calculated from the heats of combustion, it appears, as J. Thomsen has pointed out, that on an average about 13,500 gram. deg. C. units of heat are developed in the fixation of a single atomic proportion of

chlorine; but that in the case of di-derivatives the average amount of heat developed is far greater, viz., $\frac{33000}{2} = 16500$ units. As the value found for tri-derivatives is only 33,000 + 13,500, it is to be supposed that the extra-outgoing of affinity is in some way due to an interaction of the two halogen atoms. Similar differences are apparent in the case of other properties. Thus the refraction equivalents of chlorine and bromine, calculated from observations made with compounds such as ethylene chloride and bromide, are distinctly higher than those deduced from observations made with monochlorides and bromides. Again, Thorpe and Rodger have shown that the viscosity constants of dichlorides and dibromides are remarkably different from those of the monochlorides and monobromides. But the effect is most obvious in the case of iodo-compounds. Thus the refraction equivalent (58·2) of methylene iodide, CH_2I_2, is far higher than that calculated (52·1) on the assumption that the value of each atom of iodine is that of the iodine atom in methyl iodide. In all the cases referred to the two atoms of halogen are associated either with a single carbon atom or with contiguous carbon atoms, and there is little doubt that this will be found to be necessary to the production of the effect under consideration. One of the very few observations bearing on this point is that of Perkin, showing that the molecular rotatory power acquired in a magnetic field is considerably higher in the case of propylene bromide, $CH_3.CHBr.CH_2Br$, (10·82), than in that of the isomeric trimethylene bromide, $CH_2Br.CH_2.CH_2Br$, (10.34). The "co-operative effect" is most obvious, however, in compounds in which several benzenoid and ethenoid systems are conjoined. Thus if the atomic refractive power of carbon be calculated from the molecular refractive power of diphenyl, $C_6H_5.C_6H_5$, its apparent value is about 6·4, whereas in benzene it is only about 6. Stilbene, in which an ethenoid group is interposed between two phenyl groups, Ph.CH:CH.Ph, is still more "abnormal" in its behaviour, its molecular refractive power (113·4) exceeding the calculated value by 12 units. The very high refractive power of cinnamic aldehyde, which exceeds the calculated value by 10 units, may be accounted for in a similar way, and even seems to suggest that this compound is to be represented as Ph.CH:C:CH.OH, rather than as Ph.CH:CH.COH, *i.e.*, that it is the isodynamic form of the aldehyde.

It is by no means improbable that the principle here developed may prove to be of wide application, and that it will afford an explanation of the many "anomalies" which are apparent on contrasting the properties especially of benzenoid compounds with those of the paraffinoids; it may also serve to explain the fact that they often differ from paraffinoids in physical properties to an extent altogether disproportionate to the extent to which they differ from them in their chemical properties. Perkin's observations on the rotation of polarized light in the magnetic field by benzenoid compounds afford many striking illustrations of their peculiar behaviour (*Trans. Chem. Soc.* 1896, p. 1026). Thus, on contrasting the rotatory power of phenol with that of benzene, and that of heptylic alcohol with that of heptane, the difference due to the displacement of H by OH is 0·856 in the case of phenol, but only 0·181 in the case of the alcohol. That the superior effect exercised by the OH group is at least mainly due to the co-operative action of the centric system and the oxygen appears probable from the fact that the difference between toluene, $Ph.CH_3$, and benzylic alcohol, $Ph.CH_2.OH$ (0·243), is but slightly in excess of the paraffinoid value. Co-operative action can only be exerted by contiguous radicles. A comparison of the values for benzene, nitrobenzene, and the mono-derivatives containing halogens, leads to similar conclusions:—

	Mol. rot.	Diff.
Nitrobenzene . .	9·361	1·923
Benzene . .	11·284	
Fluorbenzene . .	9·970	1·314
Chlorobenzene . .	12·510	2·540
Bromobenzene . .	14·506	1·996
Iodobenzene . .	19·108	4·602

The fact that the differences are negative in the case of nitro- and fluorbenzene is in itself almost a proof of co-operation. When the effects produced by the other halogens in benzene are contrasted with those they produce in propylic compounds, the differences observed are—

Chlorine −0·253. Bromine −0·086. Iodine 0·321.

In benzene, therefore, chlorine has a slight negative influence, and only iodine has a marked extra positive effect: such a result is in harmony with the fact that in carbon compounds generally iodine alone has a marked tendency to exhibit residual affinity.

But by far the strongest argument in favour of the view here advocated is afforded by the consideration of the conditions which determine the appearance of colour in carbon compounds. The majority of coloured compounds may be referred to one type, that of quinone (*a*). Speaking generally, they contain two ethenoid groups C : R″, in ortho- or para-positions, in association with an unsaturated benzenoid nucleus. As compounds such as diketohexamethylene (*b*), in which the nucleus is saturated, are colourless, colour must be supposed to originate in the co-operation of the two ethenoids with the unsaturated nucleus, and each must be regarded as an independent light-absorbing centre. Whether the nucleus be represented as a centric or as an ethenoid structure matters little; suffice it to say that coloured compounds are known of the dihydrobenzene type (*c*), so that it is to be supposed that either the centric or the ethenoid-system may act as the third centre. A colour-producing system such as is present in quinone may, therefore, be represented by the symbol $=$ If this symbol be adopted as a broad definition of quinonoid structure, it is probably safe to assert that all coloured substances are quinonoids. Iodoform is a compound of particular interest from this point of view. Attention has already been directed to the exceptionally high refractive power of methylene iodide, CH_2I_2, and to the probability that this is due to the co-operation of the two iodine atoms. Such a compound may be regarded as the analogue of diketohexamethylene, each iodine atom exercising an influence similar to that exercised by the CO group in the keto-compound. When a third atom of iodine is introduced, forming iodoform, CHI_3, an effect is produced equivalent to that observed when diketohexamethylene is converted into quinone and a third absorbing centre is developed—the highly refractive di-iodide becoming intensely yellow when converted into the tri-iodo-derivative. The introduction of a fourth iodine atom has the effect of greatly intensifying the colour. From this point of view it is easy to understand that all tri- and tetriodides, but only *polymerized* di-iodides such as mercuric iodide $(HgI_2)_x$, should be coloured.

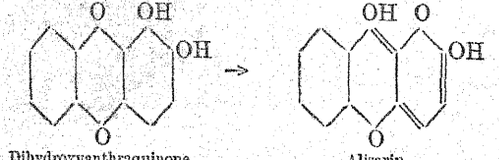
Colour in carbon compounds.

The appearance of colour in an open or *pseudo-quinonoid* system, as distinguished from a closed or true quinonoid system, is dependent on a certain intensity of effect being developed. Chlorine and bromine do not act sufficiently powerfully to condition colour, neither does the presence of three phenyl groups in association with a single carbon

atom suffice, triphenylmethane, $CHPh_3$, being colourless, although abnormally refractive. It is also noteworthy that benzil, Ph.CO.CO.Ph, if coloured at all, is at most a very pale yellow substance; if not a consequence of its symmetrical structure, this may be due to the fact that the compound is one in which there is but little residual affinity. The colour of substances such as azobenzene, Ph.N : N.Ph, may be ascribed to the co-operation of the two phenyl systems with the diazo N : N system.

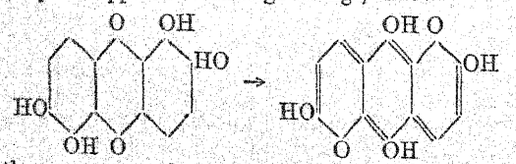
Intensification of colour.

Quinone and its homologues, and indeed the simple quinones generally, are at most either yellow, or orange, or orange-red in colour; as a rule para-quinones are yellow, and the unsymmetrical ortho-quinones orange to red. The introduction of oxygen (as OH) or halogens usually has the effect of deepening the colour—a result, it may be supposed, of the introduction of a further slight co-operative effect. Colours other than yellows and reds—blue shades of red, greens and blues—are met with only in mixed quinonoids, *i.e.*, compounds in which the two C : R″ groups are dissimilar, one at least being a more or less complex group. The colours of the rosaniline group, for example, are all derivatives of the complex $R'' : C_6H_4 : CPh_2$, R″ being usually either NH or NR′, and either NH_2 or a substituted NH_2 group being present in each of the Ph groups. The colour is much intensified by the association of several quinonoid or pseudo-quinonoid systems. Thus the simple diazo-dyes, formed from the diazo-benzenes and either phenol or aniline, or their homologues, are all derivatives of azobenzene, $C_6H_5.N : N.C_6H_5$, and resemble this compound in being yellows. The derivatives of azonaphthalene, $C_{10}H_7.N : N.C_{10}H_7$, are much deeper in colour, many pronounced reds being met with amongst them; the intensification of the colour is doubtless a consequence of the greater influence exerted by the naphthyl group. By diazotizing the amido-derivative of a diazo-dye, and then coupling the diazo-compound with amines or phenols, disazo-compounds are produced in which the azobenzene or azonaphthalene complex is contained twice. Still more complex substances are easily prepared by repeating such a series of operations. Many of these polyazo-dye stuffs absorb light so completely that they are almost black. The hydroxy-derivatives of anthraquinone afford another striking example of the influence exercised by accumulated effects. The lower derivatives are orange-red or red, the higher greens and blues; it is impossible to account for the difference on the assumption that it is due to the mere accumulation of hydroxyl groups in the one molecule, but it is easily understood if it be granted that anthraquinone itself is not the basis of the colour to which it gives rise, but an isodynamic compound. Thus the formation of alizarin may be assumed to involve the isodynamic change



Dihydroxyanthraquinone. Alizarin.

The corresponding heteronucleal tetrhydroxy anthraquinone may be supposed to undergo change, thus:—



In the one compound a quinonoid system is developed on only one, but in the other on both sides of the complex.

If the argument here adduced be accepted as valid, there is no difficulty in understanding why a limited meaning must be attached to the conception of atomic constants. It would seem that, except perhaps in the paraffin series, we are called upon to study the behaviour of more or less elastic systems—not of atoms which can freely exert a constant individual influence. In such systems the affinities are more or less deflected and controlled and subject to change according to the influence which is brought to bear upon them, and therefore they exercise a varying effect. Still more important, probably, is the variation due to the degree of influence which the systems exercise by acting in co-operation.

Colours of metallic salts, &c.

A similar doctrine may be found to apply to metallic salts and to inorganic metallic compounds generally. That a profound difference exists between metals and non-metals there can be no doubt, and that the latter tend to form complexes comparable in some cases with the ethenoid and centric hydrocarbon systems is also in the highest degree probable. But the investigation of metallic salts is complicated and rendered much more difficult than that of carbon compounds by the tendency they display to form complex molecules, and also by the readiness with which they enter into combination with water. The conclusion that coloured carbon compounds are quinonoids, using this term in a broad sense, if extended to elements, would involve the conclusion that the structure of these is in many cases comparable with that of quinonoids.[1] The increase in the intensity of the colour as atomic weight increases in the case of the halogens; the intense blue colour of ozone in comparison with that of oxygen; and especially the intense colour and extraordinarily complicated absorption spectrum of nitrogen dioxide, are of interest from this point of view. In all these cases intensity of colour is associated with a high degree of chemical activity, and the conclusion is irresistible that the existence of residual affinity determines the appearance of colour. In any case it should be worth while to take into account the apparent simplicity of the mechanism by which colour is produced in carbon compounds, and to consider whether it may not be sufficient even to account for the complicated absorption spectra which characterize many compounds: it may well be that these have their origin in the superposition of effects produced at a very limited number of absorbing centres, and that colour is the outcome of intramolecular interferences.

Conclusion.

In this article the attempt has been made to pass briefly under notice what appear to the writer to be the more important problems in chemistry which have been the subject of discussion during the period 1875-1900, and besides indicating the directions in which progress has been made, to give some idea of the problems which press for solution. The end the chemist has in view is to gain clear conceptions of the nature of the primary materials, *i.e.*, the elements, with which he has to deal, and an understanding of the operations into which they enter. He is called upon, however, to study their behaviour in crowds and companies in circumstances of great difficulty, in order that he may form an opinion of their behaviour as individuals and depict their characters. That so much success has already attended his labours is proof that the methods in use are essentially sound, but the opportunities awaiting future inquirers are infinite.

(H. E. A.)

[1] It is a question of interest whether the blue colour of oxygen be not due to the presence of complexes $(O_2)_x$. Abney's observations show that solutions of colourless salts in water are less absorptive in the infra-red region than in water *per se*; this may be regarded as proof that the colour of water is at least in part conditioned by the presence of molecular complexes.

Chemnitz, a town of Saxony, Germany, in the fertile valley of the Mulde, 50 miles by rail W. by S. from Dresden and 51 S.E. of Leipzig. It is one of the principal commercial and industrial centres of Germany. Its importance arises from its cotton-spinning, hosiery, furniture, textile, and glove manufactures, in which a very considerable trade is done with the United Kingdom and the United States of America. Its locomotive and agricultural implement works are of world-wide reputation. It is also the seat of considerable dyeworks, bleachworks, chemical and woollen factories, and produces leather and straps, cement, small vehicles, wire-woven goods, carpets, beer, and bricks. The churches of St Peter (1888), of St Nicholas (1888), and St Mark (1895), and the synagogue (1899) are the principal new buildings of interest. The town is especially well provided with technical schools for training in the various industries, including a commercial, public, economic, and agricultural schools, and has a chamber of commerce. There are also industrial and historical museums, and collections of paintings and natural history. To the north-west of the town is the Gothic church of a former Benedictine monastery, dating from 1514-25, with a tower of 1897. Chemnitz is a favourite tourist centre for excursions into the Erzgebirge, the chain of mountains separating Saxony from Bohemia. Population (1885), 110,817; (1890), 138,954; (1895), 161,017; (1900), 206,584. The commune of Alt-Chemnitz (6398 in 1890) was incorporated with Chemnitz in 1894.

Chênée, a town of Belgium, in the province of and 3 miles S.E. of Liège, on railway to Verviers. It has forges, iron and copper foundries, and manufacture of glass. Population (communal) (1880), 5765; (1897), 8334.

Chenery, Thomas (1826-1884), English scholar and editor of the *Times*, was born in 1826 at Barbados, and educated at Eton and Caius College, Cambridge. Having been called to the bar, he went out to Constantinople as *Times* correspondent just before the Crimean war, and it was under the influence there of Mr Algernon Smythe (afterwards Lord Strangford) that he first turned to those philological studies in which he became eminent. After the war he returned to London and wrote regularly for the *Times* for many years, and eventually succeeded Delane as editor in 1877. He was then an experienced publicist, particularly well versed in Oriental affairs, an indefatigable worker, with a rapid and comprehensive judgment, though he lacked Delane's intuition for public opinion. It was as an Orientalist, however, that he had meantime earned the highest reputation, his knowledge of Arabic and Hebrew being almost unrivalled and his gift for languages exceptional. In 1868 he was appointed Lord Almoner's professor of Arabic at Oxford, remaining professor till he became editor of the *Times*, and he was one of the company of revisers of the Old Testament. He was secretary for some time to the Royal Asiatic Society, and published learned editions of the Arabic classic *The Assemblies of Al-Harirî* and of the *Machberoth Ithiel*. He died in London, 11th February 1884.

Cher, a department in the centre of France, watered by the river of the same name.

Area, 2819 square miles, with 29 cantons and 292 communes. The population decreased from 355,349 in 1886 to 342,889 in 1901. Births in 1899, 6843, of which 527 illegitimate; deaths, 6336; marriages, 2615. In 1896 there were 684 schools, with 50,000 pupils, and 6 per cent. of the population was illiterate. Bourges, the capital, had a population of 44,000. The area under cultivation in 1896 amounted to 1,645,780 acres, 1,035,408 acres of which were plough-land and 296,536 acres woods and forests. In 1899 the wheat crop returned a value of £1,414,000, and oats £648,000. The produce of the vines was valued at £135,000. The live stock in 1899 included 38,090 horses, 155,580 cattle, 369,000 sheep, and 42,220 pigs. The mining industry in 1898 registered 18,000 metric tons of iron, and the working in metals 17,000 metric tons of cast iron of the value of £480,000.

Cherbourg, a seaport and chief town of arrondissement, department of Manche, France, 46 miles N.N.W. of St Lô, and 230 miles from Paris by rail. The manufacturing industries of Cherbourg, other than those connected with the Government works, are now limited, the most important being engineering, steamboat-building, and the manufacture of agricultural implements. Shipping in 1899 comprised 946 vessels entered, tonnage 989,043, and 1021 cleared, tonnage 985,882. Of this Great Britain's share was, vessels entered 774, tonnage 408,707, and cleared 825, tonnage 198,011. Wines have become one of the principal imports, and the export of stone to England has largely increased during recent years. Cherbourg is a port of call for several lines of English and American transatlantic companies. There are a chamber of commerce, a civil and naval hospital, and four libraries. In the commercial harbour the inner basin has now a length of 1311 feet, a width of 650 feet, a depth on sill at ordinary spring tide of 25 feet, and 3026 feet of quayage; in the tidal harbour the depth of water varies from about 26 feet high spring to 7 feet low neap tide; length of quays 2952 feet. The military port with the connected buildings covers an area of 54 acres. It comprises three principal basins, with a minimum depth of 30 feet. Population (1881), 27,439; (1901), 42,952.

Cherbuliez, Charles-Victor (1829-1899), French novelist and miscellaneous writer, was born 19th July 1829, at Geneva, where his father was a classical professor at the university. He was descended from a family of Protestant refugees, and many years later resumed his French nationality, taking advantage of an Act passed in the early days of the Revolution. Geneva was the scene of his early education; thence he proceeded to Paris, and afterwards to the universities of Bonn and Berlin. He returned to his native town and engaged in the profession of teaching. After his resumption of French citizenship he was elected a member of the Academy (1881), and having received the Legion of Honour in 1870, he was promoted to be officer of the Order in 1892. He died 1st July 1899. Cherbuliez was a voluminous and successful writer of fiction. His first book, originally published in 1860, reappeared in 1864 under the title of *Un Cheval de Phidias:* it is a romantic study of art in the golden age of Athens. He went on to produce a series of novels, of which the following are the best known:—*Le Comte Kostia* (1863), *Le Prince Vitale* (1864), *Le Roman d'une honnête Femme* (1866), *L'Aventure de Ladislas Bolski* (1869), *Miss Rovel* (1875), *Samuel Brohl et Cie.* (1877), *L'Idée de Jean Têtoral* (1878), *Noirs et Rouges* (1880), *La Vocation du Comte Ghislain* (1888), *Une Gageure* (1890), *Le Secret du Précepteur* (1893), *Jacquine Vanesse* (1898), &c. Most of these novels first appeared in the *Revue des Deux Mondes*, to which Cherbulicz also contributed a number of political and other learned articles, usually printed with the pseudonym G. Valbert. Many of these have been published in collected form under the titles *L'Allemagne politique* (1870), *L'Espagne politique* (1874), *Profils étrangers* (1889), *L'Art et la Nature* (1892), &c. The volume *Études de littérature et d'art* (1873) includes articles for the most part reprinted from *Le Temps*. The earlier novels of Cherbuliez have been said with truth to show marked traces of the influence of George Sand; and in spite of modification, his method was that of an older school. He did not possess the sombre power or the intensely analytical skill of some of his later contemporaries, but his books are distinguished by a freshness and honesty, fortified by cosmopolitan knowledge and lightened by

unobtrusive humour, which fully account for their wide popularity in many countries besides his own. His genius was the reverse of dramatic, and attempts to present two of his stories on the stage have not succeeded. His essays have all the merits due to liberal observation and thoroughness of treatment; their style, like that of the novels, is admirably lucid and correct. (C.)

Cheribon (Dutch, *Tjeribon*), the most easterly residency of West Java, with an area of 262,064 square miles. It is separated from Tegal in the E. by the small river Losari, which also marks the boundary between the Sundaese of West and the Javanese of Middle and East Java. The northern part of the residency, with the exception of the volcano Tjeri Mai (10,000 feet), consists of an alluvial coast plain, drained by the Manuk, which rises in the high mountains of Preanger. The Tandui, which also rises in Preanger, forms the southern boundary. Rice is cultivated on the low marshy grounds, and in addition to other products, tea is a special culture. The total population in 1897 was 1,577,521, comprising 867 Europeans, 21,108 Chinese, 1896 Arabs, other Oriental foreigners 120, natives, 1,553,530. CHERIBON, the chief town, has a roadstead, safe during the west monsoon, from which it is protected by the north and south trend of the coast. Imperfect drainage and the silting up of the little river Tjeribon long rendered the town unhealthy and the port almost inaccessible. Improvements have, however, been recently effected—a channel 900 feet long has been constructed, and the large number of Chinese and Arab residents indicate the commercial activity. Sugar and coffee are exported in considerable quantity, and the total port traffic amounts to about 200,000 tons annually. Railways and tramways afford land communication with Batavia, Samarang, and the neighbouring residencies, and steamers with the other islands of the archipelago.

Chernomorskaya, formerly a province of Russia, North Caucasia, now a separate military district of Kubañ. It includes the narrow strip of land along the east coast of the Black Sea, from Novorossiysk, its capital, to nearly as far as Pitsunda, between the sea-coast and the water-parting of the main Caucasus range, which sends many spurs to the coast, leaving a narrow and extremely malarial belt between the mountains and the sea. A rich vegetation of a southern character, favoured by copious rains, grows along the coast; but the country, since the forced exodus of the Tcherkesses, is very thinly populated. It is divided into three districts: Novorossiysk, capital of the province (20,511), Veliaminovsk, and Soch (chief town Dakhovskiy Posad, 1040). Novorossiysk is connected by rail with the main line of North Caucasia, and a mountain road is being made from Veliaminovskaya (Tuapse) to Maikop in Kubañ. A road runs all along the coast, upon which small Russian and pretty Czech villages are growing up. Population (1896), 49,745, chiefly Russians, also Greeks, Czechs, Armenians, and about 1300 Tcherkesses.

Cherso (Serbo-Croatian, *Cres*), an island belonging to the Austrian province of Istria, in the Gulf of Quarnero. Population, 10,180—two-thirds Serbo-Croatians and one-third Italians. The chief town, which bears the same name, has 4725 inhabitants. It is a harbour, and is provided with a shipwright's wharf. The principal resources of the population are the cultivation of the vine and olive, fishing and seafaring.

Chesham, a parish, urban district (1894), and market town of England, on the Chess, an affluent of the Colne, 13 miles S.E. of Aylesbury by rail, in the Aylesbury parliamentary division of Buckinghamshire. Under a local board from 1885, it was by the Local Government Act, 1894, erected into an urban district. Besides the ancient church of St Mary, Christchurch (1864), and a church built in 1887, there is a Congregational chapel (rebuilt in 1886), a Baptist chapel (rebuilt in 1898), a Wesleyan chapel (erected in 1897), and a Calvinistic chapel. Other buildings are the town hall and a mechanics' institute. There are numerous charities. All sorts of small dairy utensils, chairs, malt-shovels, &c., are made of beech, the growth of which forms a feature of the surrounding country. Shoemaking is also carried on. In Waterside hamlet, adjoining the town, are flour mills, duck farms, and watercress beds. Chesham publishes two weekly newspapers. In consequence of the constitution in 1898 of three new parishes the area of Chesham has been reduced to 10,360 acres. Its population on the old area of 12,746 acres was in 1881, 6502; on the new area (1891), 6075; (1901), 7245.

Cheshire or CHESTER, a north-western county of England, bounded on the N. by the Mersey, which separates it from Lancashire, on the N.E. by York and Derby, on the S.E. by Stafford, on the S. by Shropshire, on the W. by Denbigh, Flint, and the estuary of the Dee, and on the N.W. by the Irish Sea.

Area and Population.—The area of the ancient county is 657,068 acres or 1027 square miles. The population in 1881 was 644,037, and in 1891 was 730,058, of whom 352,936 were males and 377,122 females, the number of persons per square mile being 711, and of acres to a person 0·91. In 1901 the population was 814,555. The area of the administrative county, as given in the census returns of 1891, was 655,036 acres, with a population of 743,869; but since then several alterations have been made in the administrative area. In 1895 the parish of Tittenley in Cheshire was transferred to Shropshire; in 1896 part of the parish of Threapwood in Flint was transferred to Cheshire; in the same year part of the townships of Appleton-with-Hull, Latchford Without, and Walton Inferior was transferred from Cheshire to Lancashire; and in 1898 part of the township of Ashton-under-Lyne was transferred from Lancashire to Cheshire, and part of the township of Dukinfield from Cheshire to Lancashire. The area of the registration county is 643,791 acres, with a population in 1891 of 707,978, of whom 508,498 were urban and 199,480 rural. Within this area the increase of population between 1881 and 1891 was 13·76 per cent. The excess of births over deaths between 1881 and 1891 was 84,417, and the increase in resident population was 85,655. The following table gives the numbers of marriages, births, and deaths, with the number of illegitimate births, for 1880, 1890, and 1898:—

Year.	Marriages.	Births.	Deaths.	Illegitimate Births.	
				Male.	Female.
1880	4269	20,823	12,303	526	509
1890	5171	21,161	13,684	536	509
1898	5671	22,064	13,467	473	457

The number of marriages in 1899 was 5957, of births 22,004, and of deaths 13,893.

The following table gives the marriage, birth, and death rates per 1000 of the population, with the percentage of illegitimate births, for a series of years:—

	1870-79.	1880.	1880-89.	1890.	1887-98.	1898.
Marriages . .	15·5	13·8	13·6	14·7	14·1	14·7
Births . .	35·4	33·8	32·1	30·2	30·0	28·7
Deaths . .	21·4	19·9	19·0	19·5	18·4	17·5
Percentage of illegitimacy	5·4	5·0	5·1	4·9	4·6	4·2

In 1891 there were in the county 8651 natives of Scotland, 20,006 natives of Ireland, and 2254 foreigners.

Constitution and Government.—The ancient county is divided into eight parliamentary divisions; and it also includes the parliamentary borough of Birkenhead, returning one member, part of Stockport, returning two members, and parts of Ashton-under-Lyne, Chester, Stalybridge, and Warrington, returning one member each. The administrative county contains nine municipal boroughs: Birkenhead (110,926), Chester (36,281), Congleton (10,706), Crewe (42,075), Dukinfield (18,929), Hyde (32,768), Macclesfield (34,635), Stalybridge (27,674), and Stockport (78,875). Birkenhead, Chester, and Stockport are county

boroughs. The following are urban districts: Alderley Edge (2856), Alsager (2597), Altrincham (16,831), Ashton-upon-Mersey (5563), Bollington (5244), Bowdon (2788), Bredbury and Romiley (7107), Bromborough (1891), Buglawton (1452), Cheadle and Gatley (10,807), Higher Bebington (1540), Hollingworth (2447), Hoole (5341), Hoylake and West Kirby (10,911), Knutsford (5172), Lower Bebington (8387), Lymm (4707), Marple (5595), Middlewich (4669), Mottram in Longendale (3128), Nantwich (7722), Neston-cum-Parkgate (4154), Northwich (17,609), Runcorn (16,491), Sale (12,088), Sandbach (5556), Tarporley (2644), Wallasey (53,580), Wilmslow (7361), Winsford (10,382), and Yeardsley-cum-Whaley (1487). The county is in the North Wales circuit, and assizes are held at Chester. The boroughs of Congleton, Crewe, Macclesfield, Stalybridge, and Stockport have separate commissions of the peace and separate courts of quarter sessions. The ancient county—which is chiefly in the diocese of Chester and partly in those of Lichfield, Manchester, and St Asaph—contains 254 entire ecclesiastical parishes.

Education.—There is a residential training college (Chester, Manchester, and Liverpool diocesan) at Chester. The total number of elementary schools on 31st August 1899 was 488, of which only 36 were board, and 452 were voluntary schools, the latter including 334 National Church of England schools, 28 Wesleyan, 29 Roman Catholic, and 61 "British and other." The average attendance at board schools was 10,024, and at voluntary schools 93,609. The total school board receipts for the year ended 29th September 1898 were over £67,693. The income under the Technical Instruction Act was over £55, and that under the Agricultural Rates Act was over £802.

Communications.—Besides being traversed by a network of railways and numerous small canals, Cheshire is now skirted on the north by the Manchester Ship Canal, opened in 1894. (See under LANCASHIRE.)

Agriculture.—Within recent years much attention has been paid to the improvement of agriculture by special training in dairy work and in farming. Nearly five-sixths of the total area is under cultivation, and of this about three-fifths is in permanent pasture, chiefly for dairy-farming purposes—the manufacture of cheese and milk supply. More than 14,000 acres are in hill pasturage, nearly 2500 acres under orchards, and over 24,000 acres under woods. Oats occupy about three-fourths of the acreage under corn crops, and potatoes more than one-half of that under green crops, only about one-fourth being planted with turnips and swedes. There is a considerable acreage under small fruit. The following table gives the larger main divisions of the cultivated area at intervals of five years from 1880:—

Year.	Total Area under Cultivation.	Corn Crops.	Green Crops.	Clover.	Permanent Pasture.	Fallow.
1880	536,348	79,534	37,043	54,644	363,420	1707
1885	540,551	79,472	42,091	58,818	359,580	590
1890	541,348	80,986	38,887	62,390	357,128	771
1895	539,555	78,242	39,483	63,621	355,750	495
1900	536,332	82,449	41,933	70,987	339,023	266

The following table gives particulars regarding the principal live stock for the same years:—

Year.	Total Horses.	Total Cattle.	Cows or Heifers in Milk or in Calf.	Sheep.	Pigs.
1880	23,081	151,866	91,174	97,892	49,971
1885	21,966	172,019	101,892	86,343	62,988
1890	22,314	167,465	99,650	106,418	77,464
1895	26,143	170,136	102,791	92,456	78,392
1900	26,917	182,633	107,406	103,456	70,126

Industries and Trade.—According to the report of the chief inspector of factories for 1898 (1900) the total number of persons employed in factories and workshops in 1897 was 112,598, as compared with 114,391 in 1896. The number employed in textile factories was 43,182; between 1895 and 1896 there was an increase in the number of 2·3 per cent., but between 1896 and 1897 a decrease of 0·5. The main textile industry is cotton, employing 34,446 persons; silk employs 8025 persons. The non-textile factories in 1897 employed 60,936 persons, there being an increase between 1895 and 1896 of 6·4 per cent., and a decrease between 1896 and 1897 of 3·0 per cent. Over a third (20,766) were in 1897 employed in the manufacture of machines, conveyances, tools, &c. On the Mersey there are a number of shipbuilding yards, in addition to several large engine, machine, and iron works. In the manufacture of chemicals 5874 persons were employed, in clothing industries 9555, in print, bleach, and dye works 4474, and in the founding and conversion of metal 5068. Workshops in 1897 employed 8480 persons, of whom 4205 were employed in the clothing industry and 1054 in that of food. In 1899 there were 3489 persons employed in mines and quarries. In the same year 127,972 tons of sandstone were raised, 26,785 of gravel and sand, and 20,967 of clay; but the principal minerals are coal and salt. The output of coal in 1890 was 637,402 tons, valued at £191,221; and in 1899 it was 721,431 tons, valued at £270,537. Rock-salt is obtained at Northwich and Winsford, and salt from brine is manufactured at Lawton, Wheelock Valley, Middlewich, Northwich, and Winsford. In the case of rock-salt the value in the returns is lumped with that of Lancashire, and in the case of salt from brine the quantity is lumped with that of Staffordshire, so that exact statements of the tonnage and value of the annual production are impossible; but in 1899 the amount was at least considerably over 1,000,000 tons, and the value must have closely approached £400,000.

AUTHORITIES.—Among the principal works are: Sir JOHN DODDRIDGE. *History of the Ancient and Modern State of the Principality of Wales, Duchy of Cornwall, and Earldom of Chester.* London, 1630; 2nd ed. 1714.—KING. *The Vale-Royall of England, or the County Palatine of Cheshire Illustrated,* 4 parts. London, 1656; abridged by T. Hughes, London, 1852.—HANSHALL. *History of the County Palatine of Chester.* Chester, 1817-23.—J. O. HALLIWELL. *Palatine Anthology.* London, 1850.—BAINES. *Lancashire and Cheshire,* 2 vols. London, 1868-69.—ORMEROD. *History of the County Palatine and City of Chester,* 3 vols. London, 1819; new ed. 3 vols., London, 1875-82.—EARWAKER. *East Cheshire,* 2 vols. London, 1877.—WILBRAHAM. *Glossary.* London, 1820; 2nd ed., London, 1826; and *Glossary founded on Wilbraham* by E. LEIGH, London, 1877.—CROSTON. *Historic Sites of Cheshire,* Manchester, 1883; and *County Families of Cheshire,* Manchester, 1887.—AXON. *Cheshire Gleanings.* Manchester, 1884.—WATKIN. *Roman Cheshire.* Liverpool, 1886.—HOLLAND. *Glossary of Words used in the County of Cheshire.* London, 1884-86.—PHILIPS. *Views of Old Halls in Cheshire.* London, 1893.—THORNLEY. *Monumental Brasses of Cheshire.* Hull, 1893; and ANDREWS, *Bygone Cheshire.* Chester, 1895. See also various volumes of the Chetham Society and of the Record Society of Manchester, as well as the *Proceedings* of the Cheshire Antiquarian Society, and *Cheshire Notes and Queries.* (T. F. H.)

Cheshunt, a town and railway station in the Hertford parliamentary division of Hertfordshire, England, on the Lea, 7 miles S. of Hertford. Cheshunt College for theological instruction was established here in 1792 by the countess of Huntingdon. There are an ancient church, recently restored, two halls for public meetings, church rooms, a cottage hospital, and a recreation ground of 8 acres. Nursery and market gardening, largely under glass, brick-making, and saw-mills are the chief industries. Area of parish (an urban district), 8480 acres; population (1881), 7736; (1901), 12,288.

Chesney, Sir George Tomkyns (1830-1895), English general, colonel-commandant of Royal (late Bengal) Engineers, youngest son of Captain Charles Cornwallis Chesney of the Bengal Artillery, was born at Tiverton, Devonshire, on 30th April 1830. Educated at Blundell's School, Tiverton, and at Addiscombe, he entered the Bengal Engineers as second lieutenant on 8th December 1848. He was employed for some years in the Public Works Department and, on the outbreak of the Indian Mutiny in 1857, joined the Ambala column, was field-engineer at the battle of Badli-ke-serai, brigade-major of engineers throughout the siege of Delhi, and was severely wounded in the assault (medal and clasp and a brevet majority). In 1860 he was appointed head of a new department in connexion with the Public Works accounts. His work on *Indian Polity* (1868), dealing with the administration of the several departments of the Indian Government, attracted wide attention and remains a permanent text-book. The originator of the Royal Indian Civil Engineering College at Cooper's Hill, Staines, he was also its first president (1871-80). In 1871 he contributed to *Blackwood's Magazine* a brilliant skit called "The Battle of Dorking"—a picture of what might happen if the victorious German army, after defeating France, invaded England—which was republished in many editions and translations, and produced a profound

impression. He was promoted lieut.-colonel, 1869; colonel, 1877; major-general, 1886; lieut.-general, 1887; colonel-commandant of Royal Engineers, 1890; and general, 1892. From 1881 to 1886 he was secretary to the Military Department of the Government of India, and was made a C.S.I. and a C.I.E. From 1886 to 1892, as military member of the Governor-General's Council, he carried out many much-needed military reforms. He was made a C.B. at the jubilee of 1887, and a K.C.B. on leaving India in 1892. In that year he was returned to Parliament, in the Conservative interest, as member for Oxford, and was chairman of the committee of service members of the House of Commons until his death on 31st March 1895. He wrote some novels, *The Dilemma*, *The Private Secretary*, *The Lesters*, &c., and was a frequent contributor to periodical literature. (R. H. V.)

CHESS.

THE article on CHESS in the ninth edition of the *Encyclopædia Britannica* was written in 1875. W. Norwood Potter, who appended his initials, was one of the foremost English players and writers on the game; he died in 1895. The article was, in essentials, the joint work of Steinitz and Zukertort. Dr J. H. Zukertort died in 1888, five years after his famous victory in the London tournament in 1883, and W. Steinitz survived his great rival about thirteen years. In 1876 England was in the van of the world's chess army. Two years previously Staunton, for years the English champion, had died. De Vere died a year later in the prime of life, being only twenty-nine years old. The latter was an irreparable loss, and England has produced no chess genius since. English-born players then were Boden, Burn, MacDonnell, Bird, Blackburne, and Potter; whilst among naturalized English players were Löwenthal, Steinitz, Zukertort, and Horwitz. Of this remarkable array of talent only Bird, Blackburne, and Burn survived in 1901. This illustrious contingent was reinforced in 1878 by Mason, an Irish-American, who came over for the Paris tournament, and by Gunsberg, a Hungarian, and more recently by Teichmann, who also made England his home. English chess under the leadership of the masters mentioned flourished. The chief prizes in tournaments, up to within comparatively recent years, were consistently carried off by the English representatives, as will be seen from the following list of tournaments from 1878 up to date:—

PARIS, 1878.—First, Zukertort; second, Winawer; third, Blackburne; fourth, Mackenzie; fifth, Bird. Winawer made an equal score with Zukertort, but was beaten in the tie match. Winawer, whose name was unknown, competed for the first time in the Paris tournament, 1867, and to the surprise of everybody he won the second prize (Kolisch being first) amongst competitors like De Vere, Steinitz, Neumann, and Rosenthal. He tied and divided the first and second prizes with Steinitz in Vienna, 1882, and won the first prize at Nüremberg, 1883. In this tournament B. Englisch of Vienna made his first appearance, and the promising talent of which he then gave evidence was fully justified in his career during the next nineteen years. It was also Mason's first appearance in Europe.

WIESBADEN, 1880.—First, second, and third a tie between Blackburne, Englisch, and A. Schwarz.

BERLIN, 1881.—First, Blackburne; second, Zukertort; third and fourth, Tchigorin and Winawer; fifth, Mason. Blackburne, who previously to this tournament was beaten in a match by Zukertort, rehabilitated his reputation by winning the first prize with three games to spare, Zukertort being second. Tchigorin made his first public performance in this contest.

VIENNA, 1882.—First and second, Steinitz and Winawer; third, Mason; fourth and fifth, Mackenzie and Zukertort; sixth, Blackburne.

LONDON, 1883.—First, Zukertort; second, Steinitz; third, Blackburne; fourth, fifth, and sixth equal, Mackenzie, Mason, and Englisch. This tournament, played in two rounds, endowed with large prizes, and the third draw only counting one-half each, was one of the most severe contests held hitherto. Zukertort won the first prize very easily, and also played the finest games. Steinitz challenged him shortly afterwards to a match, but it only came off three years later in America, and ruined Zukertort both in body and mind. Winawer, for the first time in his career, was not even placed.

NÜREMBERG, 1883.—First, Winawer; second, Blackburne; third, Mason; Bardeleben and Bird taking the other prizes. This tournament is a milestone in modern chess history. The prizes having been comparatively small, it was thought that it necessarily must be a failure, the munificently endowed London tournament having just been concluded. But, strange to say, whilst in London fourteen players competed, there were nineteen entries in Nüremberg. Winawer, not placed in the former, won the first prize in the latter. A number of young and talented players made their first appearance, amongst them being Fritz, Bardeleben, Hruby, Riemann, Schottländer, Gunsberg, and of older masters L. Paulsen and the famous Dr Max Lange. It is also noteworthy that, having won the "Haupt" tournament at this congress, the afterwards famous Dr Tarrasch gained the title of "master."

HAMBURG, 1885.—First, Gunsberg, the next prizes being divided by Blackburne, Mason, Englisch Dr Tarrasch, and Weiss; seventh, Mackenzie. Max Weiss of Vienna, Englisch's rival, made his first appearance here. This tournament was remarkable for the fact not only that five players made an equal score, and divided the five prizes after the first, but that Gunsberg wired to London that he had won the first prize, when Mason, who had to finish several adjourned games, could still have tied with him.

HEREFORD, 1885.—First, Blackburne; second and third, Bird and Schallopp; fourth, Mackenzie. In this tournament Mason and the late W. H. K. Pollock competed, as well as the well-known amateurs Rev. A. B. Skipworth, Rev. C. E. Ranken, and the late E. Thorold.

LONDON, 1886.—First, Blackburne; second, Burn; third and fourth equal, Gunsberg and Taubenhaus; fifth, Mason; Mackenzie, Bird, Lipschütz, and Hanham not placed.

NOTTINGHAM, 1886.—First, Burn; second, Schallopp; third and fourth equal, Gunsberg and Zukertort.

FRANKFORT, 1887.—First, Mackenzie; second and third, Blackburne and Weiss; fourth, Bardeleben; fifth and sixth, Berger and Tarrasch, followed by Englisch and L. Paulsen. Gunsberg, first in Hamburg, was not placed, nor Burn nor Zukertort. Mackenzie, of Scottish extraction, living in America, deservedly won first prize.

BRADFORD, 1888.—First, Gunsberg; second, Mackenzie; third and fourth, Mason and Bardeleben; fifth, Burn, followed by Blackburne and Weiss.

NEW YORK, 1889.—First and second equal, Tchigorin and Weiss; third, Gunsberg; fourth, Blackburne; fifth, Burn, followed by Lipschütz and Mason. There were twenty competitors, some Americans playing. Of the latter Lipschütz only was placed.

BRESLAU, 1889.—First, Dr Tarrasch; second, Burn; third, Weiss, followed by Bardeleben and Bauer, Gunsberg and Paulsen equal; Blackburne and Mason, the former for the first time not placed. This tournament is remarkable for the advent of Lasker, who gained his mastership in the "Haupt" tournament. Here also Mieses scored his first success.

AMSTERDAM, 1890.—First, Burn; second, Lasker; third, Mason; fourth, van Vliet; fifth, Gunsberg. There were only nine competitors, Lasker unexpectedly losing to van Vliet by a trap.

MANCHESTER, 1890.—First, Dr Tarrasch; second, Blackburne; third and fourth, Bird and Mackenzie; fifth and sixth, Gunsberg and Mason, followed by Alapin, Scheve, and Tinsley.

DRESDEN, 1892.—First, Dr Tarrasch; second and third, Makovetz and Porges; fourth and fifth, Marco and Walbrodt; sixth and seventh, Bardeleben and Winawer. Blackburne received only a special prize, Mason not being placed at all. Makovetz, a talented Hungarian, who never played afterwards, made his first appearance, as well as Walbrodt, a Berlin player of promise. The latter did not, however, justify the very high expectations formed of him.

LEIPZIG, 1894.—First, Dr Tarrasch; second and third, Lipke and Teichmann; fourth and fifth, Blackburne and Walbrodt; sixth, Janowsky and Marco. It was the first appearance of two great players, Lipke of Halle, and Janowsky, of Polish extraction, living in Paris; also of Teichmann, a well-known English resident, who gave great promise at the time when Lasker became known.

The success of this tournament was mainly due to the enthusiastic efforts of the late Dr Max Lange.

HASTINGS, 1895.—First, Pillsbury; second, Tchigorin; third, Lasker; fourth, Tarrasch; fifth, Steinitz; sixth, Schiffers, followed by Bardeleben and Teichmann. This tournament is historical for the advent of Pillsbury, the American champion, and Maroczy, the Hungarian champion; Lasker being only third; Tarrasch, after four successive first prizes, being only fourth; and Steinitz, fifth; whilst Schlechter, Blackburne, Marco, Janowsky, Mason, Walbrodt, Mieses, Bird, and Gunsberg were not placed at all. Hastings must be considered the beginning of the greater tournaments. It is also a curious fact that Maroczy, the eminent Hungarian, was refused admission to the minor tournament because his name was not known to the committee. Fortunately a vacancy gave him a chance of showing his skill. He won the first prize.

NÜREMBERG, 1896.—First, Lasker; second, Maroczy; third and fourth, Pillsbury and Tarrasch; fifth, Janowsky; sixth, Steinitz, followed by Schlechter and Walbrodt. Remarkable for the first appearance of Charousek, and for the fact that Dr Tarrasch was again low in the list, and Blackburne, Tchigorin, Marco, Winawer, and Charousek not placed at all. Charousek was just as obscure at Nüremberg as Maroczy was at Hastings. Dr Tarrasch detected the genius of the youthful candidate, and admitted him to the tournament.

BUDAPEST, 1896.—First, Tchigorin; second, Charousek; third, Pillsbury; fourth and fifth, Janowsky and Schlechter; sixth and seventh, Walbrodt and Winawer. Remarkable features: Maroczy not placed at all, and Dr Tarrasch only receiving a special prize for the best score against prize-winners.

BERLIN, 1897.—First, Charousek; second, Walbrodt; third, Blackburne; fourth, Janowsky; fifth, Burn, followed by Alapin, Marco, and Schlechter. Tchigorin, Winawer, and Teichmann not placed, whilst Englisch had to abandon the tournament and return to Vienna ill. He never recovered, and died a few weeks later.

VIENNA, 1898.—First, Dr Tarrasch; second, Pillsbury; third, Janowsky; fourth, Steinitz; fifth, Schlechter; sixth and seventh, Burn and Tchigorin; eighth and ninth, Lipke and Maroczy; tenth, Alapin. Blackburne received a special prize. Dr Tarrasch achieved a remarkable victory in this important tournament. Pillsbury's chances were better than his, but he managed to run him neck and neck, and beat him in the tie match which followed. Although Lasker did not compete, the tournament was quite as important as that at Hastings.

COLOGNE, 1898.—First, Burn; second, third, and fourth, Charousek, Cohn, and Tchigorin; fifth, Steinitz; sixth and seventh, Schlechter and Showalter, followed by Berger and Janowsky. It is curious that Cohn stood first up to the last round; in the end he gave way. Charousek, who was convalescent and played against the advice of the doctors, made a slip in one of the games, a serious drawback in so short a contest.

LONDON, 1899.—First, Dr Lasker; second, third, and fourth equal, Janowsky, Maroczy, and Pillsbury; fifth, Schlechter; sixth, Blackburne; seventh, Tchigorin; eighth, Showalter; ninth, Mason. A very important tournament, organized under the auspices of the British Chess Club. It was a two-game tournament, and a one-round tournament was held simultaneously. In the latter Marco, Mieses, and Marshall of America competed with some well-known British amateurs. Marshall won the first prize. The chief tournament was noteworthy for the fine games which occurred, and for the fact that Janowsky sacrificed the second prize by trying to win a game against Steinitz when with an easy draw in hand he could have secured it.

MUNICH, 1900.—Tie between Maroczy, Pillsbury, and Schlechter for the three chief prizes; fourth, Burn; fifth, Marco; sixth, Cohn; seventh and eighth divided between Berger, Janowsky, Showalter, and Wolf. Lasker did not compete, but a new star was found in Wolf of Vienna, whilst France was represented by a talented amateur, M. Billecard. It was a close contest between Pillsbury, Maroczy, and Schlechter. Marozcy abandoned the contest owing to ill-health, and the two others fighting out the tie made even games, and divided first and second prizes. A big "Haupt" tournament with twenty-two entries was held, and several other tournaments.

PARIS, 1900.—First, Dr Lasker; second, Pillsbury; third and fourth, Maroczy and Marshall; fifth, Burn; sixth, Tchigorin; seventh, Marco and Mieses. Schlechter, with an equal score to the latter two, did not obtain a prize, because his total was made up by a large number of drawn games, and under the rules this total was of inferior quality to the totals made up of won games. Marshall was unexpectedly successful; he beat both Lasker and Pillsbury, and for some time he had expectations of a higher place even than the one he eventually obtained. This was a two-game tournament, and a number of very fine games were produced. Janowsky, Showalter, and Mason were not placed. Didier, a French amateur, showed more talent than steadiness.

MONTE CARLO, 1901.—First, Janowsky; second, Schlechter; third and fourth, Scheve and Tchigorin; fifth, Alapin, followed by Mieses and Blackburne; Gunsberg, Marshall, Mason, Marco, and Winawer not being placed. This tournament was originated by the Société des Bains de Mer, M. Blanc, the director, entrusting the veteran master, M. Arnous de Rivière, with the carrying out of the scheme. A novel rule was introduced, viz., the first drawn game to count ¼ each, to be replayed, and in case of a draw again to count ¼ each, and in case of win ½ to the winner. Theoretically this seems logical, but in practice it did not work as well, the result being just the contrary to what was expected. Some players indulged in too many draws. Otherwise the tournament was a success.

PROBLEMS.

A chess problem has been described as "merely a position supposed to have occurred in a game of chess, being none other than the critical point where your antagonist announces checkmate in a given number of moves, no matter what defence you play." Correct enough so far as it goes, the above description conveys no notion of the degree to which problem composing has become a specialized study of late years. At first but a modest adjunct of the game proper, owing its inception doubtless to the practice of recording critical phases from actual play, wherein the issue turned upon some particularly subtle and instructive manœuvre or strikingly brilliant move, the art of the problem composer has grown in favour until its numerous devotees justifiably style it the "poetry" of the game. The growing perception of the fact that the construction of problems, being in the nature of an "art," was governed by certain æsthetic rules of taste, had the effect of gradually lessening their practical utility to players of the game, and in course of time the positions themselves ceased to bear necessarily any but the remotest resemblance to such as would be likely to arise in the course of play. The reason of this change, the first step in the evolution of the chess problem, is not far to seek.

A good chess problem exemplifies chess strategy idealized and concentrated. In the finest extant examples of actual play there will necessarily remain on the board both white and black pieces immaterial to the issue (checkmate), whereas in the "idealized" problematic presentation of the same combination the composer, being free to select his own materials, employs only *indispensable* force so as to focus attention on the idea, avoiding all material which would tend to "obscure the issue." Whilst the element of difficulty is a highly desirable one in a chess problem, it must be due solely to the intrinsic depth of ideas and the artistic manner in which it is expressed. Hence the use of otiose force is rigorously eschewed, and the first object in a problem composed in accordance with modern theories is to extract the maximum of *finesse* with a sparing use of the pieces. "Economy of force" must be combined with "purity of the mate," in the chief lines of play at least. A proper understanding of what is meant by "economy of force" will help to a better appreciation of the lines upon which the evolution of the chess problem has proceeded. A very common mistake until comparatively recent years was that of appraising the economy of a position according to the slenderness of the force used, regardless of the fact that economy is not a question of absolute values. The only true criterion is the ratio of force employed to the sum total of meritorious play in the course of the solution. The earliest composers strove to give their productions every appearance of real play, and indeed their compositions partook of the nature of ingenious end-games. The entire interest is usually centred in a single forced line of play. It was usual to give Black a predominance of force, and to leave the White King in apparent jeopardy. From this critical predicament he was extricated by a long series of checking moves, usually involving a number of brilliant

sacrifices. The number of moves was rarely less than five, and the conditions were not infrequently cumbered by restrictions on the movements of certain pieces. In the course of time the solutions were reduced to shorter limits, and the beauty of quiet (*i.e.*, non-checking) moves began to make itself felt. The early "transition" school, as it has been called, was the first to recognize the importance of economy as then understood, *i.e.*, the representation of the main point of strategic worth without any extraneous force. The mode of illustrating single-theme problems, often of depth and beauty, was being constantly improved, and the problems of C. Bayer, R. Willmers, S. Loyd, J. G. Campbell, F. Healey, J. B. of Bridport, and W. Grimshaw are, of their kind, still unsurpassed. In the year 1845 the "Indian" problem attracted much notice, and in 1861 appeared Healey's famous "Bristol" problem. To the transition period must be ascribed the discovery of most of those clever ideas which have been turned to such good account in the more richly varied contents of the modern school. In an article written in 1899 F. M. Teed mentions the interesting fact that his *incomplete* collection of "Indians" totalled over three hundred.

In the early 'seventies, which may be called the later transition period, a more general tendency was manifest (as it became recognized that further improvements were well-nigh impossible in the construction of one-idea problems), to illustrate two or more finished ideas in a single problem with strict regard to "purity" and "economy." In the years 1872-75 the theory of the art received greater attention than it had done previously, and the essays of C. Schwede, Kohtz and Kockelkorn, Lehner and Gelbfuss, helped to codify hitherto unwritten rules of taste. The last quarter of the 19th century, and its last decade especially, saw a marked advance in technical accomplishment, until it became a common thing to find as much deep and quiet play embodied in a single first-class problem as in three or four of the old-time problems. This broader conception of the idea of "economy" gave a great impetus to the practice of blending several distinct ideas in one elaborate whole, even at the cost of a slight increase of force, provided always that the principle of "purity" was regarded, if thereby the ratio aforesaid is enhanced.

In the composition of "two-movers" it is customary to allow greater elasticity and no very rigorous application of the principles of purity and economy. By this means a greater superficial complexity is attained; but neither the Teutonic nor the Bohemian school countenances this contravention of what they regard as fundamental æsthetic rules, and even amongst the English and American two-move specialists it is recognized that complexity, at the cost of discarding the canons of construction which obtain in the construction of problems of heavier calibre, is liable to abuse. Mr A. F. Mackenzie of Jamaica, however, is an uncompromising advocate of a relaxation of ordinary rules where two-movers are concerned, and he and a few others (notably T. Taverner, W. Gleave, H. and E. Bettman, and P. F. Blake) have won some of their greatest successes with problems which, under the stricter ruling of Continental authorities, would be tabooed.

Whilst in a sense it is fruitless to discuss the degrees in which composers of varying nationalities may claim to have advanced the art, since the true style is cosmopolitan, Bohemian (Czechish) composers have long stood unrivalled as exponents of that blending of ideas which is the distinguishing trait of the present-day problem. It would not, indeed, be too much to say that they were pioneers, and by their exceptional technical skill popularized the theories which nowadays find almost universal acceptance. Such is their skill in construction that the distinction between main lines of play and subsidiary variations disappears entirely. Indeed, it is rare to find in a problem of the Bohemian school fewer than three or four lines of play which, so far as economy and purity are concerned, are unimpeachable. Amongst the earliest composers of the small band that was destined to revolutionize the standard of composition so widely, Anton König, the founder of this school, Makovky, Drtina, Palet, and Pilnacek deserve to be honourably mentioned, but it was not until the starting of a chess column in the weekly journal *Svetozor* that the merits of the new school were fully asserted. It was in 1871 that Jan Dobrusky contributed his first composition to that paper. In 1872 the name of G. Chocholous first appeared, and three years later that of C. Kondelik. These three great composers set up a tradition for finished workmanship which has been worthily upheld without cessation to the present day. Pospisil, Dr Mazel, Kviciala, Kesl, Tuzar, Musil, and J. Kotrc; and later still, Havel, Traxler, and Z. Mach, are no unworthy followers of Dobrusky. The influence of the Bohemian school upon the somewhat conservative proclivities of the older English composers is commonly traced back to the publication of the second prize set of problems from the Leipzig tourney 1879, the work of G. Chocholous.

The characteristic faculty for blending several variations into one harmonious whole is not without "the defects of its qualities," and consequently we find amongst the less gifted exponents that the mere agglomeration of clean and economical variations is apt to be regarded as an end in itself. Hence a certain tendency to repeat combinations of similar companion ideas is discernible at times. The danger that mere virtuosity in facile construction should be allowed to usurp the place of freshness of invention and strategic depth was already apparent to Chocholous when, in an article on the classification of chess problems (*Deutsche Schachzeitung*, 1890), he warned the younger practitioners of the Bohemian school against what had been dubbed by H. v. Gottschall "Varianten-leierei," or the "grinding-out of variations." When this one reservation is made few will be inclined to dispute the pre-eminence of the Bohemian school. To some tastes, however, a greater appeal is made by the generally deeper if less richly varied play typical of the older German school, the quaint fancy untrammelled by hard-and-fast rules of the genial American composer, Samuel Loyd, or the almost ultra-studious immunity from "duals" which is the distinguishing trait of the English school.

The following masters in practical play are also known as composers of distinction: J. Berger, J. H. Blackburne, C. Schlechter, R. Teichmann, Dr H. von Gottschall, J. Mieses, and the late Professor Anderssen, whilst Dr E. Lasker and Steinitz and Zukertort have not disdained to contribute occasionally to the "poetry" of the game. Similarly the following composers are, or were in their time, noted players: Professor J. Berger, S. Loyd, J. G. Campbell, C. D. Locock, and F. M. Teed; and among ladies: Sophie Schett, Mrs T. B. Rowland, and Mrs W. J. Baird, whose record of tourney successes and remarkable accuracy entitles her to a place in the foremost ranks of British composers.

It is somewhat singular that a study, the pursuit of which entails high powers of imagination as well as deep and accurate analysis, has proved to be within the powers of those afflicted with blindness. Yet by universal acclaim Mr A. F. Mackenzie of Jamaica is unsurpassed at the present day. In one tourney he won the prize for three-movers, whilst that for two-movers fell to H. F. Lane, who has likewise to compose *sans voir*. Mr Mackenzie also won the first prize in the self-mate tournament of the

British Chess Magazine and first prize in the problem tournament of the *Wiener Schachzeitung*.

Problem Tournaments.—The idea of holding a problem competition open to the world was first mooted in connexion with the Chess Congress of 1851. The projected tournament was for the time abandoned, but in the year 1854 a tourney confined to British composers was held, and this—the earliest recorded—resulted in the two prizes falling to W. Grimshaw and Silas Angas respectively. A brief summary of the more important tournaments is appended, in which, however, no mention is made of the competitions held in the leading provincial chess columns of the United Kingdom, as to enumerate all would require too much space, whilst a choice would be invidious. Mention may be made of a few of the organs which have been conspicuously successful in attracting the participation of composers of the highest repute: *Leeds Mercury* Supplement, *Manchester Weekly Times*, *Liverpool Weekly Mercury*, *Bristol Mercury*, *Brighton Society*, and *The English Mechanic* and *Knowledge*. Amongst the prize-winners in these the most notable successes have fallen to G. Heathcote, Mrs Baird, P. F. Blake, P. H. Williams, W. Gleave, and P. G. L. Fothergill.

In the following list the winners of first prizes only are given. Where two or more names occur they represent winners in different sections of the same tourney:—

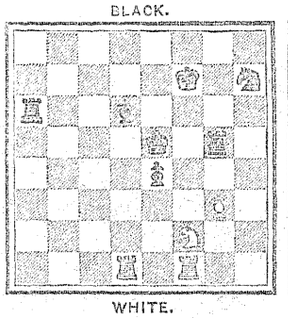
Era	1855	C. Bayer.
New York	1857	R. Willmers.
Bristol	1861	F. Healey.
London	1862	C. Bayer.
Le Palamède Français	1865	D. Lamouroux.
Paris	1867	C. Bayer.
British Chess Association	1872	S. A. Sörensen.
Paris	1878	J. Berger.
Leipzig	1879	Kohtz and Kockelkorn (joint).
Berlin	1881	E. Pradignat, L. Noack, and F. Dubbe.
Brentano's Magazine	1882	J. Dobrusky.
Chess Monthly	1882	H. Leprettel, Rev. A. Cyril Pearson.
Nüremberg	1883	J. Berger (2), F. Schrüfer, F. Geyerstam
Chess Monthly	1884-86	A. E. Studd and F. Healey.
British Chess Association	1886	J. Pospisil.
Prague	1886	J. Kotre and J. Pospisil.
Counties Chess Association	1887	B. G. Laws.
Frankfort	1887	J. Berger and J. Jespersen.
Andrews Memorial (*B.C.M.*)	1888	J. Kotre.
Breslau	1889	G. Chocholous, R. Adam, and J. Pospisil.
Münchener neueste Nachrichten	1889	F. Schindler, A. Norlin, J. Pospisil.
Bahn Frei	1890	L. de Yong and Z. Bennecke.
St. John's Globe	1891	W. A. Shinkman.
Dresden	1892	O. Fuss and J. Pospisil.
Chess Monthly	1895	B. G. Laws, J. Jespersen, and V. Marin.
Münchener neueste Nachrichten	1893-9	M. Karstedt, F. Möller, F. Meyer, and R. Weinheimer.
Schachmatny Journal	1894	K. Musil.
Prague	1895	W. Tuzar and P. K. Traxler.
Warsaw Courier	1896	L. Vetesnik.
Ruy Lopez	1897	V. Marin.
Neues illustrirtes Blatt	1898	J. Svejda.
St. Petersburger Zeitung	1898	J. Fridlizius.
British Chess Magazine	1898	A. F. Mackenzie, M. A. Dahl, and O. Nemo.
Prague	1899	A. F. Mackenzie.
British Chess Magazine	1900	P. K. Traxler.
Nuova Revista	1901	E. Pradignat.
Wiener Schachzeitung	1901	A. F. Mackenzie.

Problem Literature.—The following are some of the best works in the English language to consult on chess problems:—J. B. of Bridport. *Chess Strategy.* 1865.—F. Healey. *A Collection of 200 Chess Problems.* 1866.—*English Chess Problems.* Edited by James and W. T. Pierce. 1876.—H. J. C. Andrews, E. N. Frankenstein, B. G. Laws, and C. Planck. *The Chess Problem Text-Book.* 1887.—A. F. Mackenzie. *Chess: its Poetry and its Prose.* Jamaica, 1887.—J. A. Miles. *Chess Stars* (self-mates). 1888.—James Rayner. *Chess Problems.* 1890.—B. G. Laws. *The Two-Move Chess Problem.* 1890.—*The Chess Bouquet.* Compiled by F. R. Gittins. 1897.—Mr and Mrs T. B. Rowland. *The Problem Art* (second edition). 1898.—E. B. Cook, T. Henery, and C. A. Gilberg. *American Chess-Nuts.* 1868.—Samuel Loyd. *Chess Strategy.* 1878.—W. H. Lyons. *Chess-Nut Burrs and how to open them.* 1886.—C. A. Gilberg. *Crumbs from the Chess Board.* 1890.—*Canadian Chess Problems.* Edited by C. F. Stubbs. 1890.—W. Pulitzer. *Chess Harmonies.* 1894.—G. E. Carpenter (N. Preti of Paris). *200 Chess Problems.* 1900.

History.—According to Mr W. S. Branch of Cheltenham, an authority on problem lore, the earliest known problem dates from the 9th century, and is ascribed to an Arabian caliph. The first known collection is that in a manuscript (in the British Museum) of Alfonso, king of Castile, dated 1250, containing 103 problems; whilst the collection of Nicholas de Nicolai of Lombardy, dated 1300, comprises 192 problems. Problems are to be found in the works of the undermentioned:—Lucena (1437), Damiano (1512), Polerio (1616), Carrera (1617), Stamma (1737), Ercole del Rio (1750), Lolli (1763), Ponziani (1769), Lewis (1817), Mendheim (1832), Alexandre (1846). Other early composers were: Bone, Bolton, D'Orville, L'Hermet, Capraez, Kling, Herlin, Kuiper, Angas, Micheson, Pavitt, Plachutta, Kieseritsky, and Silberschmidt. Coming to the period of the "transition" and "modern" problems (roughly speaking from the middle of the 19th century), the foremost composers of various nationalities have been: (Great Britain), J. G. Campbell, W. Grimshaw, J. B. of Bridport, F. Healey, C. W. of Sunbury, G. J. Slater, A. E. Studd, Mrs Baird, B. G. Laws, C. Planck, C. A. L. Bull, G. Heathcote, P. F. Blake, Rev. A. Cyril Pearson, Sir J. O. S. Thursby, and E. B. Schwann, the latter one of the foremost authorities on the problem in England; (Germany and Austria), C. Bayer, P. Klett, R. Willmers, J. Kohtz, C. Kockelkorn, R. Braune, F. Schrüfer, A. Bayersdorfer, J. Berger, M. Ehrenstein, H. v. Gottschall, R. Schindler, R. Weinheimer, O. Nemo, M. Feigl, and C. Erlin; (Bohemia), J. Dobrusky, J. Pospisil, G. Chocholous, K. Kondelik, P. K. Traxler, and J. Kotre; (United States), S. Loyd, G. Cheney, G. E. Carpenter, C. A. Gilberg, W. A. Shinkman, F. M. Teed, and O. Wurzburg; (Canada), J. N. Babson; (Jamaica), A. F. Mackenzie; (France), H. Leprettel and E. Pradignat; (Italy), G. B. Valle; (Scandinavia), Fr. af Geyerstam and A. S. Sörensen; (Spain), Tolosa Carreras and V. Marin;

Examples of Problems.

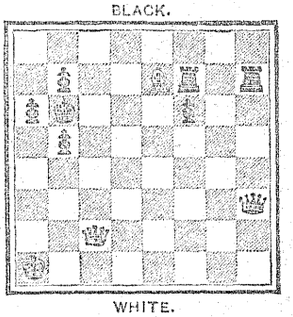
I. By Stamma.



WHITE.

White to play and mate in three (3) moves.

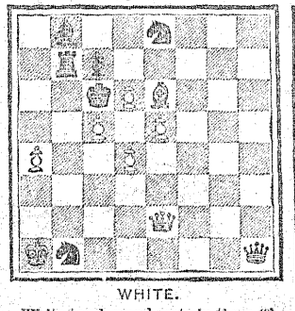
II. By W. Bone.



WHITE.

White to play and mate in seven (7) moves.

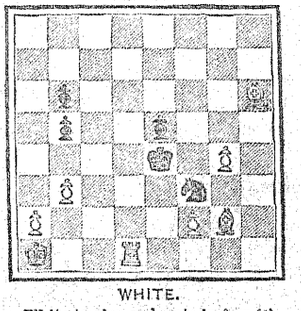
III. By A. Anderssen.



WHITE.

White to play and mate in three (3) moves.

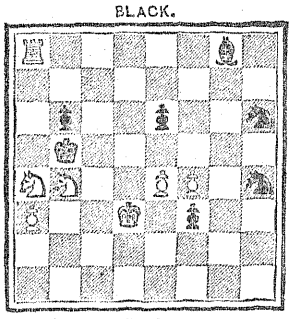
IV. By Rev. C. Loveday.



WHITE.

White to play and mate in four (4) moves.

V. By J. G. Campbell.



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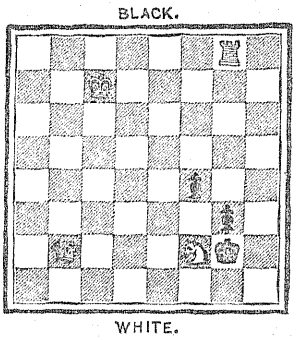
WHITE.

White to play and mate in four (4) moves.

VI. By S. Loyd.



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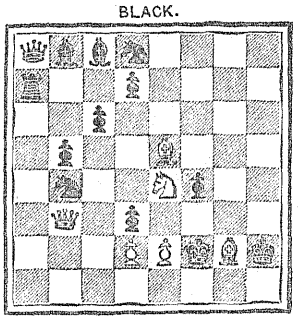
WHITE.

White to play and mate in three (3) moves

XIII. By Rev. J. Jespersen.



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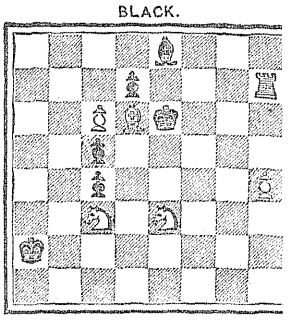
WHITE.

White to play and mate in three (3) moves.

XIV. By Rev. H. W. Sherrard



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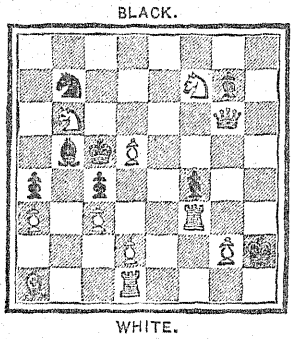
WHITE.

White to play and mate in three (3) moves.

VII. By F. Healey.



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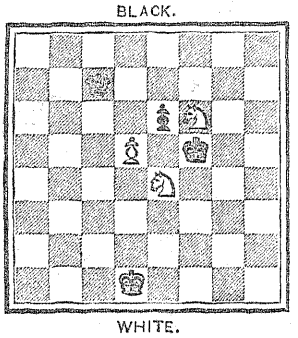
White to play and mate in three (3) moves.

VIII. By J. B. of Bridport.



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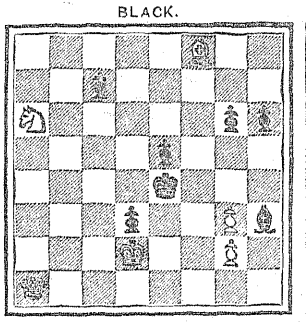
WHITE.

White to play and mate in three (3) moves.

XV. By J. Pospisil.



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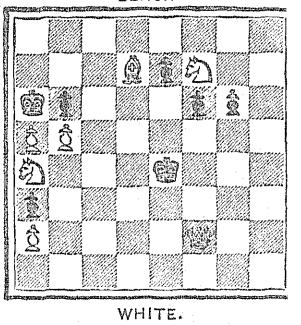
White to play and mate in three (3) moves.

XVI. By J. Kesl and K. Musil.



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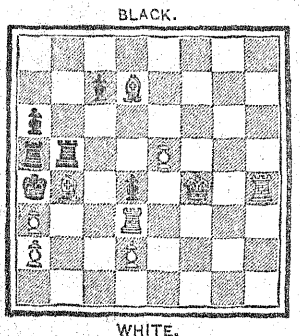
White to play and mate in three (3) moves.

IX. By P. Klett.



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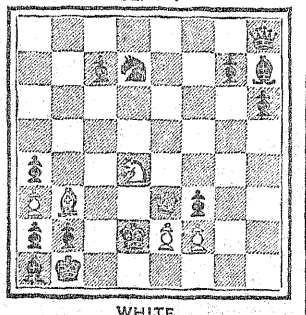
WHITE.

White to play and mate in four (4) moves.

X. By W. Grimshaw.



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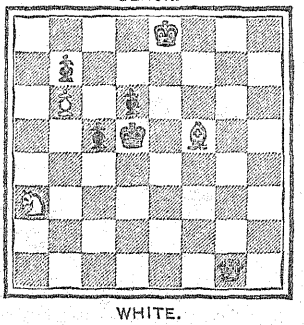
WHITE.

White to play and mate in three (3) moves.

XVII. By C. Behting.



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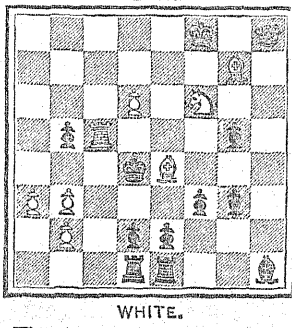
White to play and mate in three (3) moves.

XVIII. By A. F. Mackenzie.



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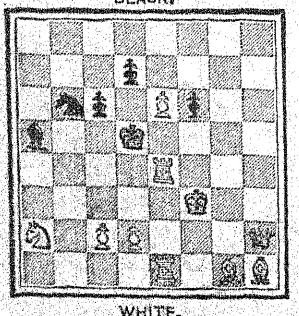
WHITE.

White to play and mate in three (3) moves.

XI. By T. Taverner.



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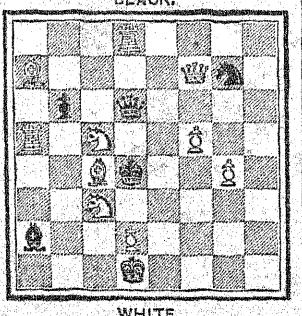
WHITE.

White to play and mate in two (2) moves.

XII. By V. Marin.



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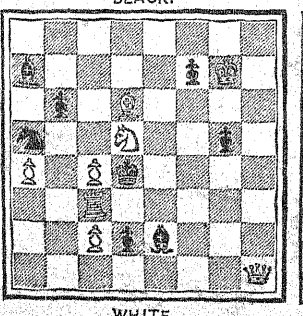
WHITE.

White to play and mate in two (2) moves.

XIX. By J. Fridlizius.



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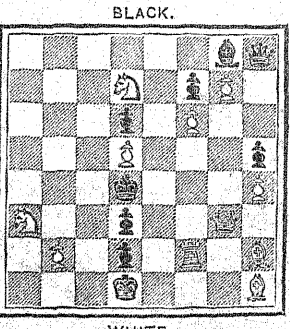
WHITE.

White to play and mate in three (3) moves.

XX. By B. G. Laws.



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WHITE.

White to play and *self*-mate in three (3) moves.

(Holland), P. A. Kuijers and C. Colpa; (Russia), Dr A. W. Galitzky and N. Maximoff.

The following eminent composers are no longer living, the year in which each died being shown. "J. B." (John Brown) of Bridport (1863); A. Nowotny (1871); O. T. Malmquist (1874); V. Portilla (1874); R. B. Wormald (1874); O. Gelbfuss (1877); R. Willmers (1879); A. Anderssen (1879); H. Leprettel (H. E. Pelletret) (1882); P. T. Duffy (1888); J. H. Obermann (1888); Count Pongracz (Hermit of Tyrnau) (1890); W. Grimshaw (1890); Fr. af Geyerstam (1890); J. G. Campbell (1891); A. Abela (1892); G. Szabo (1892); J. Pierce (1892); G. E. Barbier (1895); G. C. Heywood (1895); D. Lamouroux (1895); A. S. Sörensen (1896); L. K. Istomin (1897); F. Dubbe (1897); C. Bayer (1897); F. Moucka (1898); J. Rayner (1898); C. A. Gilberg (1898); W. C. Spens (1900); A. Bayersdorfer (1901); A. C. Vasquez (1901); J. Minckwitz (1901).

Solutions.

Problem No.	Composer.	White 1.	Black 1.	White 2.	Black 2.	White 3.
I.	Stamma	Kt – Kt4 (ch)	R × Kt	R – B5 (ch), &c.		
II.	W. Bone	Q – B5 (ch)	K – R4	Q – Kt4 (ch)	K – Kt3	Q – Q4 (ch)
			(3) K – R4	(4) B – Kt4 (ch)	(4) K – R5	(5) B – K sq. (ch)
			(5) K – Kt6	(6) Q – Kt4 (ch), &c.		
III.	Prof. A. Anderssen	Q – KR5	Q × Q	P – Q7, &c.		
IV.	Rev. C. Loveday	B – KKt5	P – Kt5	B – QB1	P – Kt4	R – Q2, &c.
V.	J. G. Campbell	P – K5	B – R2 (ch)	P – KB5	B × P (ch)	K – Q4, &c.
VI.	S. Loyd	Kt – Kt4 (ch)	K – R8	Q – R2 (ch), &c.		
			K – R6	Kt – R2		
			K – B6	Q – B2		
			K – B8	R – QR8		
			K – Kt8	R – QR8, also R – QB8		
VII.	F. Healey	R – KR1	B – Q2	Q – QKt1	B – Kt4	Q – KKt1 (mate)
VIII.	J. B. of Bridport	P – Q6	P – K4	Q – QR7, &c.		
			K – K4	Q – QB1, &c.		
			K – B5	Q – B5, &c.		
IX.	P. Klett	R – KR6	P – B4	R – KR1	P × B	R – QR1, &c.
X.	W. Grimshaw	Q – Kt5 also solved by Kt – KB5	P × Q	Kt – QKt5, &c.		
			B × Kt	Q – K6 !		
XI.	T. Taverner	R – KR4, &c.				
XII.	V. Marin	Q – QB7, &c.				
XIII.	Rev. J. Jespersen	Q – Q5	Kt × Q	Kt – Kt5, &c.		
			P × Q	Kt – B6, &c.		
			Other	B × P (ch), &c.		
XIV.	Rev. H. W. Sherrard	P × P	B – Kt3	P – Q8 (= Kt) (ch), &c.		
			K – B3	P × B (= B), &c.		
			K × B	P × R (= R), &c.		
XV.	J. Pospisil	Q – Q1	B × P	Q – KKt4 (ch)		
			B – KB4	Q – QR4 (ch)		
			K – Q4	Q – Kt3 (ch)		
			K – B4	Q – B3 (ch)		
XVI.	J. Kesl and K. Musil (joint composition)	B – R3	K – Q6	B – B1 (ch)		
			P – B4	B – Kt2 (ch)		
			P – Kt4	B – B5 (ch)		
			P × P	Kt – B5 (ch)		
			P – K4	Kt – Q6 (ch)		
			P – K3	B – B1, &c.		
XVII.	C. Behting	B – R7	K – B3	Q – QKt1	P – Q4	Q – KKt6 (mate)
			P – B5	Q – Kt5 (ch)		
XVIII.	A. F. Mackenzie	Q – R3	P – KKt5	Q – R6, &c.		
			K × R	Kt – Q7 (ch), &c.		
			K – K6	Kt – Q5 (ch), &c.		
XIX.	J. Fridlizius	R – KB3	P – Q8 (= Q)	Q – R4 (ch), &c.		
			B × R	Q – R1 (ch), &c.		
			Kt × P	R – Q3 (ch), &c.		
			B × P	P – B3 (ch), &c.		
XX.	B. G. Laws	B – Kt1	Q × P	Q – K5 (ch)	P × Q	R × P (ch), &c.
			Q or B – R2	Q – K3 (ch)	K × Q	Kt – B2 (ch), &c.
			Q – R3	Q × P (ch)	K × Q	R × P (ch)

Remarks.—Problems I. to X. are selected to illustrate the old and transition styles of composition, whilst Nos. XI. to XX. belong to the later transition and modern period.

I. and II. are early examples of problem composition.

IV. is the "Indian" in its original, but not wholly sound form. A. F. Mackenzie describes this now well-worn theme as "covering an ambush in a stale-mating position, giving the king a loophole of apparent escape, and then mating by double check" (*Chess: its Poetry and its Prose*).

V. is from a set in the *Era* tourney, 1855. It is a fine early example of the cross-check theme, the White King exposing himself to the enemy's fire both on the first and second moves.

VI. A prize problem of the year 1859, is an early example of the introduction of several distinct ideas in a single problem. According to later ideas, the check upon the first move would be considered as a key-move of too aggressive a character. In this case, however, compensation is found in the interesting quiet continuations which it introduces.

VII. is the famous Bristol tourney prize problem, 1861, from which the term "Bristol" theme is derived, of which the essential idea consists in moving a piece to a most out-of-the-way place, for the simple object of making room for another piece to reach a desired square. Compare with No. XVII., in which the "Bristol" idea is worked in accordance with modern ideas of economy and purity.

VIII. A characteristic example of J. B. of Bridport's peculiar style, in which neat construction and elegance are more marked features than complexity.

Problem No. IX. is a masterpiece of difficulty. It was composed in 1871 for a solution tourney at Crefeld.

Problem No. X. is worthy of note as containing a cook (*i.e.*, an unintended second solution) of almost equal obscurity to that intended by the author. A comparison of this problem with No. XIII. by J. Jespersen affords another illustration of the progress in the art of composition. Not only is the latter problem sound, but the unfortunate threat of immediate mate is avoided, and a second idea of equal merit is combined with that common to both. This it will be seen lies in the sacrifice of the Q on the first move, to prevent subsequently a black pawn from moving two squares, so as to nullify the double threat of mate which a quiet second move of the Kt introduces.

Problem No. XIV. is a fine example of the "pawn promotion" theme, the point of which lies in the fact that White (having the right to claim a Q, on advancing his pawn to the eighth square) finds it more effectual to claim pieces of less power, viz., a Knight, a Bishop, and a Rook in the three several variations.

Problem No. XV. is a good example of a theme recurrent. It will be seen that the leading mate given by Q, B, and Kt is repeated, in all cases being perfectly pure, no less than four times.

Problem No. XVI. is given to show the extraordinary lengths to which variety can be carried consistently with a scrupulous regard to the principles of construction. Every single variation results in a mate perfect in form.

Problem No. XVII. is a modern (1896) version of the "Bristol," and shows the advance made, not only in the lighter, cleaner style, but in the addition of a secondary idea of merit.

Problems XVIII. and XIX. are typical "modern style" prize-winners in leading tourneys, and illustrate the blending of several equally fine variations into a harmonious and finished whole.

Problem XX. is an example of a sui-mate.

IMPORTANT MATCHES SINCE 1834.

			Won.	Lost.	Drawn.
1834	London	Labourdonnais *v.* MacDonnell	46	26	11
1843	Paris	Staunton *v.* St Amant	11	6	4
1847	London	Philidor *v.* Stamma	8	1	1
1851	London	Anderssen *v.* Löwenthal	5	2	0
1858	London	Horwitz *v.* Löwenthal	11	10	10
1858	Paris	Anderssen *v.* Horwitz	3	1	3
1858	London	Morphy *v.* Löwenthal	9	3	3
1858	Paris	Morphy *v.* Horwitz	5	2	1
1858	Paris	Morphy *v.* Anderssen	7	2	2
1861	London	Anderssen *v.* Kolisch	4	3	2
1861	London	Paulsen *v.* Kolisch (drawn)	7	6	18
1862	London	Anderssen *v.* Paulsen (drawn)	3	3	2
1863	London	Steinitz *v.* Blackburne	7	1	2
1866	London	Steinitz *v.* Anderssen	8	6	0
1870	London	Steinitz *v.* Blackburne	5	0	1
1872	London	Steinitz *v.* Zukertort	7	1	4
1876	Leipzig	Paulsen *v.* Anderssen	5	4	1
1876	London	Steinitz *v.* Blackburne	7	0	0
1877	Leipzig	Paulsen *v.* Anderssen	5	3	1
1881	London	Zukertort *v.* Blackburne	7	2	5
1881	London	Blackburne *v.* Gunsberg	7	4	3
1886	America	Steinitz *v.* Zukertort	10	5	5
1887	London	Blackburne *v.* Zukertort	5	1	8
1887	London	Gunsberg *v.* Blackburne	5	2	6
1889	Havana	Steinitz *v.* Tchigorin	10	6	1
1890	Havana	Gunsberg *v.* Tchigorin	9	9	5
1891	Havana	Steinitz *v.* Gunsberg (drawn)	6	4	9
1892	Havana	Steinitz *v.* Tchigorin	10	8	5
1892	London	Lasker *v.* Blackburne	6	0	4
1893	St Petersburg	Dr Tarrasch *v.* Tchigorin (drawn)	9	9	4
1894	America	Lasker *v.* Steinitz	10	5	4
1894	Nüremberg	Dr Tarrasch *v.* Walbrodt	7	0	1
1896	Moscow	Lasker *v.* Steinitz	10	2	5

Comments.

Steinitz v. *Blackburne* (1863).—A remarkable victory, judging from the figures, but Blackburne suffered from a severe cold all through the contest, and should have won at least three games on the merits of the positions.

Paulsen v. *Anderssen* (1877).—Paulsen's victory was out of proportion considering the respective strength of the players.

Zukertort v. *Blackburne* (1881).—A legitimate victory, Zukertort being then at the height of his power.

Blackburne v. *Gunsberg* (1881).—A fair average number of wins for Gunsberg, who was then gradually making his way to the front rank.

Steinitz v. *Zukertort* (1886).—A memorable match. Zukertort started well ahead; the second series of games was played at St Louis after an interval, which gave Steinitz time to recover from his despondency at the New York defeat. Zukertort lost courage in proportion as Steinitz gained it, so that the concluding series at New Orleans proved Zukertort's *débâcle*.

Blackburne v. *Zukertort* (1887).—Blackburne took full revenge for his previous defeat, but Zukertort was already merely the shadow of himself.

Steinitz v. *Tchigorin* (1889).—A good fight on the part of Tchigorin, the result being exactly what was anticipated.

Gunsberg v. *Tchigorin* (1890).—Even games being played, Gunsberg would not stake the result of the match upon a single decisive game, which Tchigorin proposed.

Steinitz v. *Gunsberg* (1891).—Steinitz should have won by a larger majority, but he persisted in playing a number of Evans gambits, defending compromisingly with one of his own inferior variations.

Steinitz v. *Tchigorin* (1892).—Here the Russian master made a better stand than in the previous match, also owing to Steinitz indulging in hobbies.

Lasker v. *Blackburne* (1892).—The first noteworthy achievement of the future champion. This was a better result, as far as quality is concerned, than Steinitz's against the latter opponent, for whereas in the match against Steinitz Blackburne had chances of winning some of the games, he had none in this.

Dr Tarrasch v. *Tchigorin* (1893).—A fine match, well fought and producing instructive games. This, and Tchigorin's victory at Budapest, were his best performances. It must be remembered that Dr Tarrasch was then considered the greatest living player.

Lasker v. *Steinitz* (1894).—A memorable match. It was said at the time that Steinitz was ill-advised to accept the challenge of the rising master. So he was. But pecuniary circumstances compelled him to play and to stake a lifelong reputation upon the issue of this contest, even if he had known that he would be beaten. In better circumstances he refused to play with Mason, who challenged him after the match with Blackburne.

Dr Tarrasch v. *Walbrodt* (1894).—The latter was no match against the famous doctor, and no other comment is required.

Lasker v. *Steinitz* (1896).—This return match should never have been played. Pecuniary circumstances again induced Steinitz to venture upon a hopeless task. In fact, he insisted on playing, Lasker not being particularly eager. The result was a foregone conclusion; Lasker standing at the height of his fame, having just won the first prize at the great Nüremberg tournament. After the match Steinitz had an attack of mental aberration, which was erroneously ascribed to the "strain upon his mind" which the contest involved. But age and a shattered career, coupled with a predisposition to hypochondria, were the real causes.

GAMES.

The following is a selection of noteworthy games played by famous masters:—

QUEEN'S GAMBIT DECLINED.

White. W. Steinitz.	Black. Dr E. Lasker.	White. W. Steinitz.	Black. Dr E. Lasker.
1. P – Q4	P – Q4	21. Kt – B3	Kt – Q5
2. P – QB4	P – K3	22. Q × P	Kt × B (ch)
3. Kt – QB3	Kt – KB3	23. P × Kt	R – Kt sq
4. B – B4	B – K2	24. Q × P	R – Kt3
5. P – K3	Castles	25. Q – B4	R × P
6. R – B sq	P – B4	26. P – KR4	B – R2
7. QP × P	B × P	27. B – K4	Q – Q3
8. P × P	P × P	28. P – B4	Q – Q2
9. Kt – B3	Kt – B3	29. B – Kt2	Q – Kt5
10. B – Q3	P – Q5	30. Q – Q3	Kt – B4
11. P × P	Kt × P	31. Kt – K4	B – K6
12. Castles	B – KKt5	32. R – B3	R × B
13. Kt – QKt5	B × Kt	33. K × R	Kt × P (ch)
14. P × B	Kt – K3	34. K – R2	Kt × R (ch)
15. B – K5	Kt – R4	35. K – Kt2	Kt – R5 (ch)
16. K – R sq	Q – Kt4	36. K – R2	Kt – B4
17. B – Kt3	QR – Q sq	37. R – QKt sq	P – R4
18. Q – B2	Q – R3	38. R – Kt5	R – R sq
19. QR – Q sq	R – B sq	39. P – R3	R × P
20. Q – Kt3	P – R3	Resigns.	

This game was played in the St Petersburg tournament 1895, a fine specimen of Lasker's style. The final attack beginning with 21...with Kt – Q5 furnishes a gem of an ending.

BISHOP'S GAMBIT.

White. Charousek.	Black. Tchigorin.	White. Charousek.	Black. Tchigorin.
1. P – K4	P – K4	13. Q × P (ch)	K – K2
2. P – KB4	P × P	14. Kt × P	Kt × Kt
3. B – B4	Kt – QB3	15. B × Kt	P – R3
4. P – Q4	Kt – B3	16. Kt – B3	B – B5
5. P – K5	P – Q4	17. P – K6	R – B sq
6. B – Kt3	B – Kt5	18. B – B7	P × P
7. Q – Q3	Kt – KR4	19. B × Q (ch)	R × B
8. Kt – KB3	Kt – Kt5	20. Q – Kt7 (ch)	R – Q2
9. Q – QB3	Kt – R3	21. R – B7 (ch)	K × R
10. Castles	B – K7	22. Q × R (ch)	B – K2
11. B – R4 (ch)	P – B3	23. R – K sq	R – K sq
12. B × P (ch)	P × B	24. P – QKt3	Resigns.

This pretty game was played in the tie match for first prize at the Budapest tournament 1896.

RICE GAMBIT.

White. Professor Rice.	Black. Major Hanham.	White. Professor Rice.	Black. Major Hanham.
1. P – K4	P – K4	15. Q – R3	Kt – B7
2. P – KB4	P × P	16. R × B (ch)	B – K3
3. Kt – KB3	P – KKt4	17. K – B sq	Q – R8 (ch)
4. P – KR4	P – Kt5	18. Kt – Kt sq	Kt – R6
5. Kt – K5	Kt – KB3	19. P × Kt	P – B6
6. B – B4	P – Q4	20. B – Kt5	Q – Kt7 (ch)
7. P × P	B – Q3	21. K – K sq	P – B7 (ch)
8. Castles	B × Kt	22. K – Q2	P – B8 = Kt (ch)
9. R – K sq	Q – K2		
10. P – B3	P – Kt6	23. K – Q3	K – Q2
11. P – Q4	Kt – Kt5	24. P × B (ch)	K – B2
12. Kt – Q2	Q × P	25. Q – K7 (ch)	K – Kt3
13. Kt – B3	Q – R3	26. Q – Q8 (ch)	R × Q
14. Q – R4 (ch)	P – B3	27. B × Q and mates	

The Rice Gambit (so called after its inventor, Prof. Isaac L. Rice of New York), whether right or not, is only possible if Black plays 7...B – Q3. Paulsen's 7...B – Kt2 is better, and avoids unnecessary complications. 8. P – Q4 is the usual move. Leaving the Knight *en prise*, followed by 9. R – K sq, constitutes the Rice Gambit. The interesting points in the game are that White subjects himself to a most violent attack with impunity, for in the end Black could not save the game by 22. P – B8 claiming a second Queen with a discovered check, nor by claiming a Knight with double check, as it is equally harmless to White.

RUY LOPEZ.

White. Halprin.	Black. Pillsbury.	White. Halprin.	Black. Pillsbury.
1. P – K4	P – K4	14. P – Kt6	BP × P
2. Kt – KB3	Kt – QB3	15. Kt – Q5	P × Kt
3. B – Kt5	Kt – B3	16. KR – K sq (ch)	K – B sq
4. Castles	Kt × P	17. R – R3	Kt – K4
5. P – Q4	Kt – Q3	18. R × Kt	P × R
6. P × P	Kt × B	19. R – B3 (ch)	K – Kt sq
7. P – QR4	P – Q3	20. B – R6	Q – K2
8. P – K6	P × P	21. B × P	K × B
9. P × Kt	Kt – K2	22. R – Kt3 (ch)	K – B sq
10. Kt – B3	Kt – Kt3	23. R – B3 (ch)	K – Kt2
11. Kt – Kt5	B – K2	24. R – Kt3 (ch)	K – B sq
12. Q – R5	B × Kt	25. R – B3 (ch)	K – Kt sq
13. B × B	Q – Q2	Draw.	

This brilliant game, played at the Munich tournament, 1900, would be unique had the combinations occurred spontaneously in the game. As a matter of fact, however, the whole variation had been elaborated by Maroczy and Halprin previously, on the chance of Pillsbury adopting the defence in the text. The real merit belongs to Pillsbury, who had to find the correct defence to an attack which Halprin had committed to memory and simply had to be careful to make the moves in regular order.

SICILIAN DEFENCE.

White. Pillsbury.	Black. Mieses.	White. Pillsbury.	Black. Mieses.
1. P – K4	P – QB4	16. P × P	Kt – Q5
2. Kt – KB3	P – K3	17. B × R	K × B
3. P – Q4	P × P	18. R – R2	B – K3
4. Kt × P	Kt – KB3	19. R – Q2	R – K sq
5. Kt – QB3	Kt – B3	20. Castles	B – Kt6
6. KKt – Kt5	B – Kt5	21. Q – Kt sq	B – Q4
7. P – QR3	B × Kt (ch)	22. B – Q sq	B × P
8. Kt × B	P – Q4	23. K × B	Q – Kt4 (ch)
9. P × P	P × P	24. K – R sq	Q × R
10. B – KKt5	Castles	25. B – Kt4	Q – B5
11. B – K2	P – Q5	26. R – Kt sq	P – B4
12. Kt – K4	Q – R4 (ch)	27. B – R5	Kt – B6
13. P – Kt4	Q – K4	28. B × Kt	Q × B (ch)
14. Kt × Kt (ch)	P × Kt	29. R – Kt2	R – K7
15. B – R6	P – Q6	30. Q – QB sq	Q × QP

Drawn eventually.

This brilliant game occurred at the Paris tournament, 1900.

GIUOCO PIANO.

White. Steinitz.	Black. Bardeleben.	White. Steinitz.	Black. Bardeleben.
1. P – K4	P – K4	14. R – K sq	P – KB3
2. Kt – KB3	Kt – QB3	15. Q – K2	Q – Q2
3. B – B4	B – B4	16. QR – B sq	P – B3
4. P – B3	Kt – B3	17. P – Q5	P × P
5. P – Q4	P × P	18. Kt – Q4	K – B2
6. P × P	B – Kt5 (ch)	19. Kt – K6	KR – QB sq
7. Kt – B3	P – Q4	20. Q – Kt4	P – KKt3
8. P × P	KKt × P	21. Kt – Kt5 (ch)	K – K sq
9. Castles	B – K3	22. R × Kt (ch)	K – B sq
10. B – KKt5	B – K2	23. R – B7 (ch)	K – Kt sq
11. B × Kt	QB × B	24. R – Kt7 (ch)	K – R sq
12. Kt × B	Q × Kt	25. R × P (ch)	Resigns.
13. B × B	Kt × B		

As a matter of fact, Bardeleben left the board here, and lost the game by letting his clock run out the time limit; but Steinitz, who remained at the board, demonstrated afterwards the following variation leading to a forced win :—

White. Steinitz.	Black. Bardeleben.	White. Steinitz.	Black. Bardeleben.
25.	K – Kt sq	31. Q – Kt8 (ch)	K – K2
26. R – Kt7 (ch)	K – R sq	32. Q – B7 (ch)	K – Q sq
27. Q – R4 (ch)	K × R	33. Q – B8 (ch)	Q – K sq
28. Q – R7 (ch)	K – B sq	34. Kt – B7 (ch)	K – Q2
29. Q – R8 (ch)	K – K2	35. Q – Q6 mate.	
30. Q – Kt7 (ch)	K – K sq		

This game was awarded the prize for "brilliancy" at the Hastings tournament, 1895.

EVANS GAMBIT.

White. Anderssen.	Black. Dufresne	White. Anderssen.	Black. Dufresne.
1. P – K4	P – K4	13. Q – R4	B – Kt3
2. Kt – KB3	Kt – QB3	14. QKt – Q2	B – Kt2
3. B – B4	B – B4	15. Kt – K4	Q – B4
4. P – QKt4	B × P	16. B × P	Q – R4
5. P – B3	B – R4	17. Kt – B6 (ch)	P × Kt
6. P – Q4	P × P	18. P × P	R – Kt sq
7. Castles	P – Q6	19. QR – Q sq	Q × Kt
8. Q – Kt3	Q – B3	20. R × Kt (ch)	Kt × R
9. P – K5	Q – Kt3	21. Q × P (ch)	K × Q
10. R – K sq	KKt – K2	22. B – B5 (ch)	K – K sq
11. B – R3	P – Kt4	23. B – Q7 (ch)	K moves
12. Q × P	R – QKt sq	24. B × Kt mate.	

This game is still more remarkable and more brilliant than the "immortal game" published in the *Ency. Brit.* vol. v. p. 596. The *coup de repos* of 19. QR – Q sq is the key-move to the brilliant final combination, the depth and subtlety of which have never been equalled, except perhaps in the following game between Zukertort and Blackburne.

ENGLISH OPENING.

White. Zukertort.	Black. Blackburne.	White. Zukertort.	Black. Blackburne.
1. P – QB4	P – K3	18. P – K4	QR – QB sq
2. P – K3	Kt – KB3	19. P – K5	Kt – K sq
3. Kt – KB3	P – QKt3	20. P – B4	P – Kt3
4. B – K2	B – Kt2	21. R – K3	P – B4
5. Castles	P – Q4	22. P × P e.p.	Kt × P
6. P – Q4	B – Q3	23. P – B5	Kt – K5
7. Kt – B3	Castles	24. B × Kt	P × B
8. P – QKt3	QKt – Q2	25. P × KtP	R – B7
9. B – Kt2	Q – K2	26. P × P (ch)	K – R sq
10. Kt – QKt5	Kt – K5	27. P – Q5 dis.(ch)	P – K4
11. Kt × B	P × Kt	28. Q – Kt4	QR – B4
12. Kt – Q2	QKt – B3	29. R – B8 (ch)	K × P
13. P – B3	Kt × Kt	30. Q × P (ch)	K – Kt2
14. Q × Kt	P × P	31. B × P (ch)	K × R
15. B × P	P – Q4	32. B – Kt7 (ch)	K – Kt sq
16. B – Q3	KR – B sq	33. Q × Q	Resigns.
17. QR – K sq	R – B2		

This game, played in the London tournament, 1883, is one of the most remarkable productions of modern times, neither surpassed nor indeed equalled hitherto.

END GAMES.

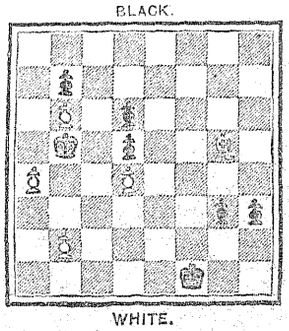
A game of chess consists of three branches — the opening, the middle, and the end game. The *openings* have been analysed, and are to be acquired by the study of the books on the subject. The *middle game* can only be acquired practically. The combinations being inexhaustible in their variety, individual ingenuity has its full scope. Those endowed with a fertile imagination will evolve plans and combinations leading to favourable issues. The less endowed player, however, is not left quite defenceless; he has necessarily to adopt a different system, namely, to try to find a weak point in the arrangement of his opponent's forces, and concentrate his attack on that weak spot. As a matter of fact, in a contest between players of equal strength finding the weak point in the opponent's armour is the only possible plan, and this may be said to be the fundamental principle of the modern school. In the good old days the battles were mostly fought in the neighbourhood of the King, each side striving for a checkmate. Nowadays the battle may be fought anywhere. It is quite immaterial where the advantage is gained, be it ever so slight. Correct continuation will necessarily increase it, and the opponent may be compelled to surrender in the end game without being checkmated, or a position may be reached when the enemies, in consequence of the continual fight, are so reduced that the Kings themselves have to take the field—the end game. The *end game*, therefore, requires a special study. It has its special laws, and the value of the pieces undergoes a considerable change. The Kings leave their passive *rôle* and become attacking forces. The pawns increase in value, whilst that of the pieces may diminish in certain cases.

Two Knights, for instance, without pawns, become valueless, as no checkmate can be effected with them. In the majority of cases the players must be guided by general principles, as the standard examples do not meet all cases.

The handbooks as a rule give a sprinkling of elementary endings, such as to checkmate with Queen, Rook, Bishop and Knight, two Bishops, and pawn endings pure and simple, as well as pawns in connexion with pieces in various forms. In the 'eighties a valuable work on end games was published in England by the late B. Horwitz; thus for the first time a theoretical classification of the art was given. This was followed by a more comprehensive work by Professor J. Berger of Graz, which was translated a few years later by the late Mr Freeborough.

A few specimens of the less accessible positions are given below:—

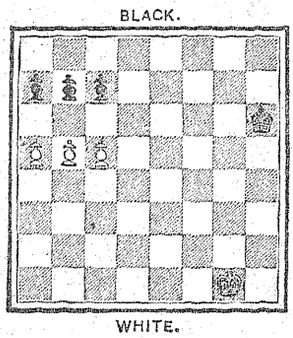
Position from a Game played by the late J. G. Campbell in 1863.



Obviously White has to lose the game, not being able to prevent the pawns from queening. By a remarkably ingenious device White averts the loss of the game by stale-mating himself as follows:—

1. B – Q2, P – Kt7; 2. B – R5, P – Kt8 = Q; 3. P – Kt4 stalemate.

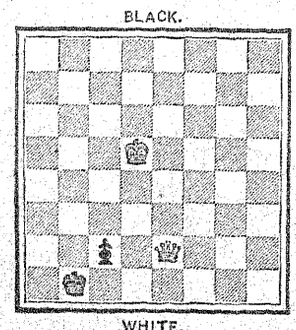
Position by Surratt, 1808.



White wins as follows:—

1. P – Kt6, RP × P; 2. P – B6, P (Kt2) × P; 3. P – R6 and wins by queening the pawn. If 1. . . . BP × P then 2. P – R6, KtP × P; 3. P – B6 and queens the pawn.

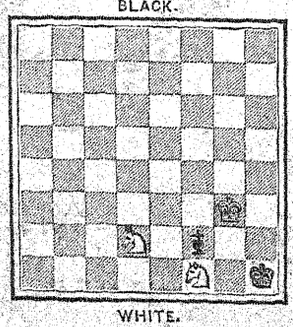
Position by B. Horwitz.



As a rule the game should be drawn. Supposing by a series of checks White were to compel Black to abandon the pawn, he would move K – R8; Q × P and Black is stale-mate. Therefore the ingenious way to win is:—

1. K – B4, P – B8 = Q ch; K – Kt3 and wins. Or 1. . . . K – R8 (threatening P – B8 = Kt); then 2. Q – Q2 preliminary to K – Kt3 now wins.

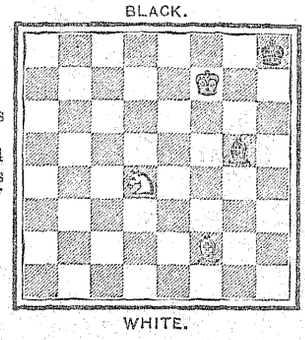
Position by B. Horwitz.



Without Black's pawn White could only draw. The pawn being on the board, White wins as follows:—

1. Kt – B4, K – Kt sq; 2. Kt (B4) – K3, K – R sq; 3. K – Kt4, K – Kt sq; 4. K – R3, K – R sq; 5. Kt – B4, K – Kt sq; 6. Kt (B4) – Q2, K – R sq; 7. Kt – Kt3 ch, K – Kt sq; 8. Kt – B3 mate.

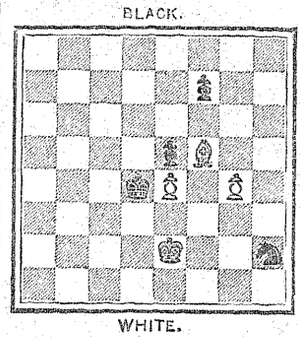
Position by B. Horwitz.



White wins with two pieces against one—a rare occurrence.

1. Kt – K6, B – R3; 2. B – Q4 ch, K – R2; 3. B – B3, B moves anywhere not *en prise;* 4. B – Kt7 and Kt mates.

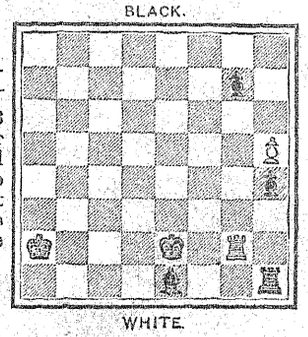
Position by O. Schubert.



White wins as follows:—

1. P – Kt5, Kt – Kt5; 2. K – B3, Kt – K6; 3. B – K6, Kt – B8; 4. B × P, Kt – Q7 ch; 5. K – Kt4, Kt × P; 6. P – Kt6, Kt – B3, ch; 7. K – Kt5, P – K5; 8. K × Kt, P – K6; 9. B – B4, K × B; 10. P – Kt7, P – K7; 11. P – Kt8 = Q ch, and wins by the simple process of a series of checks so timed that the King may approach systematically. The fine points in this instructive ending are the two Bishops' moves, 3. B – K6, and 9. B – B4, the latter move enabling White to queen the pawn with a check.

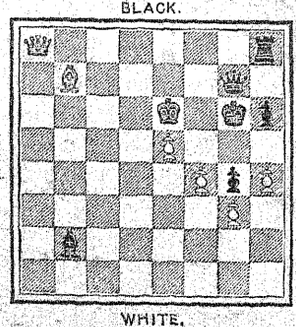
Position by F. Amelung.



White with the inferior position saves the game as follows:—

1. P – R6, P × P; 2. K – B3 dis. ch, K moves; 3. R – R2, or Kt2 ch, K × R; 4. K – Kt2 and draw, as Black has to give up the Rook, and the RP cannot be queened, the Black Bishop having no power on the White diagonal. Extremely subtle.

Position by B. Horwitz.



The main idea being to checkmate with the Bishop, this is accomplished thus:—1. B – K4 ch, K – R4; 2. Q × R, Q × Q; 3. K – B7, Q – B sq ch; 4. K × Q, B × P; 5. K – B7. B × P; 6. B – Kt6 mate.

Position by A. Troitzky.

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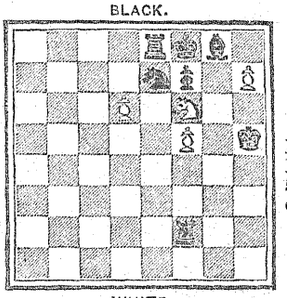


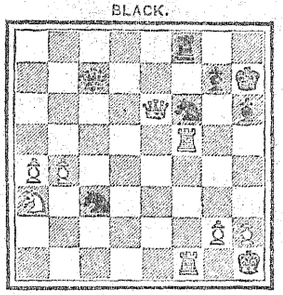
WHITE.

White wins as follows:—

1. P – R8 = Q, R – Kt7 ch; 2. K – Kt5, R × Q; 3. Kt – Q7 ch, K – Kt2; 4. P – B6 ch, K – R2; 5. QP × Kt, R – R sq; 6. Kt – B7 ch, R × Kt; 7. P × R = Kt mate.

Position by Hoffer

BLACK.



WHITE.

A position from actual play. White plays 1. R – B5 threatening to win a piece. Black replies with the powerful Kt – Kt5, threatening two mates, and finally White (Mr Hoffer) finds an ingenious sacrifice of the Queen—the saving clause.

The following are the moves:—

1. R – B5, Kt – Kt5; 2. Q – Kt8 ch, K – Kt3; 3. Q – K6 ch, K – R2; 4. Q – Kt8 ch, and drawn by perpetual check, as Black cannot capture the Queen with K or R without losing the game.

Progress of the Game

To gauge the enormous strides which chess has made since 1875, it will suffice to give the following statistics. In London Simpson's Divan was formerly the chief resort of chess players; the St George's Chess Club was the principal chess club in the West End, and the City of London Chess Club in the east. Now the British Chess Club is the principal West End club, whilst about a hundred or more clubs are disseminated all over the metropolis. Formerly only the British Chess Association existed; after its dissolution the now defunct Counties' Chess Association took its place, and this was superseded by the re-establishment by Mr Hoffer of the British Chess Association, which again fell into abeyance after having organized three international tournaments—London, 1886; Bradford, 1888; and Manchester, 1890—and four national tournaments. There were various reasons why the British Chess Association ceased to exercise its functions, one being that minor associations did not feel inclined to merge their identity into a central association. The London League was established, besides the Northern Chess Union, the Southern Counties' Chess Union, the Midland Counties' Union, the Kent County Association; and there are associations in Surrey, Sussex, Essex, Hampshire, Wiltshire, Gloucestershire, Somersetshire, Cambridgeshire, Herefordshire, Leicestershire, Northamptonshire, Staffordshire, Worcestershire, Lancashire. All these associations are supported by the affiliated chess clubs of the respective counties.

Scotland has its own association and a large number of clubs. Wales counts nine chess clubs, and Ireland several clubs in Dublin, Belfast, and other chief places, altogether about twenty-five.

In spite of all this array of temples devoted to the worship of Caïssa, England did not produce one eminent player between 1875 and 1901. First-class chess remained in the hands of the few veterans remaining from the Old Guard—Burn, Blackburne, Mason, and Bird. The old amateurs—with the exception of the Rev. C. E. Ranken—passed away, their place being taken by a new generation of powerful amateurs, so well equipped that Great Britain could hold its own in an amateur contest against the combined forces of Germany, Austria, Holland, and Russia. It must be distinctly understood that the terms "master" and "amateur" are not used in any invidious sense, but simply as designating, in the former case, first-class players, and in the latter, those just on the border-land of highest excellence. The professional element as it existed in the heyday of Simpson's Divan is almost extinct, the reason being the increased number of chess clubs where enthusiasts and students may indulge in their favourite pastime to their hearts' content, tournaments with attractive prizes being arranged during the season. The former occupation of the masters has gone in consequence; the few who still exist depend upon the passing visitors from the provinces who are eager to test their strength by the standard of the master. Blackburne has visited the provinces annually, keeping the interest in first-class chess alive by his simultaneous play and his extraordinary skill as a blindfold player—unsurpassed until the advent of Pillsbury, who has done similar good work in America. Pillsbury is the only first-class player produced by the United States. America has a number of amateurs—Showalter, Delmar, Hymes, Barry; and they have also beaten Great Britain in producing a second Morphy. Still the Americans have difficulties in recruiting a team of ten for the annual cable match against Great Britain.

It stands to reason that first-class chess can only be acquired by an interchange of opinions with and by the advice of first-class players, and until this fact is recognized and acted upon by the officers of clubs, the undoubted talent of the amateurs may be diverted into the furrows of mediocrity. A club trophy or a cup should not be considered the Ultima Thule of a skilful chess player.

Germany has produced Dr Tarrasch, Dr E. Lasker, Lipke, Fritz, Bardeleben, Walbrodt, Mieses, and a goodly number of amateurs, to replace Andersen, Paulsen, Tassilo von Heydebrand und der Lasa, and others. Austria has worthy substitutes for Kolisch, Bauer, Falkbeer, in Max Weiss, Schlechter, Marco, and Hruby. It has also such fine players as the Fleissigs, Dr Mertner, Dr Kaufmann, Fahndrich, Jaques Schwarz, and others. Hungary is worthily represented by Maroczy, Makovetz, and Brody, Maroczy being the best since Charousek's death. Russia, having lost Jacnisch, Petroff, and Schumoff, is now represented by Tchigorin, Janowsky, Schiffers, Alapin, Winawer, and Taubenhaus, and some younger players are ready to take their place in future. France has been on the decline for many years, and at present has only the veteran M. Arnous de Rivière and the naturalized M. Rosenthal left. Next come Goetz and two good amateurs, MM. Didier and Billecard. Italy has only Signor Salvioli, although latterly Signor Reggio has come to the fore. Holland has a fair number of players equal to English amateurs, but no master since the promising young Van Lennep died. Fortunately the periodical international tournaments contribute in a large measure to maintain the standard of first-class chess. A collection of the games is generally published in book form, whilst the press disseminates a selection of the best games during the progress of these contests.

Past and Present.

The theory of the game has not advanced in proportion to the enormous strides in popularity of chess. The tendency has been one of elimination, and therefore progress has been negative, if the expression may be used. For-

merly the theory had been enriched by such enthusiasts as Dr Max Lange, Louis Paulsen, Professor Anderssen, Neumann, Dr Suhle, Falkbeer, Kieseritzky, Howard Staunton, Dr Zukertort, W. N. Potter, and Steinitz, foremost amongst them being Louis Paulsen. The openings were thoroughly overhauled, new variations discovered and tested in practical play over the board. These are now *tempi passati*. The masters who find flaws in old and discover new variations bring them to light only in matches or tournaments, as new discoveries have now a market value; new discoveries may gain prizes in matches or tournaments. For the same reason the romantic school is extinct, and the eliminating process alluded to above has resulted in the retention of a small *répertoire* only, sufficient for practical purposes in important contests. Gambits and kindred openings containing elements of chance are avoided, and the whole stock which a first-class player requires is a thorough knowledge of the *Ruy Lopez*, the *Queen's Pawn Openings*, and the *French* and *Sicilian Defences*—openings which contain the least element of chance. The *répertoire* being restricted, it necessarily follows that the scope for grand combinations is also diminished, and only strategy or position play remains. The romantic school invariably aimed at an attack on the king's position at any cost; nowadays the struggle is to obtain a "minute" advantage, and the whole plan consists in finding a weak spot in the opponent's arrangement of forces, or to create such a weak spot—and this is the theory of the modern school, conceived and advocated by Steinitz (mentioned under "End Games"). But it is a curious fact that Steinitz founded the modern school rather late in life. He felt his powers of combination waning, and being the "world's champion," and eager to retain that title, he started the new theory. This novel departure revolutionized chess entirely. The attacking and combination style was sacrificed to a sound, sober, and dry style; but Steinitz, strange to say, was not even the best exponent of his own theory, this position falling to younger players, Dr Siegbert, Tarrasch, Schlechter, Mr Amos Burn, and Dr Emanuel Lasker. Pillsbury and Janowsky adhere to both styles, the former in a high degree, and so did the late Dr Zukertort and Charousek, whilst Tchigorin is a free-lance, with a style of his own. The old charm of the game has gone—in match and tournament play at least—and beauty has been sacrificed to exact calculation and to scoring points. This is to be regretted, for the most beautiful games occur still if a player resorts to the gambits. One of the finest games in the Hastings tournament was played by Tchigorin against Pillsbury, and this was a *King's Gambit Declined;* Charousek won a *Bishop's Gambit* against Dr Lasker in the Nuremberg tournament; and some brilliant games occur in *Queen's Gambit Declined*, if either white or black sacrifices the KP. Another reason why gambits should be adopted by players in tournaments is that competitors would necessarily be readily prepared for the regulation openings, so that the gambits might take them by surprise. After all, the new school is a natural consequence of the progress of the game. Paulsen, Anderssen, and Tchigorin devoted a lifetime to the Evans gambit, and volumes of analyses were written on it, and then comes Dr Lasker, revives an obsolete defence, and the Evans gambit disappears! Dr Zukertort achieved a great success with 1 Kt to KB 3 in the London tournament, 1883, and since then this or the kindred 1 P to Q 4 opening has become the trusty weapon in serious encounters. Dr E. Lasker wrote *Common Sense in Chess*, and gave the best defences of the *Ruy Lopez* (a certain form of it); and the "common sense" was demolished in the Paris and Nuremberg tournaments, and old forms of that remarkable opening have to be refurbished. Any number of similar instances could be cited, but those mentioned will suffice to show the reason for the cautious style of the present day—the Moltkes have replaced the Napoleons.

The former versatility of style could be revived gradually if club tournaments were organized differently. The players should be compelled to adopt one single opening only in a two-round contest, each player thus having attack and defence in turn. The next season another opening should form the programme, and so on. Even in international tournaments this condition might be imposed, and the theory would be enriched; full scope would be given to power of combination and ingenuity, whilst the games would be more interesting. The *raison d'être* of tournaments being to further the progress of the game, the suggestion, it would seem, might be seriously considered. Lovers of the game generally give special prizes for brilliant games, but these prizes are only an allurement to those competitors who no longer hope to gain any of the regular prizes. So as a last resource, having nothing to lose, they adopt a more enterprising style, even at the expense of soundness.

The club trophies and the sums devoted to brilliancy prizes might be devoted to a more useful purpose—namely, as prizes for essays on the Openings, so as to induce experts to devote their leisure to the advancement of the theory. All these suggestions, however, could only be thoroughly carried out by a powerful central authority such as a British Chess Association. If amateurs like Sir George Newnes, Captain A. S. Beaumont, and Mr F. G. Neumann should take steps to reconstitute such an administrative body, a new era for English chess would dawn.

There are still amateurs who devote their energies to the theory of the game; but so long as innovations or new discoveries are not tested by masters in serious games, they are of no value. A case in point may be cited. Steinitz used to keep a number of new discoveries ready to be produced in masters' contests, the result being that his novelties were regularly demolished when it came to a practical test. The mistake was that he did not try his novelties over the board with an opponent of equal strength, instead of trusting to his own judgment.

Literature.

Chess literature has grown *pari passu* with the popular progress of the game. *Gossip's Manual* and *Wormald's Openings* were the last old-form works. No sooner did the *Westminster Papers* (the chief monthly magazine) cease publication, than the *Chess Monthly* was started in its stead by Hoffer and Zukertort, and was continued single-handed by the former after Dr Zukertort's death. It ceased publication after seventeen years' existence. The former *Huddersfield Magazine* was converted into the *British Chess Magazine*, and this is now the only English monthly periodical. The demand for such a publication diminished as the daily press opened its pages to regular chess columns. After the famous London tournament in 1883, the *Standard*, *Morning Post*, and *Daily News* led the way in this matter, other papers following suit; and within recent years the *Times* has had an occasional chess column in its daily and a regular column in its weekly issue. The provincial papers devote still more space to chess than the London press, especially in their Saturday issues. The principal towns have two or more chess columns. Scotland has chess columns in Aberdeen, Edinburgh, and Glasgow; Ireland in Belfast and Dublin; and Wales in the Cardiff *Evening Express*. There are chess columns in every important town in Canada, in New South Wales, Victoria, Melbourne,

South Australia, Queensland, West Australia, New Zealand, British India, Jamaica, Cape Town, Johannesburg, Calcutta, and Malta. In the American press liberal space is devoted to chess, and the same is the case on the Continent of Europe, Germany leading. There are chess publications in Havana, Peru, and even in China.

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Chester, a city and county of itself, municipal county (1888) and parliamentary borough, episcopal city, seaport, and county town of Cheshire, England, on the Dee, 179 miles N.N.W. of London by rail. A station on the Great Central railway was opened in 1890, whence branch lines have since been made to Hawarden and South Wales. The parliamentary representation was in 1885 reduced to one. The churches include St Mary's-without-the-Walls (1887) and the parish church of St Mary-on-the-Hill (1887). Among the schools are Blue Coat School (1700), the Diocesan Training College for schoolmasters, and the Queen's School for girls (1878). Other buildings are the Royal Theatre (1882), Grosvenor Museum and School of Art (1886), Campbell Memorial Hall (1895). Handbridge Park was opened in 1892. Extensive alterations of the castle are in progress. The navigation of the Dee has been much improved. In 1898, 86 vessels of 7240 tons were registered at the port; entrances numbered 2194 of 167,923 tons; clearances 2092 of 170,232 tons. Imports of foreign and colonial produce for 1898, £29,205, against £49,576 in 1888. Exports of the produce and manufactures of the United Kingdom in 1898 amounted to the value of £16,058, against £1621 in 1888. The area of the municipal borough, according to the delimitation made in 1898, measures 2860 acres. Before then the area of city and county borough was 2960 acres; population on the old area (1881), 36,794; (1901), 36,281. Area of parliamentary borough, whose limits reach into the ancient county of Flint, 3455 acres; population (1881), 40,972; (1891), 42,295; (1901), 46,204.

Chester, a city of Delaware county, Pa., U.S.A., situated in 39° 54′ N. lat. and 75° 21′ W. long., on Delaware river. It is regularly laid out on a level site, with broad streets, and has extensive cotton manufactures and a large shipbuilding industry, mainly of iron vessels. It is the site of the Pennsylvania Military College. Three railways traverse it: the Philadelphia, Wilmington, and Baltimore, the Baltimore and Ohio, and the Philadelphia and Reading. The assessed valuation of real property in 1900, on a basis of about two-thirds of the full value, was $14,883,773, the net debt $769,647, and the tax-rate $19.50 per $1000. Population (1880), 14,997; (1890), 20,226; (1900), 33,988, of whom 5074 were foreign-born and 4403 negroes.

Chesterfield, a municipal borough (enlarged 1892) and market town in the Chesterfield parliamentary division of Derbyshire, England, 24 miles N. of Derby by rail. A gas and water board has been incorporated, and the gas-works reconstructed. A George Stephenson Memorial Hall has been erected, containing a free library, a lecture room, art and science class-rooms, the rooms of the Chesterfield Institute, and a theatre. A large theatre was built in 1895. Chesterfield Hospital has been enlarged, and a public park purchased. There are slate and sandstone quarries in the neighbourhood. Extended area, 1219 acres; population (1881), 19,835; (1901), 27,185.

Chester-le-Street, a town in the Chester-le-Street parliamentary division of Durham, England, 6 miles N. of Durham city by rail. Two Roman altars with inscriptions have been found. A church founded towards the end of the 13th century, and containing interesting memorials, has been restored. There are Congregational and Methodist chapels; also a mechanics' institute and a church institute; an infectious diseases hospital has been opened. Confectionery is manufactured. Area of civil parish, 2900 acres; population (1881), 6911; (1891), 8623; (1901), 11,753.

Chesterton, a parish and village in the Chesterton division of Cambridgeshire, England, the village being 1½ miles N. from Cambridge station, on the north bank of the Cam. It is the goal for boat-races from Cambridge, and several picturesque boat-houses have been erected along the river by the University Boat Club. Boat-building and tile manufacture are local industries. In 1894 an urban district council was established. Area, 2778 acres. Population (1881), 5706; (1901), 9583.

Chevalier, Michel (1806-1879), French political economist, was born at Limoges, 13th January 1806. In his early manhood, while employed as an engineer, he became a convert to the theories of Saint Simon; these he ardently advocated in the *Globe*, the organ of the Saint Simonians, which he edited until his arrest in 1832 on a charge of outraging public morality by its publication. He was sentenced to a year's imprisonment, but was released in six months through the intervention of M. Thiers, who sent him on a special mission to the United States to study the question of land and water transport. In 1836 he published, in two volumes, the letters he wrote from America to the *Journal des Débats*. These attracted so much attention that he was sent in the same year on an economic mission to England, which resulted in his publication (in 1838) of *Les intérêts matériels de la France*. The success of this made his position secure, and in 1840 he was appointed professor of political economy in the Collège de France. He sat for a short time (1845-46) as a member of the Chamber of Deputies, but lost his seat owing to his enthusiastic adoption of the principles of free trade. Under Napoleon III. he was restored to the position of which the revolution of 1848 had temporarily deprived him. In 1850 he became a member of the Institute, and in the following year published an important work in favour of free trade, under the title of *Examen du système commercial connu sous le nom de système protecteur*. His chief public triumph was